DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL STATION

SUMMERLAND, B.C.

REPORT OF THE SUPERINTENDENT

W. T. HUNTER

FOR THE YEAR 1928

Horticultural building and fruit products plant on the Summerland Station.

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DOMINION EXPERIMENTAL STATION, SUMMERLAND, B.C.

REPORT OF THE SUPERINTENDENT, W. T. HUNTER, B.S.A.

THE SEASON

The winter of 1927-28 was fairly severe, following a wet fall with less sunshine than usual. Low temperatures were recorded during the second week in December and early in the new year. Heavy snowfalls were recorded between November 12 and 16 but remained on the ground only a few days. Further heavy falls occurred during the second week in December and this lay on the ground until the end of January. The total snowfall during the winter was 50·2 inches, this being exceptionally heavy for this district. Spring was cold and backward with heavier precipitation than usual but under these conditions seed germination, especially of root seeds, was excellent. The wet weather continued until the first week in July to be followed during the remainder of the year by months of persistently dry weather. After the first week, July was very hot, the hottest day of the year, 100 degrees, being recorded on July 22. High temperatures were recorded throughout August and as late as September 3 the mercury reached 91 degrees.

The fall continued dry with moderate temperatures. Slight frosts were recorded throughout October and November but it was not until the first week of December that a severe freeze occurred, the mercury falling to 10 degrees above zero. No snow fell until the end of December.

The accompanying table gives a summary of the meteorological data for the year 1928, also the average mean temperatures and precipitation over a period of thirteen years, and average sunshine for twelve years.

TABLE 1—METEOROLOGICAL RECORDS, 1928

1928	Temperature (F)						Precipitation				Sunshine	
	Mean		Maximum		Minimum		Rain	Snow	Total precipitation			
	1928	Average 13 years	Highest	Mean-maximum	Lowest	Mean-minimum			1928	Average 13 years	1928	Average 12 years
	°	°	°	°	°	°	in.	in.	in.	in.	hours	hours
January	27·93	25·62	44·0	32·90	−1·0	22·97	0·15	9·7	1·12	0·96	32·1	50·4
February	33·05	29·22	46·0	39·89	9 0	26·21	0·09	0·5	0·14	0·54	156·8	93·8
March	41·71	38·80	65·0	50·71	19·0	32·71	0·50	4·0	0·90	0·53	137·0	138·5
April	45·80	47·31	71·0	55·33	27·0	36·27	1·57	.....	1·57	0·78	181·1	190·2
May	60·11	56·18	87·0	72·42	33·0	47 81	1·16	.....	1·16	0·73	299·9	233·3
June	63·75	63·48	90·0	74·50	44·0	53·00	1·48	.....	1·48	1·10	206·1	252·2
July	72·48	70·70	100·0	84·81	53·0	60·06	1·65	.....	1·65	0·68	337·9	320·9
August	69·04	68·59	94·0	82·32	45·0	55·76	0·23	.....	0·23	0·31	316·1	269·5
September	62·02	59·07	91·0	74·07	39·0	49·97	0·01	.....	0·01	0·79	240·8	203·7
October	46·87	48·01	65·0	55·13	30·0	38·61	0·39	.....	0·39	0·79	184·4	142·8
November	38·58	36·30	53·0	44·74	24·0	32·43	0·35	.....	0·35	0·98	76·5	60·1
December	29·27	27·45	45·0	34·74	10·0	23·81	0·43	3·2	0·75	1·37	80·4	41·8
Totals	.....	.....	.....	.....	.....	.....	8·01	17·4	9·75	10·06	1,248·1	1,997·2

HORTICULTURE

TREE FRUITS*

The annual report is an important means of keeping the fruit grower in close touch with the work carried on by this Station. Accordingly, a great deal of time and thought is employed each year in an endeavour to make the report of this division a vital link between the grower and the Station. In the early days of the Station the report was used chiefly as a medium through which to acquaint the grower with results of practical value secured from the many experiments in progress. Simple non-technical language was used in an attractive, readable form which would make it interesting to growers.

During the past few years, however, it has become increasingly apparent that the fruit investigations carried on at this Station are attracting the attention of agricultural scientists, teachers and students as well as growers. To these readers and also to the more progressive growers the data on which recommendations are based are often more interesting and more valuable than the recommendations themselves. Accordingly, it has seemed advisable to include at least sufficient data to show that the recommendations are substantiated by adequate experimental evidence. Such a procedure necessitates the use of additional space and the size of the annual report is strictly limited. It is therefore evident that if the report is to serve both classes of readers only a few of the many questions under investigation can be discussed each year.

In the reports for the past five years about half the space has been devoted to presentation of the results secured from the numerous fruit projects which are being conducted. The fact that tree fruit culture is the premier industry in the Okanagan Valley is ample justification for this procedure, but the diversified agricultural problems in the territory served by this Station have necessitated the expenditure of a great deal of time and money on other lines of investigation such as vegetable production, floriculture, tobacco growing, forage crops, animal husbandry, poultry and bee-keeping. Owing to the limited space available in the annual report it has been necessary, in past years, to omit discussion of many of the important lines of work underway in the above divisions. In order that growers may be more fully informed concerning the progress made towards the solution of problems other than those dealing with fruits it has been considered advisable to devote only a comparatively small portion of the present report to a discussion of fruit projects.

Accordingly, the following paragraphs embody only brief mention of some of the major fruit investigations, reference being made to previous reports for a more comprehensive presentation of methods of procedure and results. In addition four projects, dealing respectively with apricot harvesting, cherry pollination, apricot pruning and peach pruning, are treated at greater length. These projects have been in progress a comparatively short time and have consequently received little attention in previous reports. For this reason it is considered that a fairly extensive statement is justified in order that growers may be kept fully informed of the steps which are being taken to find a solution for their problems.

BREAKDOWN OF APPLES

This project was undertaken in 1923 with the purpose of devising some practical means of preventing the extremely heavy losses caused by breakdown of the Jonathan and other varieties of western grown apples. Some very interesting data have been accumulated and helpful recommendations have been made to

* The work in this Division is under the charge of Mr. R. C. Palmer, M.S.A., assistant to the Superintendent, who has been entirely responsible, under the superintendent, for this work, and has prepared this section of the report.

growers from time to time through the medium of press articles, illustrated lectures and annual reports. A general outline of the investigation, with special reference to the Jonathan variety, was published in the 1925 annual report. This discussion was supplemented the following year by information concerning the influence of growing, harvesting and storage conditions on the development of breakdown in several other important commercial varieties of apples.

In the 1927 annual report sufficient experimental data were included to show that the disease can be prevented by harvesting the fruit before it reaches an advanced stage of maturity. It was also clearly demonstrated that early picking is especially desirable with trees which are carrying a light crop. On the other hand the undesirable effects of premature harvesting were pointed out. In order to facilitate harvesting at the proper stage of maturity the use of a colour chart was suggested. Copies of this colour chart have been distributed free to interested growers. The use of this chart by growers has undoubtedly resulted in a very material reduction in the losses from breakdown during the past few years. Nevertheless the problem is a most complex one and further investigation to determine the fundamental cause of the disease is very urgently needed.

BREEDING OF TREE FRUITS

The purpose of these projects is the development of new varieties more attractive to the consumer and more profitable to the grower than our present commercial sorts. Excellent as our present varieties are, not one of them is perfect, and there is no doubt that many new and improved forms will be developed in fruit districts all over the world. In order to meet competition from other fruit growing areas, British Columbia must develop her own superior varieties specially adapted to local soil and climatic conditions. Progress in this direction is necessarily slow, but reference to the outline of fruit breeding projects given in the 1926 report will show that this matter is receiving due attention.

CULTURAL METHODS FOR ORCHARDS

Several projects dealing with orchard soil management are included under this heading. They involve the use of over forty acres of land and embrace a study of various systems of cover cropping, manuring and cultivation. The aim in view has been to devise and test economical methods of culture calculated to suit the varied temperature, moisture and soil conditions encountered in the B.C. Dry Belt.

In the annual report for 1923 a good deal of space was devoted to a comparison of the results secured from clean cultivation, the alfalfa sod mulch system and cover cropping with hairy vetch. The 1925 and 1926 reports contain further information relative to these three methods of culture and also include a discussion of the comparative value, for cover crop purposes, of red clover, biennial sweet clover and various annual crops such as field peas, buckwheat and fall rye. The place of vegetable intercrops and the use of manure in the economy of orchard operation are also dealt with in these reports.

It is difficult to estimate the influence which these investigations have had on the trend of orchard soil management in the interior valleys of British Columbia. It is evident, however, from the number of enquiries received and the interest which growers have shown in the experimental orchards, that the expenditure of time and money on this field of enquiry has been fully justified.

FERTILIZERS FOR ORCHARDS

The soils of semi-arid regions are commonly well supplied with mineral nutrients such as potassium and phosphorus but they are usually deficient in nitrogen and humus. Where sufficient irrigation water is available this deficiency may be largely overcome by growing legume cover crops. This is especially true with young orchards. There is reason to believe, however, that after the trees have come into full bearing it may often be profitable to supply additional nitrogen in chemical form. It is even possible that on certain soil types the application of other chemicals may sometimes be justified. With these facts in mind several fertilizer experiments are being carried out and three of them are outlined in the annual reports for 1925 and 1926.

FILLER TREES IN THE ORCHARD

The question of just how far apart trees should be planted to give maximum profits over a series of years is one of vital interest to every fruit grower. Accurate records as to cost of operation and yields secured are necessary in order to arrive at the truth in problems of this nature. Four projects designed to throw light on this question are being conducted and the methods of procedure adopted are briefly stated in the annual report for 1926. These experiments must necessarily be continued for a good many years before definite conclusions can be drawn.

GRAFTING OF TREE FRUITS

Commercialization of the fruit industry has brought about a demand for large quantities of relatively few varieties of fruit. For this reason the old type of orchard, consisting of a large number of varieties, is now out of date in progressive fruit growing districts. Furthermore the introduction of improved varieties has reduced the demand for old favourites which were profitable to the grower only a few years ago. As several years are required to bring a fruit tree to bearing age the grower is naturally loath to pull out a mature tree and replant with a new variety unless this drastic step is absolutely essential. Top grafting has been suggested as a more rapid means of converting undesirable varieties to profitable sorts.

In the present state of the growers' knowledge concerning top grafting there is a good deal of risk attached to the procedure. There is urgent need of more information as to the advisability of top working trees of different kinds and ages.

Grafting is also used as a means of saving trees which have been girdled at ground level by rodents or by disease. In this connection there is room for improvement in the technique of performing the operation.

Both these types of grafting have been under investigation and a detailed statement of progress made is to be found in the annual report for 1926.

HARVESTING OF TREE FRUITS

Special attention to this important phase of orchard operation is rendered necessary by the fact that a great deal of the fruit produced in British Columbia is shipped to distant markets. It is of the utmost importance that the fruit be harvested at the proper stage of maturity to facilitate delivery in prime condition at consuming centres. The problem is complicated by the fact that most growers ship through central packing houses so that they have no means of knowing the condition in which their particular fruit reaches the consumer. In order to ensure intelligent harvesting a determined effort is being made to devise effective maturity tests simple enough to be used by the grower in the orchard.

The work with apples was begun in 1922 and more or less extensive statements of progress have appeared annually in the reports of this Station since that time. A fairly complete account of the results secured in this investigation over a six-year period was published in the 1927 annual report. Emphasis was laid on the fact that throughout the planning and carrying out of the project the idea in mind has been to apply the methods of science to the solution of some very practical problems of the orchardist. Methods of procedure were fully explained and extensive experimental evidence furnished. The investigation embraced a study of the influence of harvesting practice on the size, colour, quality and storage life of seven important commercial varieties of apples. Data were presented showing the value of maturity tests in minimizing the losses from such causes as scald and breakdown. This was followed by a full discussion of the relative efficiency of changes in size, colour, hardness, ease of picking, etc., as maturity tests for each variety. It was clearly pointed out that on many of these questions rule of thumb recommendations are impossible. Nevertheless an attempt was made to draw conclusions and make fairly definite recommendations for harvesting McIntosh, Jonathan, Grimes Golden, Delicious, Yellow Newtown, Rome Beauty and Wagener.

A somewhat similar investigation planned to secure information regarding maturity tests for pears was begun in 1926 and the methods of procedure which are being followed were outlined in the annual report for that year. In 1928, work was started with apricots along the lines indicated in the following paragraphs.

APRICOT MATURITY AND SHIPPING TEST—Project H. 621

The average annual production of apricots in British Columbia amounts to over 90,000 twenty-pound crates a year. Under present arrangements most of the crop is shipped fresh to consuming centres on the Prairie. The condition of the fruit on arrival at destination sometimes leaves much to be desired. Frequent complaints that British Columbia apricots are inferior in quality and arrive in overripe condition, suggest that more attention should be paid to the stage of maturity at which they are harvested.

In 1928, shipping tests were made with four varieties: Wenatachee Moorpark, Blenheim, Royal and Tilton. The fruit was secured from trees five to twelve years of age growing on a light loam soil underlaid with gravel. This soil had been built up by the use of leguminous cover crops. The trees were healthy and vigorous. They carried a good crop, and the fruits averaged somewhat larger than the general run of apricots produced in this province.

Fruit at various stages of maturity was picked from the same trees on the same day. It was then segregated into grades according to colour. Apricots showing a tinge of yellow in the skin-colour were designated "just turning," whereas fully coloured firm specimens were classed as "firm ripe." The term, "half and half" was used to describe fruits intermediate in colour between "just turning" and "firm ripe." Information as to the hardness of the fruits in each of these colour stages was obtained by recording the number of pounds pressure required to force a 5/16-inch point 5/16 of an inch into the unpeeled flesh. In making the pressure determinations the point was applied to each cheek of the apricot. The average hardness was determined by making tests on several specimens.

Fruit of the different colour grades was packed in separate baskets and each basket was labelled to indicate variety, date of picking, stage of maturity, and number of fruits in the basket. The baskets were then assembled in standard four-basket crates and shipped by express to consignees qualified to render detailed reports as to the quality and condition of the fruit on arrival. In all

cases shipments were made within twenty-four hours of time of picking. A questionnaire was enclosed in each package, information on the following points being requested:—

Date when fruit was received.
Condition of package on arrival.
General condition of fruit on arrival.
Number of fruits rotten.
Number of fruits seriously bruised.
Number of fruits shrivelled.
Stage of ripeness; firm ripe, soft, very soft.
Flavour: good, fair, poor.
Texture: juicy, medium dry, dry.
General Remarks: calling for consumer's personal opinion.

Shipments were made to nineteen consuming centres at various distances from point of shipment. Duplicate crates were sent to several points with instructions that they be returned unopened for inspection at Summerland. Check lots of all grades were kept at the Station in a common storage cellar where the temperature averaged about 65 degrees Fahrenheit and the relative humidity ranged between 70 and 80 per cent.

Wenatchee Moorparks picked when "just turning" developed fair flavour and medium dry texture. They carried fairly well to places three days distant from point of shipment. The check lots kept in common storage developed full yellow colour but were slightly shrivelled and overripe eight days after picking. Fruit of this variety picked at "half and half" stage of maturity developed good flavour and texture. It carried fairly well to points within two days' journey from Summerland but the crates sent to more distant points arrived with many fruits badly bruised and some fruits rotten. In common storage they showed no shrivelling but were overripe in six days.

Blenheims picked when "just turning" developed fair quality but showed some shrivelling. When examined seven days after shipment they were still somewhat greenish in colour. Those shipped at the "half and half" stage of ripeness developed good quality. They carried well to destinations requiring three or four days to reach the consumer. The check lots held in common storage were overripe eight days after picking.

Royals picked when "just turning" developed fair flavour, medium dry texture, and slight shrivelling. Examination of the "half and half" lots three to five days after shipment showed that they had carried well but were ripening unevenly. Quality was reported as fair to good, and texture as medium dry to juicy. They were still in good condition after seven days in common storage. Shipments of "firm ripe" Royals developed excellent flavour but they arrived overripe where more than three days were required to reach their destination. In common storage they were overripe in seven days.

Tiltons shipped "just turning" arrived in good condition after six days in transit. Thy showed very little bruising, no rot, no shrivelling, and developed good yellow colour. The flavour, however, was only poor to fair and the texture medium dry. Shipped "half and half" they arrived in good shape after a six days' journey but the flavour was reported as only fair. Fruit of this variety picked "firm ripe" developed much better flavour but arrived in an overripe condition six days after shipment. In common storage it was still in good eating condition eight days after picking.

It is evident from these observations that the stage of maturity at which apricots are picked has a very important bearing on the distance to which they

can be shipped. Furthermore, it is apparent that the four varieties tested differ markedly in their ability to stand shipment. The explanation probably lies in the fact that apricots soften very rapidly as they approach maturity and varieties differ greatly in firmness. Data bearing on this point are presented in the following table:—

TABLE 2.—COLOUR AND HARDNESS OF APRICOTS

Variety	Just turning	Half and half	Firm ripe
Wenatchee Moorpark	10–9*	6–5	–
Blenheim	13–10	8–6	–
Royal	14–11	10–9	5–4
Tilton	16–13	12–10	7–6

*Pounds pressure required to force a 5/16 inch plunger 5/16 of an inch into the unpeeled flesh of the fruit.

It will be noted that within each variety there was marked softening as the fruit passed from one colour stage to the next. There was also a significant difference in hardness between fruits of the four varieties in the same colour stage.

While it would be premature to attempt to draw conclusions from one season's work the results secured indicate that, under the high temperature conditions which commonly prevail during the apricot shipping season, the life of this fruit is very short even though it is picked in an immature condition. In order that they may develop full quality, apricots must be left on the tree until they are well coloured but when picked in this stage of maturity they are likely to reach the consumer in an overripe and badly bruised condition. It seems probable that precooling and shipment under refrigeration will be found necessary if this province is to continue the shipment of large quantities of apricots in the fresh state.

IRRIGATION OF ORCHARDS

Irrigation is practised on most of the orchards in the territory served by this Station. Accordingly the problems of fruit growers in this area are very intimately associated with the artificial application of water to the soil. It is logical, therefore, that this Station should devote special attention to the study of orchard irrigation. Good progress has been made, as can be ascertained by reference to the annual report for 1925.

POLLINATION OF FRUITS

The reduction of the number of varieties grown in commercial orchards has drawn attention to the fact that many of our varieties are self-sterile, that is they require pollen from some other varieties to ensure fertilization. In some cases important commercial varieties are inter-sterile, that is they will not fertilize each other, and unless trees of some other variety are included in the planting very poor crops are likely to result. The problem is complicated by the fact that a variety which is self-fertile in one fruit section may be self-sterile in another. With these facts in mind investigations are being carried on to determine the pollination requirements of commercial varieties of fruit grown in the Okanagan Valley. Special attention is being devoted to the sweet cherry. A brief account of the plan of operation and some data recorded with this fruit are set forth below.

CHERRY POLLINATION EXPERIMENT—Project H. 673

The three varieties of sweet cherries grown most extensively in the British Columbia Dry Belt are the Bing, Lambert and Royal Ann. Extensive pollination tests carried on in Oregon, California, Ohio, Washington and elsewhere have shown that these varieties are not only self-sterile but also virtually inter-sterile under a wide range of soil and climatic conditions. For this reason it is necessary to supply pollen of an additional variety in order to ensure proper fertilization of the blooms. The inclusion of about 10 per cent of some good pollinizer in the planting appears to be the most satisfactory method of supplying the pollen. In established orchards fairly good results have been secured by top working.

Unfortunately there is a rather widespread impression that any variety of cherry other than Bing, Lambert and Royal Ann, will prove effective as a pollinizer for these varieties. Carefully controlled experiments have shown that this is far from the case; in fact it has been found that even within a variety, such as Black Tartarian, there are some trees which are good pollinizers and others which are practically worthless for this purpose. It seems probable that a number of so called varieties are in reality not true varieties but rather types consisting of a number of strains which vary in their efficiency as pollinizers.

Accordingly, it is of the utmost importance that experiments be carried on to determine the pollinizing value of individual trees. These trees may then be used as a source of propagating material. Only in this way is it possible to ensure that trees sold as pollinizers will prove effective for this purpose.

Furthermore, it is generally agreed that Black Republican and Black Tartarian, the two varieties most frequently planted as pollinizers, are not entirely satisfactory as commercial cherries. For this reason it is most desirable that a search be made for other effective pollinizers which at the same time produce fruit which is satisfactory from the market standpoint. With these objects in view this project was begun in the spring of 1928.

The technique of procedure was based largely on the methods developed at the Oregon Agricultural College. Pollen was secured by picking the blooms just before the petals opened and removing the anthers with a pocket comb. After drying for a day in a warm room the pollen was ready for use. It was placed in test tubes stopped with ordinary corks. Shaking the material up and down in the test tube caused a small amount of pollen to adhere to the cork whence it was dabbed on the stigma of the flower to be fertilized.

Petals and stamens were removed from the blooms to be pollinized just before the petals opened. This operation was very expeditiously performed by making a small incision in the corolla with a sharp knife, after which the corolla with petals and stamens attached could be easily removed. The pistils were left exposed without bagging.

Pollen was applied at time of emasculation and again the following day. Black Tartarian pollen was secured from trees in the Experimental Station orchard. Pollen of the Deacon variety was secured from a tree in Penticton. This variety was selected because experience in commercial orchards suggested that it might prove of value as a pollinizer and at the same time produce more desirable fruit than the black Tartarian and Black Republican. The third pollen parent used has been designated Nan C. Bing. This variety is of unknown origin. The original tree was purchased under the name Black Tartarian by a grower in the Penticton district. The fruit is much like Bing in form and quality and the tree sets such heavy crops that the owner was led to believe that it was self-fertile.

Pollen of each of the above varieties was tested on Lambert, Bing and Nan C. Bing. In order to secure a check on the efficiency of the technique employed adequate numbers of blooms of both Lambert and Bing were emasculated but left

unpollinized. A careful count of the number of fruits set was made just before picking time. The following table shows the number of blossoms pollinized, number of fruits set and percentage set for each variety.

TABLE 3.—CHERRY POLLINATION TEST, 1928

Pistil variety	Pollen variety	Number of blossoms pollinated	Number of fruits set	Percentage set
Lambert	Blk. Tart	310	218	70·3
"	Deacon	390	196	50·3
"	Nan C. Bing	480	36	7·5
"	Check	200	6	3·0
Bing	Blk. Tart	250	57	22·8
"	Deacon	370	152	41·1
"	Nan C. Bing	350	4	1·1
"	Check	400	2	0·5
Nan. C. Bing	Blk. Tart	100	30	30·0
"	Deacon	190	161	84·6
"	Nan C. Bing	330	35	10·6

These results suggest that the Nan C. Bing is practically self-sterile and of little value as a pollinizer for Bing and Lambert, but that Deacon is quite promising for this purpose. The low set on the checks indicates that very little pollen was carried to the emasculated flowers by insects or wind.

PRUNING FRUIT TREES

From ancient times fruit growers have resorted to the removal of branches in order to modify the form and fruiting habits of their trees. For many decades the prevailing practice in Europe was to grow fruit trees under garden conditions. Long experience of the growth responses to trees in this environment resulted in the development of pruning methods designed to secure good yields of high grade fruit while keeping the trees comparatively small. These methods necessitated a good deal of skill and a large amount of labour on the part of the pruner. Settlers coming to America from Europe introduced the pruning practices which had proved effective in the mother country. Careful experiments have shown, however, that many of these practices are quite ineffective and impractical under commercial conditions in America.

During the past few years the researches of plant physiologists and biochemists have thrown a good deal of light on the principles which underlie the response of trees to pruning. These principles have been tested by very comprehensive pruning experiments in both experimental and commercial orchards, so that it is now possible to predict, with a fair measure of certainty, the effect which a certain type of pruning is likely to have on the form and productivity of many of our commercial varieties of fruit trees.

Nevertheless there is urgent need for further information regarding the application of these principles to the practical problems of the orchardist. The growth habits of different varieties must be studied; the influence of the vigour of the tree on the response to pruning requires further investigation; and the inter-relation of pruning, distance of planting, thinning, soil fertility, irrigation practice, etc., necessitate extensive inquiry. All these phases of the pruning problem are receiving attention at this Station, over 500 trees being utilized in the various projects. An outline of the experiments dealing with the pruning of apples, pears and plums was published in the annual report for 1926. As the work with apricots and peaches has been only briefly mentioned in previous reports the pruning experiments dealing with these fruits are presented somewhat more fully below.

APRICOT PRUNING EXPERIMENT—Project H. 533

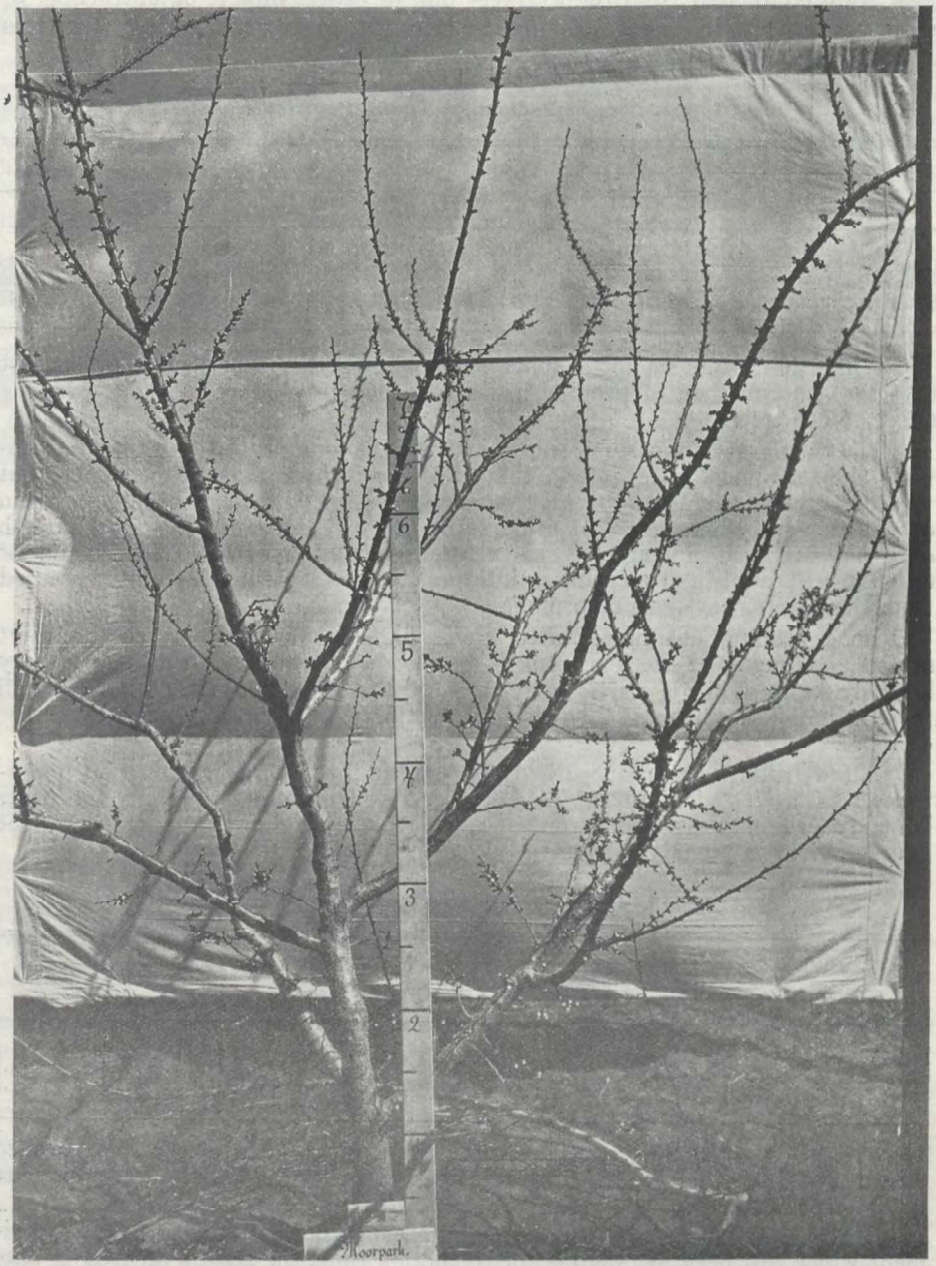
During the past few years the practice of "long pruning" apricots, as opposed to "heavy heading back," has been gaining favour with commercial growers. Advocates of the long system claim that it reduces the cost of pruning and increases the yield of fruit. Many successful growers maintain, however, that some heading back is necessary to ensure good vigour in the trees and size in the fruit. It seems probable that the severity of pruning should be modified according to the variety and the vigour of the trees. Vigour, in turn, is influenced by cultural methods, soil fertility, distance of planting, moisture supply, amount of thinning, etc. This project was planned to secure information regarding the influence of these factors on the apricot pruning problem. The land selected for the project slopes gently toward the north. The soil is a sandy loam, from one to three feet in depth, underlaid with gravel. Previous to 1924 it had been growing alfalfa hay for five years. In that year the alfalfa was ploughed under so that the soil was in good physical condition and well supplied with nitrogen when the apricot trees were set out the spring of 1925.

The planting plan made provision for two distances of planting, three varieties, and three methods of culture. In half the area the trees were set twenty feet apart each way, and in the other half they were set thirty feet apart with a filler in the centre. The varieties used were: Wenatchee Moorpark, Blenheim, and Tilton. One block is cover-cropped with hairy vetch, another receives an annual application of barnyard manure at the rate of ten tons to the acre, while the third is treated each spring with a complete chemical fertilizer applied at the rate of six-hundred pounds to the acre. Intercrops of soy beans, potatoes, and mangels were grown on the manure and fertilizer plots during the first three years. Since then these plots have been clean cultivated.

The irrigation water applied to each plot is measured, the time of application, and the amount of water applied being determined by the needs of the trees. Special care has been taken to ensure as uniform a distribution of water as possible.

For the first three years all trees received a light summer pruning early in June. This pruning was restricted to removal of superfluous new shoots. The main pruning was done in the dormant season. Three systems were followed. These may be designated long, short, and intermediate. On the long pruned trees no heading whatever has been practised, but sufficient thinning out has been done to ensure an open type of tree easily accessible to thinners and pickers. The short pruned trees have been thinned out and headed back severely, about half the new growth being removed each year. In the intermediate system, thinning out and heading back have been done where considered necessary to produce a well balanced framework. This has involved the removal of about one quarter of the new growth. Sixteen trees of each variety have received each type of pruning. These trees are distributed over the plots in such a way as to minimize error due to variation in the soil and moisture conditions.

Measurements of trunk diameter have been made during the dormant season each year, the readings being taken six inches from the ground level with a metal caliper graduated in inches and thirty seconds of an inch. It is considered that this simple measurement gives a fairly accurate indication of the total growth made by the trees. No attempt has been made to record the total amount of twig growth produced each year, but several representative terminal shoots have been measured on each tree. Notes have also been made regarding the influence of severity of pruning on the growth habits of the different varieties. A record has been kept of the labour involved in the three systems of pruning.



Four-year-old Moorpark apricot tree pruned by the "intermediate" system. Judicious thinning out and light heading back have produced a very desirable type of tree.

The data presented in the following table indicate the average trunk diameter of the trees at the close of the fourth growing season. A number of trees were eliminated from the averages due to death, injury, or untrueness to variety name, but in all cases the figures represent averages of at least ten trees of each variety receiving each method of pruning.

TABLE 4.—INFLUENCE OF PRUNING ON TRUNK DIAMETER OF APRICOTS

Method of pruning	Average trunk diameter in inches		
	Moorpark	Blenheim	Tilton
Long	4·35	4·56	4·48
Intermediate	4·14	4·56	4·59
Short	4·22	4·38	4·47

While the results set forth above are not altogether consistent they suggest that the short method of pruning has a tendency to produce a slight dwarfing effect on the trees.

The twig growth measurements show that the long pruned trees made somewhat shorter annual twig growth than did those which were headed back, but vigorous growth was made by all trees regardless of method of pruning, system of culture, and distance of planting. In many cases the one-year growth exceeded five feet in length. This vigorous condition of the trees should be taken into account in attempting to interpret the results which have been secured from the different systems of pruning.

Long pruning has necessitated about half as much labour as the short system, but many of the long pruned trees show a tendency to develop a very straggly form. This is particularly true of the Blenheim variety. Under all three pruning treatments this variety exhibits a decided weakness in the crotches.

A few fruits were produced in 1927, but the first crop of commercial importance was harvested in 1928. This crop received moderate thinning, the fruits being spaced not less than two inches apart. The following table shows the average yield in pounds per tree:—

TABLE 5.—INFLUENCE OF PRUNING ON YIELD OF APRICOTS

Method of pruning	Average yield in pounds per tree		
	Moorpark	Blenheim	Tilton
Long	27·1	12·8	14·3
Intermediate	25·2	8·7	14·1
Short	17·7	4·6	7·6

It will be noted that in each variety the average yield of the short pruned trees is less than that produced by the trees receiving the long and intermediate types of pruning.

While it is impossible to draw definite conclusions from a pruning experiment which has been in progress for so short a time, the results secured to date suggest that the less pruning an apricot tree receives the quicker will it come into bearing. There is strong evidence to indicate, however, that an intermediate type of pruning involving judicious thinning out and some heading back of strong growing young apricot trees is necessary to develop a satisfactory commercial type of tree.

PEACH PRUNING EXPERIMENT—Project H. 534

A peach pruning experiment planned for the same purpose and along the same lines as the apricot pruning project outlined above was started at the same time. The trees were set out according to the same planting plan and have been subjected to the same cultural treatments. Three varieties, Elberta, J. H. Hale, and Tuscan Cling, are included in the experiment. The systems of pruning followed are similar to those practised on the apricots. The long pruned trees have received a good deal of thinning out but no heading back. Short pruning has involved heavy heading back and thinning out, fully half of the new growth being removed each year. In the intermediate system light heading back of the main terminals, and fairly heavy thinning out has been practised.

The general cultural conditions have been such as to cause all the trees to make strong growth, the length of the one year terminals often exceeding six feet. Twig measurements made at the close of each growing season show that the short pruned trees have made the longest annual growths. Trunk diameter measurements, however, indicate that larger trees have resulted where less severe pruning has been practised. Data substantiating this statement are embodied in the following table. The figures represent the average trunk diameter of at least ten trees of each variety under each system of pruning at the close of the fourth growing season.

TABLE 6.—INFLUENCE OF PRUNING ON TRUNK DIAMETER OF PEACHES

Method of pruning	Average trunk diameter in inches		
	Elberta	J. H. Hale	Tuscan
Long	5·48	4·33	4·66
Intermediate	4·95	4·15	4·53
Short	4·89	3·93	4·27

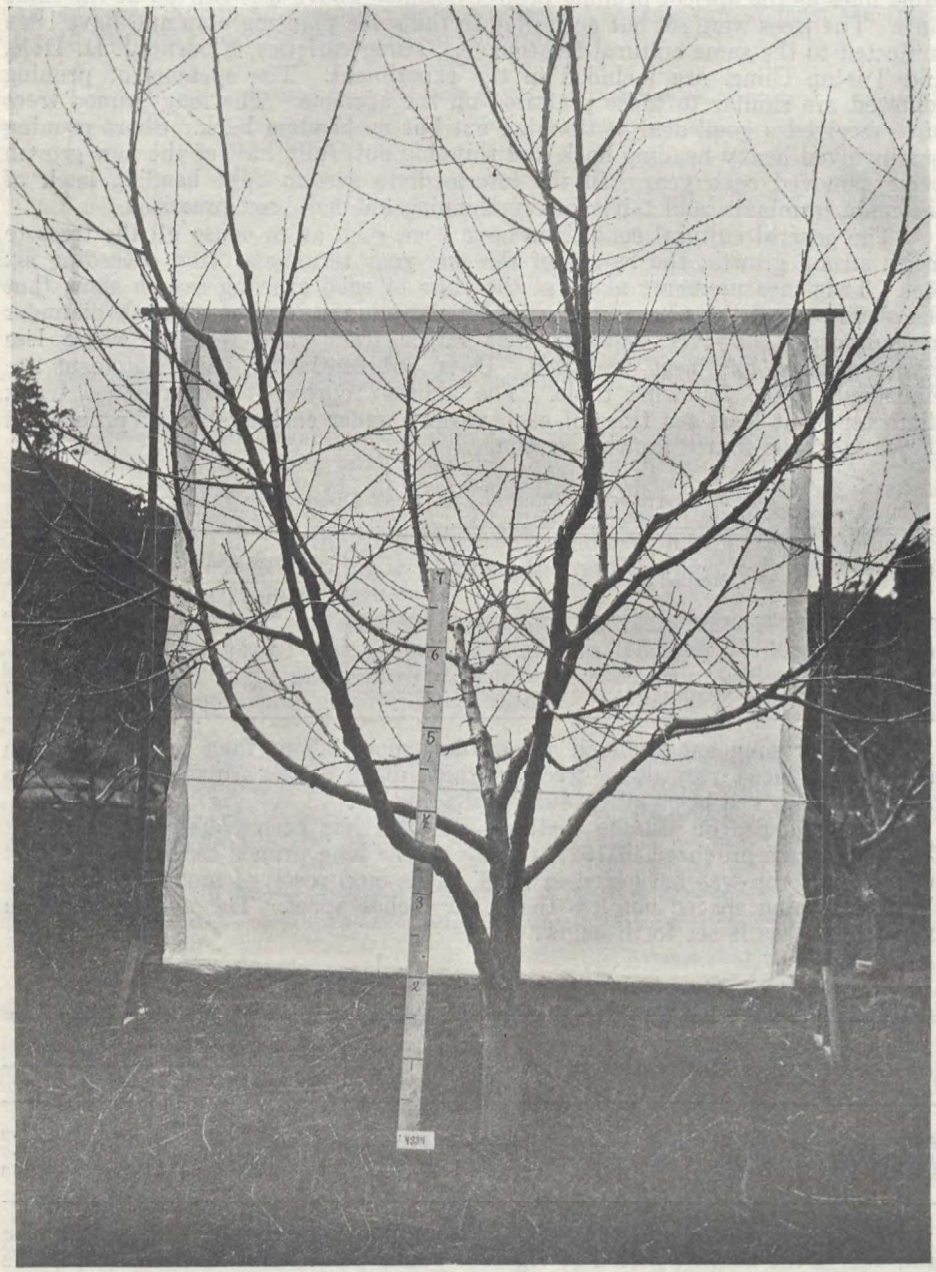
Short pruning has involved a good deal more labour than the long system and has produced very dense trees in which much of the fruiting wood on the main branches has been killed out by shading.

The influence of pruning methods on yield has been equally marked. A few fruits were produced in 1927, mostly on the long pruned trees, but the first commercial crop was harvested in 1928. This crop received moderate thinning, the fruits being spaced not less than four inches apart. The average yield in pounds per tree is set forth below.

TABLE 7.—INFLUENCE OF PRUNING ON YIELD OF PEACHES

Method of pruning	Average yield in pounds per tree		
	Elberta	J. H. Hale	Tuscan
Long	85·9	44·7	6·2
Intermediate	57·4	47·5	2·7
Short	27·3	15·3	0·3

There seems no doubt that heavy heading back materially reduces the size and delays the bearing period of vigorous young peach trees. Furthermore, this severe cutting does not seem to be necessary nor desirable in developing a good commercial type of tree. Young peach trees branch freely and very little heading back has been found necessary to produce a well-proportioned framework. Whether it will be found possible to maintain the trees in a vigorous condition without heavy heading back after they come into full bearing remains to be seen.



Five-year-old Elberta peach tree pruned by the "long" system. A large bearing surface has been developed in a very short time.

STOCKS FOR FRUIT TREES

Recent investigations conducted in both England and America have called attention to the fact that the form, hardiness, productivity and longevity of fruit trees may be very materially influenced by the character of the root systems on which they are worked. The common practice in America is to bud or graft commercial varieties of fruit on seedling roots. There is now general agreement that greater care should be taken to ensure that fruit trees are provided with roots of uniform vigour and hardiness. There is, however, great difference of opinion as to how this result can be most satisfactorily and economically achieved.

On the one hand the suggestion has been advanced that the solution of the problem lies in the vegetative propagation of root stocks. Attempts to secure commercial varieties on their own roots have not given very encouraging results except in the case of filberts. Fortunately, however, a number of comparatively free rooting strains of apples, pears and stone fruits have been isolated and fairly rapid and economical methods of increasing these by layerage, root cuttings, etc., developed. Certain advantages in the control of tree size and in disease resistance are claimed for these vegetatively propagated stocks. The chief objections to their general use at the present time are the cost of reproduction, the limited supply of roots available, and the lack of knowledge as to how trees propagated on these stocks will perform under commercial conditions.

As against the necessity of using vegetatively propagated roots to secure uniformity in fruit trees there is some evidence to support the contention that equally good results can be more economically obtained by the use of seedlings of selected parentage and by improvement in the technique of budding and grafting.

An investigation of this problem as it affects fruits grown in the Dry Belt of British Columbia is being conducted at this Station. A discusson of the projects under way is to be found in the annual reports for 1925 and 1926.

STORAGE OF TREE FRUITS

Storage is an important aid to the effective marketing of tree fruits. The number of cold and common storage warehouses erected in the fruit districts of this province during the past few years is ample evidence that commercial interests are fully aware of the truth of the above statement. It is also true, however, that the storage of a rapidly perishable product such as fruit brings with it many new problems, some of which it is exceedingly difficult for the grower or storage house operator to solve for himself. It is to assist in the solution of these problems that fruit storage investigations were begun at this Station in 1922. They have been continued and extended each year since that time and statements concerning progress made have appeared regularly in the annual reports.

THINNING OF TREE FRUITS

Fruit growers have learned from experience that it is often desirable to remove a portion of the crop in order to improve the size of the fruit left on the tree. Careful experiments are necessary, however, to determine just what proportion of the crop it is advisable to remove, and when the work can be most expeditiously performed. Experiments designed to provide answers to these questions were started as soon as the trees in the experimental orchards began to bear fruit. Information of great value has been obtained as can be verified by reference to the annual report for 1926.

VARIETY TESTS OF FRUITS

Progress in horticulture is dependent to a very large degree on the development and introduction of improved varieties. On the other hand the commercial grower is constantly being admonished to reduce the number of varieties in his plantings. This being the case the work of testing new varieties has been turned over very largely to Experiment Stations. As conditions in the British Columbia Dry Belt are entirely different from those encountered in any other part of Canada it is especially important that due attention be paid to this matter of variety testing. It is for this reason that over twenty-five acres are being devoted to variety tests of apples, pears, apricots, peaches, plums, cherries, berries, grapes and bush fruits.

These projects serve a dual purpose. They protect the grower against the introduction of worthless or inferior varieties, and at the same time they ensure due recognition of meritorious new varieties.

VEGETABLE GARDENING*

Following a severe winter with heavy snowfall spring opened slowly until May, and then growth came on with a rush. June had greater precipitation than usual. July was very hot and dry after the opening week and the autumn months gave ideal harvesting weather. Throughout the valley crops generally were good. Tomato growers were unable to market their full crop through lack of canneries caused by the burning of one factory at Kelowna. A serious breakdown occurred in tomatoes in the Keremeos district. An investigation into the cause of this was commenced. The trouble would appear to be physiological in nature but further study is necessary to find the solution of the problem. A "cherry centre" frequently accompanied by an open calyx was quite general in tomatoes in all parts of the district but caused no damage other than affecting the appearance of the fruit when cut. The cantaloupes ripened more rapidly than expected and the market was glutted for a time through failure to provide adequate distribution. The onion crop was short and brought excellent prices. The crop was well matured under ideal weather conditions.

BEANS—VARIETY EXPERIMENT—Project H. 61

The following strains of beans were planted in triplicate in rows each 15 feet long by 30 inches apart. They were planted on June 6. The following table gives the date of first picking, the average yield of one row of green beans and the yield of one row of dry beans allowed to ripen.

* The work in this Division is under the charge of Mr. W. M. Fleming, M.S.A., assistant to the superintendent, who has been entirely responsible, under the superintendent, for this work, and has prepared this section of the report.

TABLE 8.—BEANS—RESULTS OF VARIETY TEST

Variety	Source	Date of first picking	Average yield green	Yield of dry beans
			lb.	lb.
Wax Beans—				
Wardell Kidney	Sd. 4720	July 31	17·0	2·5
Round Pod Kidney	Ottawa general run	July 31	15·58	2·5
Round Pod Kidney	Steele Briggs	July 31	14·83	2·75
Round Pod Kidney	Dupuy & Ferguson	July 31	13·92	1·25
Round Pod Kidney	Ferry	July 31	12·0	1·75
Round Pod Kidney	Webb	July 31	10·92	2·0
Golden King Wax	Webb	Aug. 8	14·92	3·0
Hodson Wax	Burpee	Aug. 20	14·92	2·25
Hodson Wax	Ferry	Aug. 20	13·75	1·75
Pencil Pod	Ferry	July 31	13·92	1·50
Yellow Pod Bountiful	Schell	July 31	13·00	2·50
Green Pod Varieties—				
Bountiful	Webb	July 31	19·33	3·0
Bountiful	Stokes	July 31	15·33	3·50
Masterpiece	Dreer	July 31	19·0	3·0
Masterpiece	Dupuy & Ferguson	July 31	17·42	3·0
Early Red Valentine	Steele Briggs	July 31	17·42	2·5
Early Red Valentine	Dupuy & Ferguson	July 31	17·17	2·5
Refugee or 1000 to 1	Sd. 4736	Aug. 20	16·66	2·5
Stringless Green Pod	Dupuy & Ferguson	July 31	16·58	3·5
Stringless Green Pod	0-11402	July 31	15·33	3·0
Stringless Green Pod	Ferry	July 31	13·83	3·0
The Prince	Sutton	July 31	16·66	2·5
Roger Stringless Refugee	Sd. 4730	Aug. 20	14·25	Not ripe.
Roger Stringless Refugee	Ferry	Aug. 20	8·58	Not ripe.
Keeney Stringless Refugee	Dupuy & Ferguson	Aug. 20	11·42	Not ripe
Keeney Stringless Refugee	Dreer	Aug. 20	9·42	Not ripe.
Princess of Artois	O-925	July 31	10·33	1·75
Broad Beans—				
Broad Windsor	Steele Briggs	Aug. 20	9·17	
Broad Windsor	McKenzie	Aug. 20	4·92	
Gigantic Long Pod	Webb	Aug. 20	3·00	
Seville Long Pod	McKenzie	Aug. 20	2·33	

SOIL TEMPERATURES IN RELATION TO TIME OF PLANTING CANTALOUPES—
Project H. 638

This experiment was started in 1927. Daily records of soil temperatures were taken at 6, 12, 18, 24 and 36 inches. Cantaloupes were planted at weekly intervals. From the earliest and from the maximum yields it is hoped to ascertain the most desirable soil temperature for optimum results with cantaloupes.

The temperature at 24 inches reached 50 degrees on May 5 and rose to a peak of 65 degrees on May 25. It dropped back to 60 degrees and remained almost stationary until June 21. It then climbed slowly but steadily to 74 degrees on July 27. On August 1 it began to decline very slowly reaching 65 degrees on September 10 and 62 degrees on September 30 when the record ceased. At 36 inches the temperature was 44 degrees on April 21. It followed a similar course as at 24 inches reaching a peak of 62 degrees on May 28 then dropping to 59 degrees for two weeks. It rose slowly to a maximum of 70.5 degrees on July 27 and remained at this point for one week then fell steadily but slowly until it reached 62 degrees when the record stopped. On September 8 the temperature was equal at both depths and from that date until the end of the month the temperature was slightly higher at the greater depth.

At 6 inches the daily fluctuation was so great as to make it impossible to set a standard. Readings did not start at 12 inches and 18 inches until May 24

but from one year's tests it would appear that the daily fluctuation is too great at these depths and that 24 inches is the minimum depth for adoption of a standard temperature as a guide for planting. See experiment "Cantaloupe Protection against Frost" for further data.

CANTALOUPE PROTECTION AGAINST FROST—Project H. 607

With the hope of securing cantaloupes for the early market the seed is sometimes seeded very early or plants are set out from the greenhouse or hotbed and protection given by various types of plant protectors. In order to ascertain the merits of different types of plant protectors cantaloupes were seeded in the open and also transplanted under the following conditions:—

(1) Seeded in the open with no protection.
(2) Seeded in the open protected with Hot Kaps.
(3) Seeded in the open protected with Glassine.
(4) Transplanted with no protection.
(5) Transplanted and protected with Hot Kaps.
(6) Transplanted and protected with Glassine.

Each row was fifteen feet long and consisted of six hills. The rows were eight feet apart. The variety Hales Best was used. The test was started on April 21 and repeated each week for five weeks.

The following tables show the results of this experiment:—

TABLE 9.—COMPARISON OF DIFFERENT TYPES OF PROTECTION FOR CANTALOUPES

Protection	Date planted	Number of plants lived	Date first ripe	Ripe in August	Ripe in Sept.	Total ripe
Open seeding, no protection	April 21	5	Aug. 24	22	51	73
" Hot Kaps	" 21	6	" 23	36	48	84
" Glassine	" 21	5	" 23	32	31	63
Transplanted, no protection	" 21	0	Frozen			
" Hot Kaps	" 21	6	Aug. 21	44	32	76
" Glassine	" 21	5	" 23	31	39	70
Open seeding, no protection	April 28	6	" 28	21	55	76
" Hot Kaps	" 28	6	" 21	36	36	72
" Glassine	" 28	6	" 23	23	61	84
Transplanted, no protection	" 28	0	Frozen			
" Hot Kaps	" 28	5	Aug. 25	13	60	73
" Glassine	" 28	5	" 21	36	32	68
Open seeding, no protection	May 5	6	" 24	18	42	60
" Hot Kaps	" 5	4	" 23	16	41	57
" Glassine	" 5	3	" 24	15	43	58
Transplanted, no protection	" 5	6	" 21	23	61	84
" Hot Kaps	" 5	6	" 23	44	41	85
" Glassine	" 5	6	" 21	30	55	85
Open seeding, no protection	May 12	6	" 21	35	46	81
" Hot Kaps	" 12	3	" 21	42	41	83
" Glassine	" 12	6	" 21	35	48	83
Transplanted, no protection	" 12	5	" 21	24	42	66
" Hot Kaps	" 12	6	" 21	30	33	63
" Glassine	" 12	6	" 21	33	24	57
Open seeding, no protection	" 19	6	" 24	15	48	63
" Hot Kaps	" 19	6	" 23	21	51	72
" Glassine	" 19	6	" 23	21	56	77
Transplanted, no protection	" 19	6	" 24	25	43	68
" Hot Kaps	" 19	6	" 23	38	41	79
" Glassine	" 19	6	" 23	28	43	71

TABLE 10.—SUMMARY OF TRIALS OF EACH TYPE OF PROTECTOR FOR CANTALOUPES

—	No protection		Hot Kaps		Glassine	
	Open seeding	Trans-planted	Open seeding	Trans-planted	Open seeding	Trans-planted
Number of hills started	30	30	30	30	30	30
Number of hills lived	29	17	25	29	26	28
Total yield	353	218	368	376	365	351
Yield in August	111	72	151	169	126	158

From this summary it may be noted that:—

(1) All unprotected plants were killed on May 3.

(2) Eighty-eight decimal eight per cent of all open seeded hills lived while 88·33 per cent of transplanted hills lived if those frosted on May 3 are deducted.

(3) Open seeded hills produced 13.57 fruits per hill while transplanted hills produced 12.77 fruits per hill.

(4) Seventy-four transplanted hills yielded 399 ripe fruits in August or 5.4 fruits per hill while 80 open seeded hills yielded 388 ripe fruits or 4.85 fruits per hill.

(5) The greatest total yields and also the earliest yields are obtained by delaying planting or seeding until the soil temperature has risen above 50 degrees Fahrenheit at 24 inches for three days. This confirms a similar finding in 1927. See the data on soil temperatures on another page.

CANTALOUPE VARIETY EXPERIMENT—Project H. 122

Sixteen strains of cantaloupes were tested in triplicate in rows 15 feet long 8 feet apart 6 hills per row seeded in the open on May 14. Below is given the average total yield and also the yield of ripe fruits picked in August per row of six hills.

TABLE 11.—RESULTS OF CANTALOUPE VARIETY EXPERIMENT

Variety	Source	Ripe in August	Total yield
Heart of Gold	Col. Seed Breeders Assn.	7	94
Heart of Gold	Burrell	8	90
Heart of Gold	Rice	8	86
Heart of Gold	Vaughan	7	85
Heart of Gold	Burpee	11	78
Gold Standard	Col. Seed Breeders Assn.	3	77
Heart of Gold	Morrill	8	75
Orange Flesh	Rice	21	71
101 Special	Col. Seed Breeders Assn.	1	70
Heart of Gold	Stokes	6	65
Hales Best	Stokes	8	61
Hales Best	Col. Seed Breeders Assn.	8	60
Golden Champlain	Dupuy & Ferguson	29	59
Hales Best	Burrell	9	54
Superfecto	Col. Seed Breeders Assn.	0	44
Superfecto	Burrell	0	42

Heart of Gold, Hale Best and Superfecto can all be recommended. Hale Best is excellent quality, a good shipper and early and the type is becoming more fixed although there is still room for improvement.

Superfecto is excellent quality, a good shipper but is late and the yields this season were disappointing. This variety retains its flavour well.

Golden Champlain is very early but is not suitable for shipping. Orange Flesh is early and good flavour and quality. It is rather small and no shipping tests have been made with it. Heart of Gold is generally suited for commercial growers.

The following strains were tested in single rows of six hills each. These varieties are suitable for home use only.

TABLE 12.—TEST OF CANTALOUPES SUITABLE FOR HOME USE ONLY

Variety	Source	Ripe in August	Total yield
Prospero	Stokes	0	61
Sugar Sweet	Stokes	0	59
The Bender	Stokes	3	52
Emerald Gem	Burrell	13	44
Emerald Gem	O-2909	15	41
Casaba Honey Dew	Morse	0	30
Casaba Golden Beauty	Morse	0	20

CELERY IRRIGATION EXPERIMENT

The results of our 1927 tests of celery indicated that celery required much more water than has generally been given it in the southern Okanagan. An experiment was planned to verify these results. Two rows were planted in such a manner that the first fifteen feet could be watered daily. The next fifteen feet three times a week. The next fifteen feet twice per week. The fourth fifteen feet was watered weekly and the last fifteen feet received water fortnightly. Five-foot buffers separated each test of fifteen feet to prevent overlapping of irrigation. The rows watered daily and those watered three times per week produced fair crops. Those watered twice a week were not so good. Those watered weekly were of little use and those watered fortnightly were a failure.

These tests were made on a light sandy soil which has received dressings of barnyard manure yearly for some years but still is deficient in humus. The test was started rather late but it shows clearly that celery requires a great deal of irrigation. For home gardens in this district we recommend starting early and setting out in trenches. These should be excavated to a depth of twelve inches, a liberal supply of manure and fertilizer mixed with the soil, and then filled in to a depth of six inches. Water carefully without flooding at frequent intervals and fill in the trench in the early fall to complete blanching. Fordhook Emperor for the second season gave better results than the self-blanching types.

CUCUMBERS VARIETY TEST—Project H. 106

Seventeen strains were tested in triplicate: Early Fortune (Stokes), Arlington White Spine (Steele Briggs), Davis Perfect, Colorado Seed Breeders' Association, and Double Yield (Harris) gave the best yields. Windermoor Wonder again proved to be high quality though a moderate yielder.

EGGPLANT VARIETY EXPERIMENT—Project H. 107

Eight strains were tested in triplicate. Early Dwarf Purple (Rice) is distinctly earlier than all others tested but is low in quality. Black Beauty is about one week earlier than New York Purple. It is very difficult to distinguish the fruit off the vines. These are the best of the late varieties tested.

LETTUCE TIP-BURN CONTROL—Project H. 605

Under climatic conditions in the southern Okanagan it has been almost impossible to grow head lettuce successfully. The plants start nicely but on the arrival of warm weather tip-burn sets in and makes the heads useless for table use. An effort was made to discover the cause. The variety New York was used. Rows were seeded in the open and also were transplanted on March 27 from plants seeded early in the greenhouse. One hundred per cent tip-burn occurred immediately after May 26. On this date the maximum temperature recorded was 86 degrees. During that night it reached a minimum of 62 degrees. Throughout the night there was very little movement of air. The wind gauge recorded velocities of from one to four miles per hour. The tip-burn has been found by other investigators to be due to products of respiration and produced artificially under similar conditions. The most succulent plants were affected to the greatest degree. Transplanted plants were larger and more vigorous than open seeded plants but out of several hundred plants not a single plant free from tip-burn could be found.

Such a condition is liable to occur every spring before head lettuce is ready to use. So there is little hope of growing the New York variety commercially. Some other variety may be found to be less susceptible to tip-burn.

ONIONS VARIETY EXPERIMENT—Project H. 138

Twenty strains of onions were tested in triplicate. The onion maggot caused so much damage in every row that no comparative records of yields could be made.

PEANUTS VARIETY TRIAL—Project H. 156

Peanuts have been tried at this Station for three years. Every year a few peanuts were obtained but they do not appear to mature early enough to become a commercial crop. Spanish peanuts (Burpee) are several days earlier than Mammoth Bush, but the peanuts are very small. Considerable disease appeared in the crop this year.

PEPPERS BREEDING FOR EARLINESS—Project H. 437

Evidence that natural crossing was taking place in peppers led to an experiment to demonstrate the correctness of this belief. In 1926, specimen fruits apparently true to type were selected from each of seven varieties. Seeds from these were planted out in 1927 and approximately 22 per cent of the plants appeared to have been crossed. The second generation of these were planted out in 1928 and broke all to pieces. This may be explained by further natural crossing of the heterozygous plants grown close together in 1927. A duplication of the 1927 test made by selecting typical fruits of each variety and growing plants from the seed of these in 1928 again showed much crossing approximately 60 per cent as shown in table No. 13. Pepper growers should choose their supply of seed carefully. If attempting to grow their own seed one variety only should be grown and this should be isolated from all danger of possible crossing from other varieties that may be grown by neighbours.

TABLE 13.—RESULTS OF BREEDING PEPPERS

Variety	Number true to type in fruit and foliage	Number distinctly off type in fruit and foliage
Sweetmeat Glory	12	10
Cayenne	9	13
Sunnybrook	11	11
Pimento	2	19

PEPPERS VARIETY EXPERIMENT—Project H. 157

Conditions in the southern Okanagan valley are very well suited for the production of peppers. This crop at present is not securing the attention it deserves chiefly because the market has not been developed. Comparatively few people are aware of the merits of stuffed peppers as a table delicacy. These few people familiar with this dish provide a limited market for large early peppers. The market then declines until the pickling season starts when there is a slightly better demand for both red and green peppers for pickling. If people in other parts of Western Canada were made acquainted with the possibilities and uses of peppers a market could be found for a much larger acreage than is now grown. Peppers are light in weight and keep fresh for several days so shipping is not a difficult problem. Peppers may be canned readily. They provide a very bright garnish for finishing winter salads as well as adding a delicate flavour to tempt the jaded palate. They are also useful in the preparation of sandwiches.

Try the following recipe for canned sweet peppers: Cut around the stem of each pepper and remove the stem and all of the seeds, wash the peppers, pour in boiling water to cover and boil two minutes; drain, remove the peelings, rinse in cold water and drain again, then pack closely in hot sterile jars, fill to overflowing with boiling water; cover and sterilize ten minutes in hot water bath. Test the peppers with a knitting needle and if tender fill the jar to overflowing with boiling water, seal and sterilize ten minutes longer. Keep the jars in a cool dry place.

Or for stuffed peppers try this: Cut a slice from the stem end of each pepper, remove seeds and parboil peppers fifteen minutes. Fill with equal parts of finely chopped cold cooked chicken or veal and softened bread crumbs seasoned with onion juice, salt and pepper; bake ten minutes and serve hot.

The following average yields were obtained from fifteen foot rows in triplicate. The seed was sown in the greenhouse March 2 and plants set out May 22.

TABLE 14.—YIELDS OF PEPPERS

Variety	Source	Average total yield of 15 foot row	Average yield of 15 foot row in August
		lb.	lb.
Chinese Giant	Burpee	30·58	21·08
Hamilton Market	Moore	28·42	19·08
Harris Early Giant	Moore	26·92	14·25
Sweetmeat Glory	Burpee	25·00	8·00
Panama	Stokes	24·66	5·00
Pimento	Dreer	23·58	0·00
Neapolitan	Moore	22·92	10·83
Harris Earliest	Moore	22·58	9·92
Long Red Cayenne	Burpee	21·08	0·00

POTATOES—LOCAL VS. NORTHERN GROWN SEED—Project H. 174

In 1923 certified seed of the following varieties from the same sources was grown in the Okanagan and in the Bulkley valleys. The seed from these two crops was planted in the same district in 1924. In 1925 seed from the 1924 Bulkley valley crop was brought to Summerland and planted beside seed from the 1924 Summerland crop. Seed from the Summerland crop has been saved each year. Seed from the original strain has been brought from the Bulkley valley and grown beside it for comparison. The following table gives the results of these trials. The yield of a 66-foot row is shown in pounds of marketable potatoes produced.

TABLE 15.—COMPARISON OF LOCAL VS. NORTHERN GROWN SEED POTATOES

Year seed was grown in the north	Year seed was grown at Summerland—Yield of 66-foot row			
	1925	1926	1927	1928
	lb.	lb.	lb.	lb.
Early St. George—				
1923	124	250	155	253
1924	208	268	150	391
1925	.....	250	169	235
1926	.....	.....	180	309
1927	.....	.....	.....	832
Green Mountain—				
1923	162	235	222	235
1924	212	265	212	328
1925	.....	160	256	362
1926	.....	.....	200	304

The northern grown seed of Early St. George was outstanding in 1928. The row could be distinguished from all others throughout the summer.

A study of the other results would indicate that when a stock of seed of strong vitality was brought from the North it outyielded local grown stock and the vigour seemed to be passed on to successive crops while with northern seed of less vitality the yields were little if any greater than local stocks and the lowered vitality was passed on to succeeding crops.

SPINACH VARIETY TEST—Project H. 199

Quality is an important factor in spinach as well as length of season and yield. New Zealand spinach is a very heavy yielder but it matures so late in the season that other available vegetables are in demand and spinach is not required. Noble Gaudry (Stokes) was the most desirable of all strains tested this year. It is a heavy yielder and the quality is excellent.

TOMATO VARIETY EXPERIMENT—Project H. 211

To determine the merits of the individual selections of tomatoes made at this Station these were tested in triplicate against strains of seed of the same varieties secured from commercial seed houses. These were started in the greenhouse March 8, pricked out once and then transplanted May 16 in rows 15 feet long of five plants each. The results of these trials as shown in tables 16, 17 and 18 show the relative merits of four different varieties for total yield and for carliness. All fruit ripening in August was used as a basis for comparing maturity of the different strains.

TABLE 16.—RESULTS OF TOMATO VARIETY EXPERIMENT

(Tests in triplicate)

Variety	Source of seed	Average yield per plant		Rank for total yield	Type
		Ripe in August	Total yield		
		lb.	lb.		
Alacrity	Sd 6887-1927 Sel.	33·59	42·13	1	Rough
Earliana	Burpee 1927	30·81	41·81	4	Fair
Earliana	Sd 6898-1927 Sel.	30·65	41·92	3	Fair
Earliana	Sd 6628-1925 Sel.	29·58	38·23	21	Rough
Avon Early	Haven 1928	29·55	38·50	20	Coarse
Earliana	Ferry 1928	29·40	38·55	18	Fair
Viking	N. Dakota A.C.1928	29·00	37·71	26	Very rough.
Avon Early	Sd 6904-1927 Sel.	29·00	39·27	13	Rough
Earliana	Sd 6896-1927 Sel.	28·37	40·20	8	Rough

TABLE 16.—RESULTS OF TOMATO VARIETY EXPERIMENT—*Concluded*

(Tests in triplicate)

Variety	Source of Seed	Average yield per plant		Rank for total yield	Type
		Ripe in August	Total yield		
		lb.	lb.		
Alacrity x Hipper	Sd 6890-1927 Sel.	27·90	39·57	12	Fair
Alacrity x Earlibell	0-9729 C.E.F.	27·73	32·33	59	Good
Earliana	Sd 6895-1927 Sel.	27·64	42·00	2	Good
Earliana	Sd 6616-1925 Sel.	27·32	36·39	32	Fair
Alacrity x Hipper	0-9725 C.E.F.	27·00	35·75	39	Good
Avon Early	Sd 6905-1927 Sel.	27·00	38·69	16	Rough
Earliana	Burpee 1926	27·00	34·50	46	Rough
Avon Early	Steel Briggs 1928	27·00	36·00	38	Good
Earliana	Sd 6625-1925 Sel.	26·96	36·34	33	Fair
Avon Early	Burrell 1928	26·83	39·67	11	Good
Bolgiano	Spall 1927	26·70	32·90	57	Fair
Earliana	Sd 6900-1927 Sel.	26·57	34·40	47	Good
Earliana	Sd 6610-1925 Sel.	26·32	35·53	43	Poor
Avon Early	Sd 6906-1927 Sel.	26·13	35·67	40	Good
Earliana	Steele Briggs 1928	26·13	39·93	10	Good
Earliana	Sd 6894-1927 Sel.	26·07	38·53	19	Good
Earliana	Sd 6603-1925 Sel.	26·00	40·55	7	Good
Avon Early	Ferry 1928	25·80	33·95	52	Fair
Earliana	Sd 6892-1927 Sel.	25·65	38·08	24	Good
Earliana	Haven 1928	25·50	36·08	37	Good
Special Early 498	Morse 1928	25·30	38·95	14	Rough
Avon Early	Vaughan 1928	25·29	38·71	15	Good
Bolgiano	Bolgiano 1927	25·05	39·95	9	Variable
Avon Early	Sd 6903-1927 Sel.	24·87	37·20	30	Fair
Special Early 498	Sd 6668-1925 Sel.	24·73	34·10	50	Fair
Avon Early	Sd 6722-1924 Sel.	24·68	38·11	23	Rough
Earliana	Sd 6893-1927 Sel.	24·63	37·27	29	Good
Earliana	Sd 6607-1925 Sel.	24·62	36·34	34	Good
Earliana	Sd 6619-1925 Sel.	24·53	41·53	5	Rough
Earliana (Sparks)	Burrell 1928	24·30	32·90	58	Good
Special Early 498	Sd 6902-1927 Sel.	24·25	37·39	28	Rough
Earliana Color Tru	Haven 1928	24·03	35·67	41	Fair
Bolgiano	Sd 6907-1927 Sel.	24·00	37·95	25	Very rough
Princess Mary	McKenzie 1928	23·95	33·70	53	Good
Earliana Super Select	Burrell 1928	23·92	32·15	63	Rough
Earliana	Moore 1928	23·82	36·21	35	Poor
Alacrity	0-11381 1928	23·71	29·25	72	Poor
Avon Early	Dreer 1928	23·70	36·80	31	Good
Canadian 29-516	McKenzie 1928	23·67	34·63	45	Poor
Alacrity x Earlibell	Sd 6891-1927 Sel.	23·63	37·57	27	Fair
Alacrity x Hipper	Sd 6889-1927 Sel.	23·53	32·11	64	Rough
Earliana	Sd 6897-1927 Sel.	23·47	35·47	44	Rough
Earliana	Sd 6899-1927 Sel.	23·42	34·08	51	Fair
Gregory	Gregory 1928	23·20	35·67	42	Fair
Alacrity	Sd 6888-1927 Sel.	22·77	31·70	66	Rough
Bolgiano	Sd 6870-1925 Sel.	22·72	38·22	22	Good
Avon Early	Vaughan 1928	22·25	38·65	17	Fair
Canadian	O. A. C. 1928	22·23	30·50	71	Fair
Earliana	Graham 1928	21·87	30·60	69	Rough
Earliana	Bolgiano 1928	21·77	30·97	67	Good
John Baer	Moore 1928	21·71	34·29	49	Rough
Marvana	Rice 1928	21·69	40·69	6	Coarse
Earlibell	McDonald 1928	21·54	32·04	65	Good
Burbank	Burbank 1927	21·39	28·89	73	Rough
Burbank	Livingston 1927	20·90	30·90	68	Variable
Red River	Lowden 1928	20·70	32·30	60	Very good
Canadian	McKenzie 1928	19·75	32·18	62	Good
A. B. B. No. 2	Ottawa 1927	19·17	33·37	56	Good small
Fargo	N. Dakota 1928	18·57	28·30	74	Rough
John Baer	Rice 1928	18·27	33·50	54	Very good
Bolgiano	Bolgiano 1928	18·00	33·37	55	Fair
John Baer	Graham 1928	17·46	36·19	36	Variable
John Baer	Ferry 1928	17·34	26·89	78	Coarse
John Baer	Burrell 1928	17·12	26·27	76	Fair
A. B. B.	1928 0-11390	16·87	26·97	77	Good small
Red Canner	Moore 1924	16·64	34·36	48	Very good
John Baer	Vaughan 1928	16·63	26·53	79	Good
Marvana	Ottawa C.E.F. 1928	16·56	30·56	70	Good
John Baer	Dreer 1928	15·73	23·80	80	Good
John Baer	Bolgiano	14·39	32·25	61	Good
Alpha	Dreer 1928	12·81	27·62	75	Extra good

TABLE 17.—COMPARISON OF DIFFERENT VARIETIES OF TOMATOES FOR TOTAL YIELD

Variety	Number of strains tested	Average of all strains per plant	Highest strain per plant	Lowest strain per plant
		lb.	lb.	lb.
Avon Early	12	37·60	39·67	33·95
Earliana	38	36·49	42·13	29·25
Bolgiano	5	36·48	39·95	32·90
John Baer	8	30·09	36·19	23·80

TABLE 18.—COMPARISON OF DIFFERENT VARIETIES OF TOMATOES FOR EARLINESS

Variety	Number of strains tested	Average of all strains per plant	Highest strain per plant	Lowest strain per plant
		lb.	lb.	lb.
Avon Early	12	26·01	29·55	22·25
Earliana	38	25·91	33·59	21·77
Bolgiano	5	23·29	25·05	18·00
John Baer	8	17·33	21·71	14·39

WATERMELON VARIETY TEST—Project H. 125

Eleven strains were grown in triplicate in fifteen-foot rows of six hills each, the rows being eight feet apart. They were planted in the open on May 14. Monte Cristo or Kleckleys Sweet gave the best results of the larger type. Irish Grey is another excellent melon and Winter Queen is a splendid long keeping late melon. The following table gives the average results of each row:—

TABLE 19.—WATERMELON YIELD OF DIFFERENT VARIETIES

Variety	Source	Date first ripe	Total number picked	Average weight	Quality
				lb.	
Monte Cristo	Ferry	Aug. 24	16	12	Good crisp
Monte Cristo	Stokes	Aug. 24	16	12	Good crisp
Irish Grey	Ferry	Aug. 28	14	10	Good crisp
Irish Grey	Burpee	Aug. 24	14	10	Good crisp
Winter Queen	Burrell	Sept. 11	20	10½	Good deep colour
Tom Watson	Ferry	Aug. 30	13	13	Good pale colour
Tom Watson	Rice	Aug. 30	14	13	Good pale colour
Klondike	Morse	Aug. 28	10	9	Fair, lacks crispness
Klondike	Burrell	Aug. 24	12	9	Fair, lacks crispness
Coles Early	Rice	Aug. 20	22	8	Poor
Coles Early	Steele-Briggs	Aug. 20	22	8	Poor

PLANT BREEDING

With the approval of the vegetable committee of the Canadian Seed Growers Association several varieties of vegetables have been allotted to this Station for the development of elite stock seed.

Small stocks of Rogers Stringless Refugee and Wardwells Kidney beans are available and selections have been made of Round Pod Kidney and Pencil Pod beans. Two season's work has given a good foundation stock of Golden

Bantam corn which will be developed. An effort is being made to build up a strain of Hales Best cantaloupe but this is not yet ready for distribution. Two seasons' tests with peppers have shown that under conditions at this Station peppers cross freely and breeding strains must be carefully isolated from all other varieties. Three strains of radish are being developed. Scarlet Turnip White Tip, Scarlet Globe and Icicle. Comparative tests show that further selection is necessary before these can be distributed. Individual selection with Earliana tomatoes begun in 1925 has given some promising strains. These were given out to tomato growers associations for trial in 1928 and certain stocks are being multiplied by these associations for their own growers. The work is being continued and a start has also been made with individual selections of the John Baer variety. Individual selections have been made of sugar or pie pumpkins and Yellow Globe Danvers onions. Selections were made of alfalfa plants which apparently were drought resistant. These have been planted out in blocks and are being grown without irrigation. From the "Survival of the Fittest" it is hoped to secure some heavy yielding drought resistant strains.

Individual selections were made of Mammoth White Feeding Mangold and White Intermediate carrots for progeny tests next season.

ASTER VARIETY EXPERIMENT—Project H. 263

In 1926 eighty-five strains of asters were planted out in rows with eleven plants of each strain per row. These plants were studied carefully for different characteristics and records made on each individual. Quite a number of "rogues" or variations were found both in type and in colour. These rogues were selected for further study and the seed of each plant harvested separately. It was impossible to tell whether these rogues were due to mechanical mixing of seed or were segregations along Mendelian lines. The selection of material was therefore largely a matter of chance. It was decided to investigate one phase of variation only, viz., colour, and a number of strains were selected from the rogues of 1926 and planted for further study in 1927. Certain indications of probable order of dominance of colour were obtained from these trials and material was selected for planting the second generation in 1928.

From the result of these trials it is evident that purple is near the top of the scale in order of dominance. That reds and pinks are intermediate and whites near the bottom. This agrees with the findings with sweetpeas where the order ranges from purple bicolour, through purples, blues, reds, pinks, tinted whites, pure whites, to cream.

It has been demonstrated that some natural crossing is taking place. It is estimated that 11 per cent of the plants tested in 1927 and 10 per cent of those tested in 1928 show clear evidence of crossing. This is of great practical importance to seed growers. The market is discriminating and will not tolerate such a degree of impurity in high grade stocks. Seed growers must therefore grow only one type or colour or else provide for thorough isolation of different varieties. It has not yet been worked out what distance is necessary for isolation. The behaviour of the whites in the second generation indicates that colour in asters as in sweetpeas is due to two or more complementary factors. If either one or all of the factors are missing whites will result.

There is also a direct relation between the colour pigments in various parts of the stem and leaves and the colour of the flower. This is an aid in roguing seed plots as a plant showing strong pigmentation in a variety normally showing little or none may safely be rogued out long before blooming stage is reached. Similarly a plant lacking pigmentation should be rogued out of a strain normally strongly pigmented.

A rose pink bloom of the variety Kenneth was tagged in 1924. When planted out in 1925 the progeny of this pink bloom gave one plant with purple flowers. As purple is dominant to pink this purple rogue was saved for further testing. The progeny of this rogue was carried to the second generation. In the first generation it gave purples and pinks in the proportion of three to one and in addition two plants with white blooms carrying a faint lavender tint. In the second generation the pinks bred true. Some of the purples produced purples while others produced purples, pinks and a few lavender tinted whites. This is taken as conclusive evidence that the rose pink bloom in 1924 was crossed naturally with pollen from a purple variety. The lavender tinted whites broke up into lavenders and tinted whites. This suggests that the 1924 purple parent of the 1925 purple rogue was itself heterozygous carrying a strain of lavender which segregated in the second and third generations. While the number of cases of natural crossing in sweet peas is very small yet this experiment proves that it does occasionally take place in British Columbia.

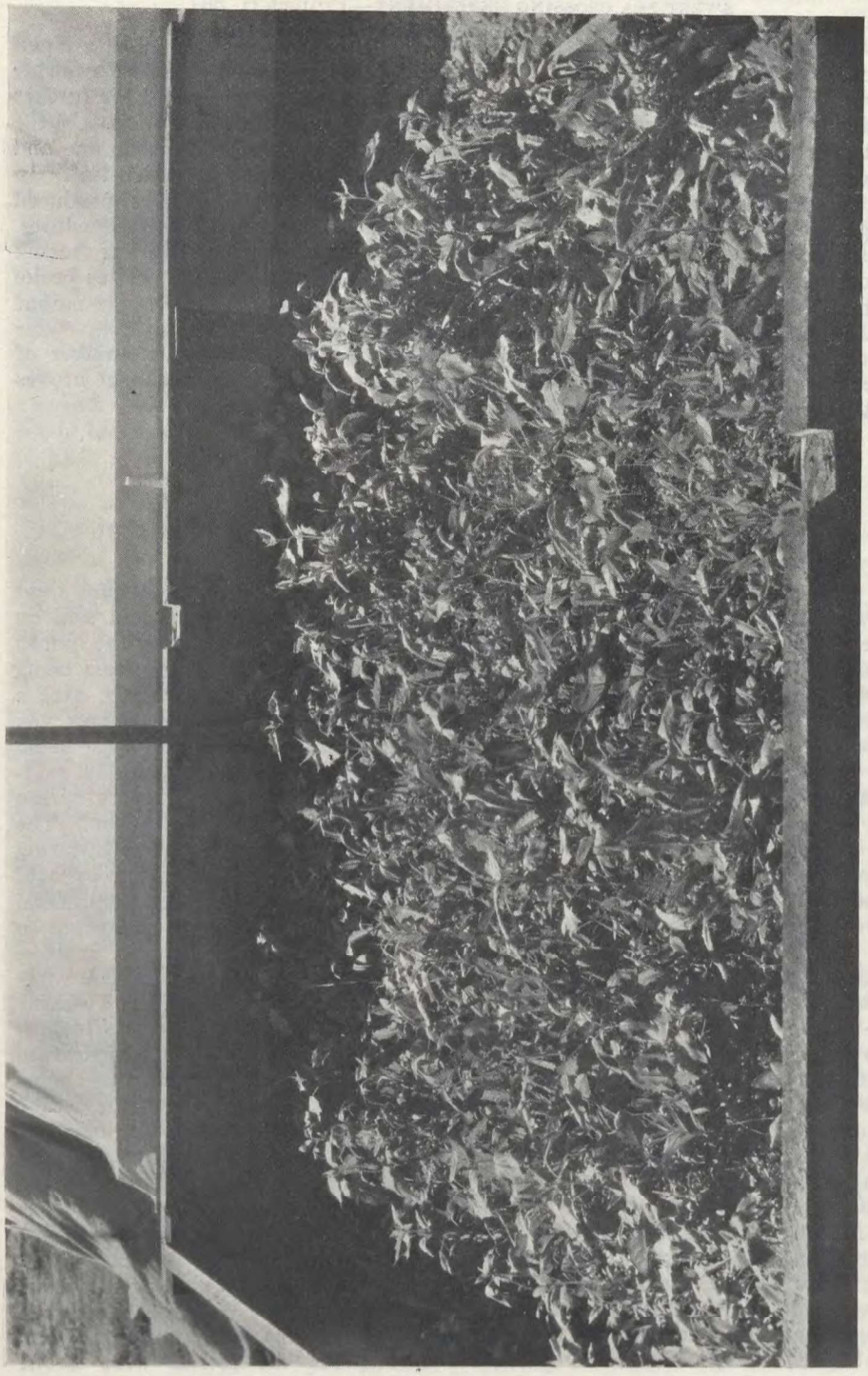
TOBACCO*

THE SEASON

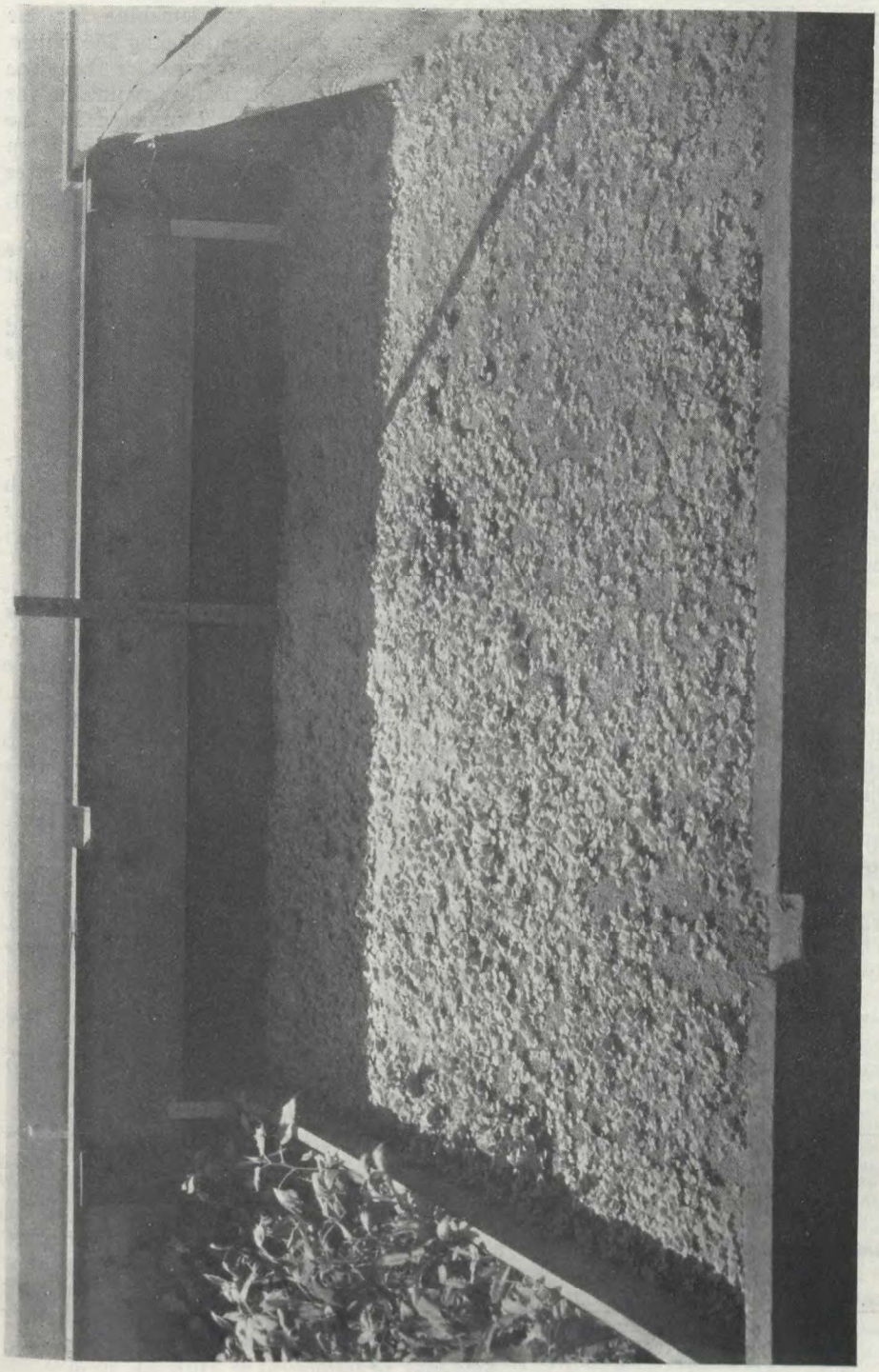
The early days of April were cloudy with threatening rains and some light showers were recorded. Throughout the month the nights were cold and on several occasions frosts were experienced. The mean temperature for the month was 45·80 degrees F., the average for April over a period of twelve years being 47·44 degrees F. The total precipitation was 1·57 inches, the average over a period of twelve years being ·72 inches. Sunshine was slightly below the average, there being recorded 181·1 hours, the average for eleven years being 191 hours. In British Columbia, tobacco seedlings are largely grown in cold-frame cotton covered seed beds and weather conditions during early spring exerts considerable influence in the production of sturdy plants in season. The sowing of seed beds started during the last week in March and continued during the first two weeks in April. Although the month was characterized by cold weather and with temperature and sunshine below the average and precipitation above the average, sturdy plants were produced in season. Transplanting to the fields commenced during the latter part of May. On the whole, growers produced much earlier, healthier and sturdier plants than last season. The early part of May was cold with moderate winds and with no precipitation. Towards the middle of the month the weather considerably warmed and on the 14th, a maximum temperature of 80 degrees F. was recorded. The highest temperature for the month reached 87 degrees F. on May 21. These high temperatures combined with strong winds caused extremely unfavourable conditions for establishing seedling tobacco plants in the field. This hot spell of weather, however, was of short duration and after the 22nd, the balance of the month recorded a total precipitation of 1·16 inches, much thunder and a severe hailstorm on the 29th, the average precipitation over a period of twelve years being 0·69 inches for May. Total sunshine for the month was 299 hours, the average for twelve years being 248 hours.

The weather during the month of June recorded a total precipitation of 1·48 inches, the average for twelve years being 1·07 inches. A severe hailstorm occurred on the 14th, but caused no damage to young tobacco plants which were established in the field. Temperatures throughout the month were about

* Prepared by A. J. Mann, B.S.A., Tobacco Specialist for British Columbia.



Weeds in an unsterilized tobacco seed-bed.



Tobacco seed-bed sterilized by steam produced no weeds.

normal, 90 degrees F. which was the highest, being recorded on the 25th. Wind and sunshine were considerably below the average. Total sunshine for the month was 205 hours, the average over a period of twelve years being 256 hours.

Owing to these unusual conditions of cool and showery weather from the 22nd of May until the end of June, the season was exceptionally favourable for transplanting which was general by the first of June and completed by the middle of the month. Plenty of natural moisture was available and irrigation was not required for the tobacco crop until late in the season. Flea beetles and wire worms necessitated considerable replanting. On the whole, however, good stands of plants were established.

During July and August favourable growing conditions prevailed and the majority of the commercial and experimental crops were topped during August and fifty per cent of these crops were harvested by the last of August. Excellent harvesting weather prevailed and no frost was recorded up to the end of September, before which time the entire crop was harvested. During the autumn the weather was very favourable for curing the crop in the barns.

CROP CONDITION AND ACREAGE STATISTICS

Although the season of 1928 was most favourable for the growing, harvesting and curing of tobacco, and although in most istances a vigorous growth and heavy yield were obtained, yet samples of leaf from the majority of this season's commercial tobacco crop which were carefully tested were in most instances very poor as to quality and grade.

The condition of the samples indicated that many of these crops did not receive proper cultural and curing treatment. A considerable amount of leaf in the samples tested were damaged by shed-burn, pole-rot and by having too much case. The samples were outstandingly characterized with variable colours of green, yellow, brown and red.

There was a large decrease in the acreage of tobacco planted this year. In 1926, in the Okanagan valley, approximately fifty-five acres were planted to tobacco. In 1927, it was estimated that three hundred and fifty acres were planted, whereas this year, 1928, it is estimated that fifty-six acres were planted in the Okanagan valley and sixty acres planted in the Sumas district. In table 20 are presented the estimates of acreage, production and farm value of the 1928 British Columbia tobacco crop. These estimates were based on a survey of the crop in the field just previous to harvesting, the condition of the crop when curing in the barn and by testing the grade and quality of the cured leaf. The estimated farm values of the crop were based on tobacco marketing conditions and prices which prevailed in Ontario this season.

TABLE 20.—ESTIMATED ACREAGE, PRODUCTION AND FARM VALUE OF BRITISH COLUMBIA'S TOBACCO CROP, 1928

District	Burley	Bright flue-cured	Cigar leaf	Other types	Totals
	acres	acres	acres	acres	acres
Lower Fraser Valley	.....	.....	23	37	60
Okanagan Valley	16	7	30	3	56
Totals	16	7	53	40	116
Estimated average yield, per acre	lb. 1,500	lb. 1,100	lb. 1,500	lb. 1,300	lb. 1,415
Estimated production	24,000	7,700	80,500	52,000	164,200

Estimated farm value of total crop, $23,866.
Estimated farm value of lowest price per pound, 6 cents.
Estimated farm value of highest price per pound, 20 cents.
Estimated farm value of average price per pound, 12 cents.

PRESENT STATUS OF THE BRITISH COLUMBIA TOBACCO INDUSTRY

From the standpoint of the individual tobacco grower in British Columbia the years 1927 and 1928 were most disappointing. After devoting time and expense to the production of the crops he found himself unable to dispose of the cured leaf at a figure even approaching the cost of production. At the time of writing, the late summer of 1929, the greater portion of the 1927 and 1928 crops remain unsold. Obviously something was very seriously wrong and it would appear advisable at this time to examine some of the factors involved with a view to establishing the industry on a sound basis.

Doubtless the chief reason for the absence of buyers is the low quality in the leaf. With plentiful sources of supply in the East, where tobacco of the desired type and quality can be readily obtained, it is obvious that the manufacturer is not interested in the purchase of very ordinary leaf in the far West. Moreover, the volume was small, the question of continunity of supply was uncertain, and prices asked by the growers far too high. The lack of a modern processing plant in the province further increased the difficulties.

The lack of quality in the British Columbia crop may be traced to a number of contributing causes. Chief among these may be enumerated, the inexperience of the growers in practical phases of tobacco culture. In view of this too large an acreage was planted, particularly when adequate curing barn space was lacking. In many instances the crop was grown on unsuitable soil and undesirable types of tobacco were set out. Furthermore the growers were the recipients of much poor, contradictory and unauthorized advice which in their inexperience they were not able to properly evaluate.

In a discussion of this nature it is not possible to enter into any detailed analysis of the future possibilities for the development of a tobacco industry in British Columbia. There are a few outstanding points, however, which are worthy of consideration. The first requirement for the successful marketing of tobacco from this province is that a sufficient volume be produced of high quality leaf of the type desired by the manufacturers and with an assured continuity of supply. Otherwise the buyers, no matter whether they come from British Columbia, the East, or Great Britain, will not be attracted. Initial acreages should be small until the growers have acquired experience. Close attention should be given to authoratative advice from governmental sources. The erection of a small but well equipped packing plant within the province would ensure satisfactory processing. Finally, the growers should be satisfied with small profits until the reputation for British Columbia leaf is established.

EXTENSION WORK

Despite the greatly reduced acreage in British Columbia, many requests have been received for information on the various phases of tobacco culture. These requests have been particularly numerous from the Sumas district, and were also received from various points in the Prairie provinces. To meet this demand for tobacco information, considerable correspondence has been conducted and many bulletins and reports on the culture of tobacco have been distributed. Several meetings of growers, growers' associations and boards of trade have been attended and addressed. Practical demonstration in the field and information on best culture have been given to the growers. In addition, choice tobacco seed of recommended varieties was supplied by the Tobacco Division to growers.

Experimental work has been conducted and the results have been placed on file for future reference and information. As this is a progress report only a portion of the work is presented at this time.

FIELD EXPERIMENTS CONDUCTED IN THE OKANAGAN VALLEY

GENERAL VARIETAL TEST—Project T. 47.—This experiment was begun in 1925 to determine the types and varieties of tobaccos that are most suitable to grow in these southern interior districts. The tests have been conducted on soils which varied from sand to clay and which included bench land, low land, irrigated and non-irrigated land. All varieties tested were air-cured and then shipped to the Tobacco Division, Central Experimental Farm, Ottawa, to determine the quality of cured leaf produced.

KELOWNA 1928

In the district of Kelowna four types of tobaccos, which included thirteen varieties, were tested on non-irrigated, low, level, silty-loam land. The plants were supplied from the Summerland Station and transplanted on June 6. Wire worms were extremely destructive and re-plantings were made each day until June 16. As was to be expected, a very uneven stand of plants was obtained, which considerably inflenced the yield, even though allowances were made for blank spaces. During the season the plots received three cultivations and two hoeings. No frosts, hailstorms or severe windstorms were recorded. The varieties tested made, in most instances, a vigorous growth in the field and gave a heavy yield of cured leaf. All varieties were harvested in good season. The field results of this test for the year 1928 and the average of three years, 1926-1928, are given in table 21.

SUMMERLAND 1928

Five types of tobaccos, which included nineteen varieties, were tested on irrigated sandy-loam bench land. The seed was sown in cotton-covered semi-hot beds on April 7 and the seedlings transplanted on May 30 and 31. The care of the plots included three hoeings, five cultivations, two suckerings and three medium irrigations.

Practically no damage was caused by cutworms or wireworms. Tobacco horn-worms, in early July, were very numerous and caused considerable damage. During the past two seasons picking of this pest was inadequate for control. A multitude of tobacco bud-worms *(chloridea obsoleta)* invaded the variety test plots on July 8 and 14, and again on July 15 to 21, and it was necessary to spray twice with arsenate of lead to keep them under control.

Frenching, a physiological disease which was very prevalent in the tobacco plots during the seasons of 1925, 1926 and 1927, was not noted in 1928. The absence of this disease in the plots this season was of considerable interest. Soil conditions and a better regulation of irrigation water probably approximated the plants' requirements to a fuller extent than in former seasons, and thus maintained the plants on a more even balance of growth and nutrition. With the exception of the Turkish varieties, Mosaic affected all varieties and particularly Station Standup Burley. "Rust" was also prevalent this season, especially on Greenwood.

The highest temperature of the season, 100° F., occurred on July 22. This resulted in the wilting and burning of leaves on plants located on lighter areas in the field. This same condition was observed in 1927 on July 24 when a temperature of 102° was recorded.

All varieties produced heavy yields, and were harvested by early September. Curing was completed by the middle of December. The field results of these tests for the year 1928 and the average for four years, 1925-1928, are given in table 22.

TABLE 21.—DUPLICATE TOBACCO VARIETY TESTS—CONDUCTED AT BENVOULIN, KELOWNA, B.C., 1926-1928

Variety	Crop of 1928					Three-year average (1926–1928 inclusive)				
	Days from transplanting		Average height of plant at topping	Average maximum length of leaf at harvest	Yield of cured leaf per acre	Days from transplanting		Average height of plant at topping	Average maximum length of leaf at harvest	Yield of cured leaf per acre
	To topping	To harvest				To topping	To harvest			
			in.	in.	lb.			in.	in.	lb.
Greenwood	65	92	32	28	2,001	62	89	33	27	2,116
Connecticut Havana 38	55	75	35	23	1,252	57	78	39	26	1,277
Comstock Spanish Pomeroy	55	75	44	24	1,574	55	75	49	26	1,797[1]
Resistant Havana	55	75	40	25	1,190	.....	.....	.....	.....	.....
Connecticut Broadleaf	55	75	39	24	831	58	83	34	24	1,219[1]
Station Standup Burley	65	92	29	29	1,481	62	90	30	30	1,924
Halley's Burley	65	92	27	28	2,030	63	92	30	28	2,226[1]
Broadleaf Burley	65	92	30	28	1,807	63	90	29	29	1,970
Standup Resistant Burley	65	92	40	26	1,666	63	90	35	27	1,933
Judy's Pride Burley	65	92	35	27	1,952	63	90	33	26	1,813
Kelly Burley	65	92	27	26	1,812	63	92	26	26	1,939[1]
Stoner Burley	65	92	35	25	2,110	.....	.....	.....	.....	.....
Resistant BII93XX Burley	65	92	29	32	1,753	.....	.....	.....	.....	.....

[1]Two year averages (1927–1928).

TABLE 22.—TOBACCO VARIETY TEST—CONDUCTED AT DOMINION EXPERIMENTAL STATION, SUMMERLAND, B.C., 1925–1928

Variety	1928					Four-year average (1925–1928 inclusive)				
	Days from transplanting		Average height of plant at topping	Average maximum length of leaf at harvest	Yield per acre	Days from transplanting		Average height of plant at topping	Average maximum length of leaf at harvest	Yield per acre
	To topping	To harvest				To topping	To harvest			
			in.	in.	lb.			in.	in.	lb.
Hickory Pryor	53	85	49	30	2,878	55	83	50	28	2,457
Warne	53	85	53	31	2,758	55	83	53	29	2,339
Greenwood	57	85	39	34	2,870	61	85	45	30	2,370
Connecticut Havana 38	51	71	45	26	2,309	50	73	32	26	2,353
Comstock Spanish Pomeroy	51	71	46	28	2,465	48	70	34	27	2,313[2]
Resistant Havana	51	71	46	27	2,383	.....	.....	.....	.....	.....
Connecticut Broadleaf	51	71	43	31	2,558	.....	.....	.....	.....	.....
Station Standup Burley	57	84	45	24	2,566	59	85	44	29	2,135
Halley's Burley	57	84	41	33	2,747	59	88	36	31	2,672[1]
Broadleaf Burley	57	84	38	34	2,981	59	88	35	31	2,366[1]
Standup Resistant Burley	57	84	35	31	2,761	59	88	40	29	2,279[1]
Judy's Pride Burley	57	84	37	31	2,500	59	88	39	29	2,253[1]
Kelly Burley	57	84	35	36	2,878	58	88	30	33	2,407[2]
Resistant B1193XX Burley	57	84	39	37	2,761	.....	.....	.....	.....	.....
Stoner Burley	57	84	37	32	2,214	.....	.....	.....	.....	.....
Baffra	51	74	16	19	1,622	62	69	35	16	1,251
Samsoun	51	74	32	16	1,462	61	70	37	14	1,066
Bazma	51	74	34	14	1,122	62	70	42	14	1,006
Basseeballee	51	74	35	15	1,331	62	67	38	14	990

[1]Three-year average. [2]Two-year average.

The data presented in tables 28 and 29 show that heavy yields of Cigar Leaf, Burley, Greenwood, flue-cured and Turkish types of tobacco have been secured. Of the various air-cured types of tobacco which were tested at the Summerland Station in 1928, the average yields obtained in pounds per acre were: Cigar Leaf, 2,429; Burley, 2,676; Greenwood, 2,870; and Turkish, 1,384. Flue-cured yielded at the rate of from 1,168 to 2,450 pounds per acre. The problem confronting the British Columbia tobacco grower is quality production rather than the number of pounds that can be grown per acre. Whether high quality tobacco can be produced under the particular conditions of soil and climate of this section is still an open question. Heavy yield is not always associated with desirable quality and the cost of production may exceed the gross returns.

CURED LEAF QUALITIES OF TYPES AND VARIETIES OF TOBACCO GROWN IN 1927-28

In order that the growers of the Okanagan valley may have some idea as to just what constitutes quality in tobacco, the Tobacco Division has carefully examined samples of tobacco from that area. In the following pages will be found the results of these examinations covering the crops of 1927 and 1928.

(See also the 1925 and 1926 Annual Reports of the Tobacco Division for results of cured leaf quality tests of types and varieties of tobacco which were tested in the districts of Kelowna and Summerland for the years 1925-26.)

TABLE 23.—NOTES ON QUALITY OF TOBACCO GROWN AT SUMMERLAND AND KELOWNA IN 1927

Variety	Colour	Body	Texture	General quality
S. S. Burley	Good	Medium	Medium	Good
Standup Res. Burley	Bright	Heavy	Medium	Fair
Judy's Pride	Bright	Thin	Smooth	Good
Halley's Burley	Dark	Heavy	Fair	Fair
Kelly's Burley	Bright	Medium	Smooth	Good
Broadleaf Burley	Reddish	Heavy	Medium	Fair
Con. Havana 38	Good	Medium	Smooth	Good
Comstock Spanish	Good	Medium	Smooth	Good
Greenwood	Mottled	Coarse	Medium	Fair
Hester	Dark	Heavy	Medium	Fair
Warne	Bright	Medium	Smooth	Fair
Hickory Pryor	Good	Medium	Medium	Fair
Baffra	Good	Medium	Medium	Good
Basseeballee	Mottled	Medium	Smooth	Good
Samsoun	Mottled	Medium	Medium	Good
Bazma	Good	Medium	Smooth	Very good

The Summerland crop, in general, was of heavier body and darker colour than that grown at Kelowna. The aroma of the cigar leaf grown in both sections as determined by leaf burn tests was pleasant and non-irritating. These varieties also burned freely with a light coloured ash.

The Burley varieties were compared in 1928 as to their quality by assorting each plot into comparable commercial grades. These results are given in table 24.

TABLE 24.—BURLEY VARIETY TESTS—BENVOULIN, KELOWNA, B.C., 1928

Variety	Yield of cured leaf per acre	Percentage of assorted grades						Relative general quality
		Lugs	Bright No. 1	Bright No. 2	Red No. 1	Red No. 2	Tips	
	lb.							
Stoner Burley	2,110	13	20	14	41	2	10	7
Halley's Burley	2,030	10	14	8	56	5	7	1
Judy's Pride Burley	1,952	11	40	7	34	3	5	4
Kelly's Burley	1,812	13	31	6	45	1	4	3
Broadleaf Burley	1,807	9	24	10	52	2	3	8
Resistant BII93XX Burley	1,753	5	23	8	57	3	4	5
Standup Resistant Burley	1,666	13	24	14	36	7	6	6
Station Standup Burley	1,481	6	30	4	45	11	4	2

Averages of duplicate plots.

The various grades of leaf from these varieties of Burleys were rough, harsh, thin, papery, and of poor quality, and had bright lemon to orange colours. There was no real red Burley grade in these lots and they did not resemble Ontario Burley. In colour and type they somewhat resembled a low grade of bright flue-cured tobacco. All grades of leaf in these Burleys had a peculiar aroma.

TABLE 25.—BURLEY—VARIETY TESTS, SUMMERLAND, B.C., 1928

Variety	Yield per acre	Percentage assorted grades						Relative general quality
		Lugs	Bright No. 1	Bright No. 2	Red No. 1	Red No. 2	Tips	
	lb.							
Broadleaf Burley	2,981	10	4	35	44	7	0	5
Kelly's Burley	2,878	7	13	20	54	6	0	2
Standup Resistant Burley	2,761	8	18	29	38	18	3	8
Resistant BII93XX Burley	2,761	10	19	16	42	13	0	7
Halley's Bruley	2,747	10	20	17	21	16	16	1
Station Standup Burley	2,566	7	26	31	26	7	3	4
Judy's Pride Burley	2,500	11	11	29	34	12	3	6
Stoner Burley	2,214	10	18	24	38	10	0	3

Averages of triplicate plots

Halley and Kelly were outstanding in brightness and general quality and resembled Burley tobacco grown in Ontario.

Similar sorting records were taken on the cigar varieties. These results are given in table 26.

TABLE 26.—CIGAR LEAF—VARIETY TESTS, SUMMERLAND, B.C., 1928

Variety	Yield per acre	Percentage assorted grades		
		Fillers	Brokes	No. 2 binders
	lb.	%	%	%
Connecticut Broadleaf	2,558	11·25	75·00	13·75
Comstock Spanish Pomeroy	2,465	12·50	75·00	12·50
Resistant Havana	2,383	10·00	76·25	13·75
Connecticut Havana 38	2,309	11·00	75·25	13·75

Averages of triplicate plots.

It will be noticed in the above table that outstandingly high yields of cured leaf were obtained. The general quality of the leaf, however, was poor, with the exception of Comstock Spanish Pomeroy, which was fair in quality. All varieties in this test produced leaf which was thick, rough and coarse. It was of papery texture and of variable colours of yellow, green, brown and red. There were no first class binders and wrapper grades produced in these tests. In the field, however, these varieties made a vigorous growth and showed much promise of quality leaf. All varieties were harvested on August 10 and although precautions were exercised in the barn to check too rapid curing, the results of these quality tests indicate that the leaf had cured too rapidly. In the British Columbia Dry Belt the weather often is so hot and dry in early August that proper curing of cigar tobacco is a real problem.

TESTS WITH FLUE-CURED TOBACCO, SUMMERLAND, 1928

As a result of a demand for information regarding flue-cured tobacco growing, it was deemed advisable to undertake preliminary work with a view to determining whether or not this type can be produced in the Okanagan valley. A varietal test was therefore conducted on three representative light soils, namely, a light sand, a sandy loam and a loam. Owing to a number of factors the results were not as satisfactory as could be desired. There was no first class leaf of any grade, and none of wrapper or cutter quality. The yields and sorting data are presented in table 27.

TABLE 27.—INFLUENCE OF SOIL TYPE ON THE YIELD AND QUALITY OF FLUE-CURED TOBACCO, SUMMERLAND, B.C., 1928

Soil type	Variety	Yield per acre	Percentage of assorted grades				
			Marketable No. 2 grades				Unmarketable
			Lugs	Bright	Red	Green	
		Lb.					
Light sand	Bonanza	1,325	0	21	45	0	34
	Hickory Pryor	1,287	0	43	41	0	16
	Gold Leaf	1,250	0	7	54	0	39
	Warne	1,168	0	22	24	0	54
Sandy loam	Hickory Pryor	1,155	0	0	53	0	47
	Warne	1,365	0	0	29	0	71
Loam	Bonanza	2,300	13	0	50	37	0
	Hickory Pryor	2,008	36	14	23	27	0
	Gold Leaf	2,450	31	24	42	0	3
	Warne	2,235	22	21	34	23	0

A high percentage of unmarketable tobacco was affected by a peculiar physiological trouble which produced a thick, brittle, leathery leaf with numerous spots of a green, olive and bronze cast. This physiological disorder was observed in the field just previous to harvesting the crop. Just before blossoming, the crop on the light sand and sandy loam soils suffered from lack of water and some of the more exposed leaf wilted and burned, but with an immediate irrigation, the affected plants quickly recovered. Then too, a considerable portion of the leaf was over-ripe owing to delay in the construction of the kiln. These abnormal water relations and over-maturity effects may have caused an improper balance nutrition and growth which resulted in this physiological disorder.

On the whole, the three types of soils produced leaf which was exceedingly variable in size, body, texture and maturity. A considerable portion of the leaf,

especially that which was grown on loam, was too large and coarse to cure a high percentage of bright leaf. This large, coarse leaf was difficult to cure. During the curing, favourable weather conditions prevailed. Whether the light sandy soils and climate of the British Columbia Dry Belt are suitable for the production of flue-cured tobacco of a quality as desired by the trade has yet to be determined. In other sections, to produce the greatest percentage of marketable bright leaf, it is necessary that the crop be grown on a light sandy soil.

This year's tests indicate that even with adequate irrigation it is extremely difficult during periods of high temperatures and strong winds to sustain this crop on the light sandy soils that are typical of these southern interior valleys. It should be noted, however, that these results are based on one year's tests only and that this is the first time that flue-cured tobacco has been produced at this Station. It is quite obvious that there is much to learn as to the most suitable method of handling flue-cured tobacco under British Columbia conditions.

QUALITY TESTS OF COMMERCIAL SAMPLES OF TOBACCO

Samples of cured leaf of different types and varieties of tobacco which were grown under variable conditions of soil and environment were collected from a number of commercial tobacco fields in the districts of Oliver, Kelowna, Vernon, Lavington, Kamloops, and Sumas. Representative samples of soil were also taken from the same fields. The leaf samples were examined to ascertain their relative quality, and mechanical analyses and reaction tests made of the soil samples. These results were forwarded to the growers, who were thereby enabled to note the relation of leaf quality and soil type.

IRRIGATION STUDIES WITH BURLEY TOBACCO—Project T. 85

Four year studies of irrigation methods as practised by tobacco growers on irrigated lands in the British Columbia Dry Belt repeatedly indicate that irrigation is untimely and that the rate of application is considerably in excess of the amount of water required by this crop. At the Summerland Station various types of tobacco have been grown under very careful irrigation, but not under definite duty of water experiment. The response of these tobacco crops under irrigation indicate that to produce large crops of quality leaf in from seventy to ninety days in the field it is essential to maintain through judicious irrigation a continuous available supply of moisture in the soil. More definite information on the duty of water requirement of the tobacco plant is needed. Accordingly an irrigation experiment with Burley tobacco was initiated at this Station in 1928. Owing to shortage of labour, inadequate equipment, soil variation, grade and exposure to the land which was allotted to this project and the possibilities of considerable experimental error when irrigating small plots under such conditions, a simple experiment in large single one-quarter-acre plots was planned.

The land which was allotted to this experiment has a southern exposure and is exposed to strong south winds. The soil is a deep gravelly loam and somewhat deficient in humus. It is a type of soil that with adequate irrigation will produce four cuttings of alfalfa per season or eighteen tons, green weight, of ensilage corn per acre.

The plots were planted to Standup Resistant Burley in rows three and one-half feet apart on May 29 and during the season received three hoeings, six cultivations, and two suckerings. With the exception of the different irrigation treatments, all plots received uniform treatment, being topped on August 1, harvested on August 28, and stripped on December 10. Quadruplicate soil

samples for soil moisture determinations were taken from strips of soil five feet long by one and a half feet wide, which were located crosswise of the plant row and irrigation furrow. These soil samples were taken before planting and after harvesting. Irrigation water was applied by the furrow method. The acre-inch was used as the unit of measurement. The dates and rates of application and the percentage soil moisture before planting and after harvesting at depths of 6, 12, 24, and 36 inches are given in table 28. The natural precipitation from April 1 to August 31, and the average for the same months for the previous twelve years, are presented in the following table.

TABLE 28.—RELATION OF APPLICATION OF IRRIGATION WATER TO SOIL MOISTURE, B.C., 1928

Irrigation applications			Percentage soil moisture at different indicated soil depths					
			Before planting			After harvesting		
Number	Dates	Rate (Acre inches)	0-6	6-24	24-36	0-6	6-24	24-36
1	July 20–21	4·5	6·6	8·6	7·3	3·0	3·4	2·6
2	July 20–21 " 28–29	9·5	8·6	6·1	2·9	2·8	2·8	1·9
3	July 20–21 " 28–29 Aug. 6– 7	14·0	5·9	7·1	2·5	3·7	4·6	2·3
4	July 20–21 July 28–29 Aug. 6– 7 Aug. 16–17	18·0	6·5	8·4	5·7	5·9	9·3	8·4

In addition to the above amounts of irrigation water, there was a total precipitation between April 1 and August 31 of 6·09 inches distributed as follows: April, 1·57 inches; May, 1·16 inches; June, 1·48 inches; July, 1·65 inches; August, 0·23 inch.

The above rainfall was nearly twice the average rainfall during the preceding twelve years. In August, 1928, however, the precipitation was less than one-third the twelve-year average for this month.

Irrigation applied at the rate of 4·5 acre-inches is considered to be a light irrigation, 9·5 below medium irrigation, 14·0 above medium irrigation, and 18·0 acre-inches a heavy irrigation for this crop. Notwithstanding the considerable increase in precipitation this season, it can readily be seen from the figures in table 28 that the percentage of soil moisture is very low, especially in the plots which received one, two, and three irrigations respectively. The water applied on these plots was too low to adequately sustain a tobacco crop to maturity, especially during an exceptionally dry August. A comparison of the soil moisture (before planting and after harvesting in the plot which received four irrigations) and the quality tests of the cured leaf given in table 29 indicates that this plot had almost sufficient moisture to produce a marketable leaf. After harvesting, this plot contained slightly more soil moisture than before planting. Irrigation and rainfall on this plot was sufficient to sustain the crop in vigorous growing condition for a period of fifty-two days after the last irrigation water was applied.

Under Swift Current, Sask., conditions, it has been determined by S. Barnes, Field Husbandman, that clay loam would never go much below 10 per cent moisture and support a crop, and under optimum moisture conditions the percentage is approximately 30.

TABLE 29.—RELATION BETWEEN NUMBER OF IRRIGATIONS PER SEASON AND THE YIELD AND QUALITY OF BURLEY TOBACCO, SUMMERLAND, B.C., 1928

Irrigations		Yield per acre	Percentage of assorted grades		
Number	Rate (acre inches)		Marketable	Unmarketable	
				Immature	Trash
		lb.			
4	18·0	1,732	96	0	4
3	14·0	1,744	94	0	6
2	9·5	1,444	92	2	6
1	4·5	1,315	72	13	15

Irrigation studies which have been conducted during the past four years (1925-1928) with commercial and experimental tobacco crops in the British Columbia Dry Belt, indicate that the proper irrigation of tobacco under the variable conditions of soil and environment in these interior valleys is a very exacting cultural operation. The operation should be given very careful supervision and every possible care should be exercised not to over-irrigate, for the tobacco plant will not thrive when the soil is too wet. Each bench or field on which tobacco is grown will present its own particular and peculiar irrigation problem. It is also well to realize that irrigation should not be substituted for cultivation.

These studies indicate that light gravelly bench loam soils require at least four medium irrigations per season; heavier soils including sandy loams, loams and silt loams three irrigations. Level bottom lands may require but one or two irrigations and in some instances no irrigation, depending on the soil and season. Time of application is also very important. Field experience has demonstrated that it is extremely difficult to establish the young seedlings in the deep dry soil with the small amount of water delivered by the planting machine. This dry mulch is often of such depth that it is impracticable to plant small plants sufficiently deep to utilize the soil moisture underneath. During warm weather, this surface mulch becomes extremely hot and absorbs the moisture which was given to the young plant at transplanting time. It is, therefore usually necessary to irrigate before transplanting. In dry seasons this practice also applies to low bottom levels. After the crop is established in the field the aim should be to irrigate at such times as will ensure a steady, continuous growth. It is also advisable to irrigate at topping time, or soon afterwards, to ensure sufficient soil moisture to properly mature the crop.

YIELD AND QUALITY OF TOBACCO AS INFLUENCED BY DIFFERENT SPACINGS OF PLANTS WITHIN THE ROW AND AS INFLUENCED BY THE NUMBER OF DAYS AFTER TOPPING TO HARVESTING—Projects No. T. 12 and T. 81

Manufacturers and leaf dealers have suggested that the 1925 British Columbia Cigar leaf was too heavy bodied and that the Burley and Green River types were too thin. Accordingly, in 1926, two experiments were inititated to determine the yield and quality of tobacco as influenced by different spacings of plants within the row and as influenced by the number of days after topping to harvesting, with the aim of ascertaining the proper cultural practices to produce marketable leaf of the Cigar, White Burley and Green River types.

These spacing and harvesting experiments were continued in 1927 and 1928 at this Station and at Kelowna. In the spacing experiment all rows were spaced

36 inches apart and the distance between the rows varied from 18 inches to 36 inches. The 1926 results of these experiments are given in the Tobacco Division report for that year. In the following tables are given the results for 1927 and 1928:—

TABLE 30.—EFFECT OF SPACING ON QUALITY OF LEAF. KELOWNA AND SUMMERLAND PLOTS, 1927

Variety	Spacing	Colour	Body	Texture	General quality
	in.				
Connecticut Havana 38	18	Fair	Medium	Smooth	Good
" "	22	Uniform	Medium	Smooth	Good
" "	26	Mottled	Medium	Woody	Fair
Greenwood	24	Fair	Medium	Medium	Good
"	30	Good	Medium	Medium	Good
"	36	Good	Heavy	Coarse	Fair
Station Standup Burley	24	Bright	Thin	Smooth	Fair
" "	30	Bright	Medium	Smooth	Good
" "	36	Red	Medium	Medium	Good

No outstanding differences were noted in 1927, excepting that closer planting produced a brighter and more uniform colour, less body and a smoother texture than tobacco set farther apart.

In 1928 these spacing experiments were continued on Burley and Cigar leaf. An attempt was made to classify the cured tobacco into commercial type grades. These results are given in the following two tables. The varieties grown in 1928 were Connecticut Havana 38 and Station Standup Burley.

TABLE 31.—YIELD AND QUALITY OF CIGAR TOBACCO AS INFLUENCED BY DIFFERENT SPACINGS OF PLANTS WITHIN THE ROW, SUMMERLAND, 1928

Space between plants	Yield per acre	Percentage of assorted grades			Relative quality rating
		Fillers	Brokes	No. 2 binders	
inch.	lb.	p.c.	p.c.	p.c.	
18	2,163	13·75	63·75	22·50	1
22	2,393	13·75	62·50	21·25	2
26	2,038	15·00	60·00	25·00	3

Rows 36 inches apart. Averages of triplicate plots.

Although the general quality of the leaf from all of the above spacing trials was of common quality, the closer spacing gave, as in 1927, the best tobacco. The favourable effects of closer spacing were greater than the above sorting records indicate.

TABLE 32.—INFLUENCE OF DIFFERENT SPACINGS OF PLANTS WITHIN THE ROW ON THE QUALITY OF BURLEY TOBACCO, SUMMERLAND, 1928

Space between plants in rows (inches)	Yield per acre	Percentage of assorted grades					
		Lugs	Bright No. 1	Bright No. 2	Red No. 1	Red No. 2	Tips
	lb.						
24	2,818	7	20	22	44	4	3
30	2,434	8	11	17	47	12	5
36	2,258	7	17	17	50	9	0

Space between rows 42 inches. Averages of triplicate plots.

The leaf from the twenty-four-inch plot was light in body and uniform in colour but finer in texture and general quality than that grown at a wider spacing. The leaf from the thirty-six-inch plot was heavy and coarse in body, with variegated colours and prominent veins. It also was the poorest in general quality. The thirty-inch plot was intermediate in general quality. Here again the closer spacing yielded a finer and higher grade of cured leaf.

TABLE 33.—EFFECT OF MATURITY AT HARVEST ON LEAF QUALITY, KELOWNA AND SUMMERLAND PLOTS, 1927

Variety	Topping to harvest	Colour	Body	Texture	General quality
	days				
Connecticut Havana 38	15	Good	Thin	Smooth	Very good
" "	20	Good	Medium	Smooth	Very good
" "	25	Good	Medium	Smooth	Good
Greenwood	20	Mottled	Medium	Coarse	Fair
"	30	Good	Med. heavy	Woody	Fair
"	40	Good	Heavy	Woody	Fair
Station Standup Burley	21	Fair	Medium	Smooth	Good
" "	28	Bright	Medium	Smooth	Very good
" "	35	Bright mottled	Heavy	Medium	Fair

The above trials indicate that the best time for harvesting Cigar leaf and Burley are 20 and 28 days after topping, respectively.

The tobacco in the maturity trials in 1928 was assorted into commercial grades. The results on the Cigar and Burley types are given in tables 34 and 35. Station Standup was the variety of Burley grown.

TABLE 34.—YIELD AND QUALITY OF CIGAR TOBACCO AS INFLUENCED BY MATURITY

Location of plots	Topping to harvesting	Yield per acre	Percentage of assorted grades			Relative rating on basis of general quality
			Fillers	Brokes	No. 2 binders	
	days	lb.				
Summerland (1)	15	2,180	10	72	18	1
"	20		11	75	14	2
"	25	2,331	9	78	13	3
Kelowna (2)	15	1,259	23	60	17	1
"	20		17	70	13	2
"	25	1,673	19	71	10	3

(1) Averages of triplicate plots.
(2) Averages of duplicate plots.

The results of 1928 both at Summerland and Kelowna tend to show that cigar tobacco should be harvested slightly on the immature side. Plots harvested fifteen to twenty days after topping yielded a higher percentage of binders than those allowed to ripen for twenty-five days.

TABLE 35.—YIELD AND QUALITY OF BURLEY TOBACCO AS INFLUENCED BY MATURITY

Location of plots	Number days topping to harvesting	Yield per acre	Percentage of assorted grades					
			Lugs	Bright No. 1	Bright No. 2	Red No. 1	Red No.2	Tips
		lb.						
Kelowna (1)	21	1,192	9	46	9	23	2	11
"	28	1,506	11	45	6	26	0	12
"	35	2,018	12	26	8	46	0	8
Summerland (2)	21	2,545	6	19	23	40	9	3
"	28	2,724	9	30	21	36	4	0
"	35	3,060	9	8	44	36	3	0

(1) Averages of duplicate plots.
(2) Averages of triplicate plots.

The red leaf grade in the twenty-one day plot was somewhat immature. This is made apparent by the higher percentages of tips and number two red grades. In the bright leaf, however, the leaf was of more uniform colour, thinner and more silky than the thirty-five-day plot. The leaf produced on the thirty-five-day plot was much heavier and coarser in the red grades, especially. It was also characterized by mixed and variegated colours. The twenty-eight-day plot was intermediate in general quality.

OTHER TOBACCO PROJECTS IN ACTIVE PROGRESS

Project T. 9.—Fertilizer tests with flue-cured tobacco as regards the effect on yield and quality of leaf.

Project T. 18.—Fertilizer tests with Burley tobacco as regards the effect on yield and quality of leaf.

Project T. 84.—Tobacco Leaf Drop. To determine the environmental relations and the cause of this disease.

Project T. 26.—Tobacco Seed Production.

Project T. 1.—Tobacco Seed Beds, tests with glass, glass cloth, cello glass and cold frame cotton covers as regards the effect on soil and air temperature within the seed bed, growth of plants also a comparison of the price of the covers and their durability.

GENERAL SUMMARY

1. The production of high quality leaf of types desired by the trade is essential before a permanent market for British Columbia tobacco can be established. Reasonable volume and continuity of supply are factors which also will have to be taken into consideration in placing the industry on a sound basis.

2. Of the Burley varieties, Halley's and Kelly have given both the best quality leaf and good yields.

3. None of the cigar leaf varieties has proven to be outstandingly better than the others. Over a period of four years the general quality has been only fair.

4. Preliminary tests have shown that, even with irrigation, the production of high quality flue-cured tobacco on the sandy soils of the Okanagan valley is extremely difficult.

5. Irrigation studies indicate that, on a deep gravelly loam, at least four irrigations (18 acre-inches), are necessary to sustain a crop of tobacco until harvest.

6. Planting cigar leaf 18 inches apart in the row and Burley 24 inches apart yielded a finer and higher grade of cured leaf than did the wider spacing.

7. Cigar tobacco harvested from fifteen to twenty days after topping yielded a higher percentage of binders than that left for twenty-five days.

8. Maturity tests with Burley indicate that for the production of leaf of cigarette quality the tobacco should be harvested about three weeks after topping. More of the heavier, red export grades were produced when cutting was delayed for an additional two weeks.

PUBLICATIONS ON TOBACCO CULTURE

The following publications of the Dominion Department of Agriculture relating to tobacco culture are available on application to the Publications Branch, Department of Agriculture, Ottawa, or to the Dominion Experimental Station, Summerland, B.C.:—

Tobacco-Growing in Canada—Bulletin 25.

Tobacco Seed-Beds—Bulletin 21.

Tobacco, Summary of Three Years' Experiments at Harrow—Bulletin 41.

Flue-Cured Tobacco in Canada—Bulletin 38.

Annual Reports of the Tobacco Division, Central Experimental Farm, Ottawa.

Annual Reports of the Dominion Experimental Station, Summerland, B.C., for years 1925, 1926, 1927, and 1928.

Annual Reports of the Dominion Experimental Station, Farnham, Que.

Annual Reports of the Dominion Experimental Station, Harrow, Ont.

ANIMAL HUSBANDRY

The work in animal husbandry conducted at this Station is naturally limited as it is of relatively minor importance to the work in horticulture. However, excellent breeding herds of Jersey cattle and Berkshire swine are maintained, and a constructive breeding program with these is in progress. These herds serve two main purposes; first, they provide an excellent medium for the disposal of waste and surplus fodders and the conversion of these into much-needed manure; and secondly, a source of supply of dependable breeding stock for the province.

The Okanagan valley farmers and fruit growers are rapidly developing the dairying and hog raising industries in this district. This expansion has been healthy and prosperous and this Station is contributing to this development as far as is possible.

DAIRY HERD

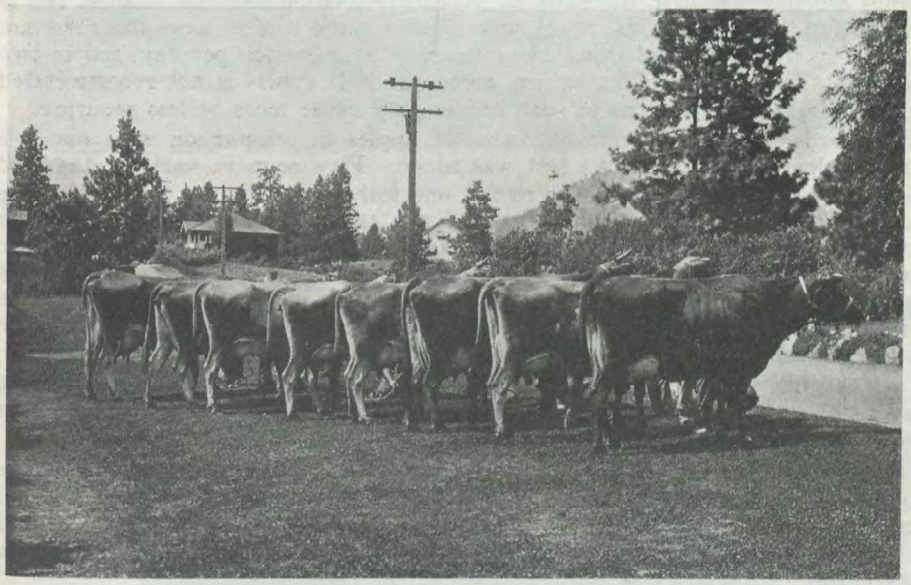
The herd of pure bred Jersey cattle which is being developed at this Station has made some material growth during the year. Unfortunately the percentage of bull calves was abnormally high and only three female calves were added to the herd. However, several exchanges of promising bull calves were made for young females and these additions have improved the herd materially.

No experimental feeding other than an apple feeding trial was undertaken as the herd is too limited in number to render such work feasible. Record of Performance work and cost of butterfat production were continued.

The senior herd sire—Rosewood Kitty's Oxford Beau —26182— was transferred at the end of the year to the Vancouver Island Station, Sidney, and the use of the imported bull—Hamlet's You'll Do —38570—was arranged for. This sire should do much to improve the type and general dairy conformation of the Station herd. He was sired by You'll Do Volunteer —P 5920 C, who was by Imported Jersey Volunteer —P 5354 H.C. and out of Hamlet Belle Noblesse, an imported and tested daughter of Fern's Oxford Noble 2nd —10601—.

The entire herd was placed on the agglutination and complement fixation blood tests for contagious abortion, and one reactor was isolated from the herd during the year. No abortions have occurred in the Station herd since it was established and it is planned to blood-test regularly and if possible avoid losses from this disease.

The herd again successfully passed the annual tuberculin test and maintained full accredited standing.



Jersey milking herd at the Summerland station.

PASTURES

The dairy herd at this Station is pastured from April 15 to October 15 or later, depending on the season and carrying capacity of the pastures. The pasture is mixed in character being a combination of grasses with alfalfa as a base. The pasture area, a total of 9·03 acres in extent, is divided into four fields and the cattle are rotated from one field to another. While a field is resting it is irrigated well and the cattle are kept off until the growth is six to eight inches in height. Owing to the presence with the alfalfa of a considerable proportion of grasses, bloating is avoided, as it has been observed that the cows going on a fresh pasture show a decided preference for the grasses. Later in the day they seem to turn to the alfalfa. The mixture with which these pastures are seeded is broad and under irrigated conditions the following mixture has given

excellent results: alfalfa, 6 pounds; tall oats grass, 3 pounds; meadow fescue, 4 pounds; orchard grass, 2 pounds; Italian rye grass, 2 pounds; western rye grass, 2 pounds; a total of 19 pounds per acre. To this mixture if the soil is dry might be added about 3 pounds of sweet clover. If the soil is deep and with a higher moisture content over the season a little timothy, and White Dutch clover may be added to good advantage.

Such a mixture at the Station carried seventeen head of cattle all over one year of age excepting one head, on 9·03 acres for the entire season during 1928, with considerable pasture to spare. Further studies in this direction will be continued in an endeavour to determine the maximum carrying capacity of such an irrigated pasture in this district.

APPLES FOR DAIRY COWS

Quite controversial opinions have prevailed throughout the fruit districts in reference to the value of apples as succulence for dairy cows. Since the establishment of the dairy herd at this Station in 1924 cull and windfall apples have been regularly fed each fall with excellent results. Care is exercised when the apples are first given to the cows to avoid overfeeding and the amount fed is limited for the first few days. However, after three to five days the cows are worked up to full feed of from thirty to forty pounds each per day, fed in two feedings. The feeding of immature, green windfall apples is not recommended as the extreme acid content of such apples may cause more or less scouring.

In order to test the relative value of apples in comparison with mangels for succulence, a comparative test was made. Five cows in various stages of lactation were used. Mangels were fed one full week; apples the succeeding week, mangels the next, and so forth for a period of six weeks. Accurate weights of the milk yield were recorded and close observations taken as to the laxative condition as indicated by the manure. Equal quantities of mangels and apples were fed to each cow, and the maximum quantity fed of either was forty pounds. The cows were swung from the full feed of mangels, or apples as the case might be, right on to the other feed.

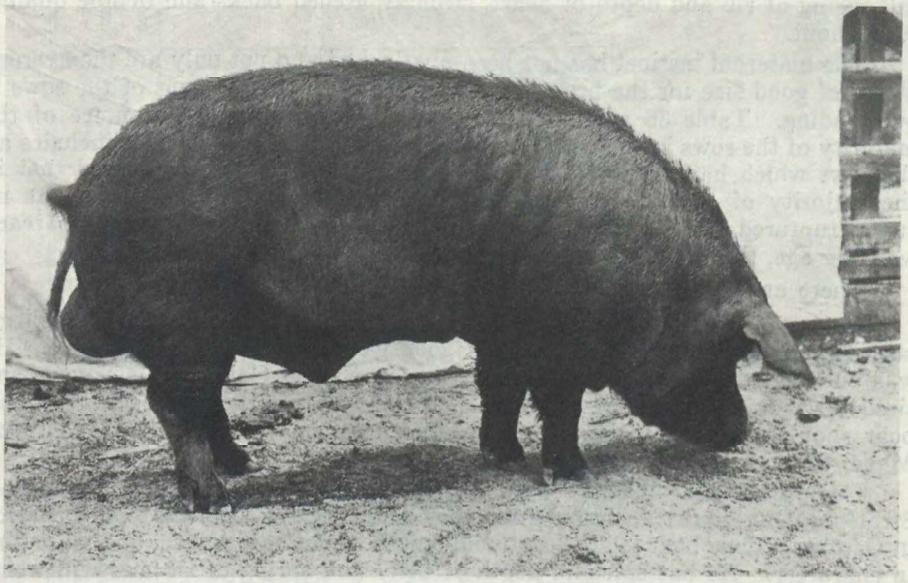
The milk yields did not vary in the slighest throughout the test, nor were any ill effects from the apples observed. The cows were perfectly normal in every particular when the apples were fed.

However, due care must be taken in getting the cows accustomed to the apples, or severe diarrhea may occur. Again cows must not be allowed free access to apples at any time as the result may be serious. Not only will the cow go off in milk almost if not entirely, but death of the animal or animals may ensue.

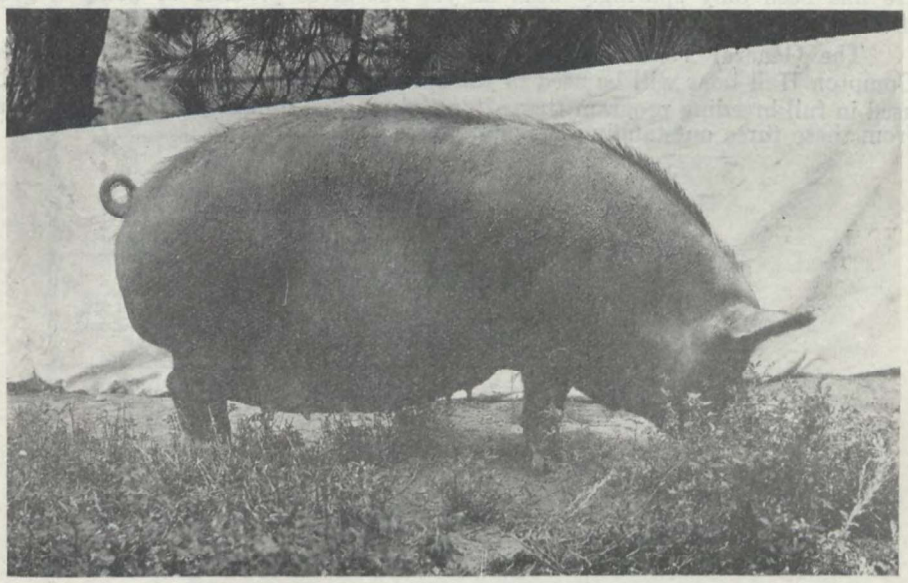
No attempt has been made at this Station to store cull apples for winter feeding, as roots are available for storage for later feeding. However, where roots are not to be had, there is no logical reason why cull and low grade apples may not be stored and successfully fed to dairy cows. In the interior fruit districts they will prove an economical source of succulent feed.

SWINE

The herd of Berkshires maintained at this Station has been materially improved during the year. The sow herd has been further increased by the addition of several young sows of improved type bred on the Station. Several of the older sows were eliminated to make room for these. The general quality



Senior herd sire—Compton Hall 69327.



Summerland 36-67520. Representative of the aged sow herd at the Summerland Station.

of the females is remarkably high. All are of uniform and exceptionally good length, deep flanks, well rounded hams, neat heads, fine, clean shoulders, good full spring of rib and depth of heart, strongly arched backs and of fine quality throughout.

The maternal instinct has not been overlooked and not only are the average litters of good size for the breed, but the mammary development of the sows is outstanding. Table 36 gives a summary of the breeding performance of the majority of the sows in the herd for the past few years and this table includes all the sows which had farrowed two or more litters. It will be observed that in the majority of cases these sows have farrowed two litters per year. As no runts, ruptured pigs, or pigs showing poor development are allowed to reach weaning age, this table shows the averages per sow to be commendable.

There are three herd sires in use at present:—

General Tom —70515— (336517A), bred by Oregon Agricultural College, born March 4, 1926. He is a boar of good length, weight and substance. He was undefeated aged boar at Class A fairs in British Columbia last year, and sired the winning gilts and boars under six months at these same fairs. This boar should leave exceptionally good stock used on the daughters of Ottawa Model 92—the former herd sire in this herd.

Compton Hall —69327— born March 3, 1926, bred by Adam Thompson, Stratford, Ont., and transferred from the Central Farm, Ottawa, to this Station in October. This boar is of exceptional length, clean hard boned, and masculine in character. He has splendid depth of body and spring of rib and will weigh over 800 pounds in show condition. He has proved exceptionally good in the Central Farm herd.

Willow Lodge Baron 81 —70724— born April 10, 1927, bred by P. J. McEwan, Wyoming, Ont., is a fine quality boar throughout and quite promising. He has been only sparingly used as yet but gives promise of being a good breeder.

The General Tom boar was used heavily in the fall of 1928 and the Compton Hall boar will be used in the spring of 1929. All three boars will be used in full breeding program thereafter and marked improvements are expected from these three outstanding Berkshire sires.

TABLE 36.—FARROWING RECORD—BERKSHIRE HERD

Name of sow		Date of birth	Litters farrowed						Date disposed of	Number of litters	Total number pigs farrowed	Average farrowed per litter	Number of pigs weaned	Average number weaned per litter
			1923	1924	1925	1926	1927	1928						
Summerland	8	Mar., 1922	2	1	2	2	2	2	x	11	108	9·82	80	7·27
"	9	Mar., 1922	2	2	2	2	.....	.....	May, 1927	8	83	10·38	54	6·75
"	11	June, 1922	1	2	2	.....	.....	.....	Dec., 1925	5	48	9·60	39	7·80
"	12	Sept., 1922	1	2	.....	.....	.....	.....	Mar., 1925	3	32	10·67	26	8·67
"	15	Sept., 1922	1	2	1	.....	.....	.....	Aug., 1925	4	34	8·50	30	7·50
"	16	Sept., 1922	1	2	.....	.....	.....	.....	Dec., 1924	3	27	9·00	24	8·00
"	21	Sept., 1923	.....	1	1	2	.....	.....	Nov., 1924	4	30	7·50	27	6·75
"	28	Oct., 1923	.....	1	1	2	1	.....	July, 1927	5	58	11·60	41	8·20
"	36	April, 1924	.....	.....	1	2	2	2	x	7	74	10·57	62	8·86
"	52	Sept., 1924	.....	.....	.....	1	1	2	Dec., 1928	4	33	8·25	30	7·50
"	55	Sept., 1924	.....	.....	1	2	2	2	x	7	67	9·57	55	7·86
"	73	Aug., 1925	.....	.....	.....	1	1	1	x	3	21	7·00	21	7·00
"	80	Aug., 1925	.....	.....	.....	.....	2	1	Nov., 1928	3	30	10·00	25	8·33
"	81	Aug., 1925	.....	.....	.....	.....	2	2	x	4	44	11·00	41	10·25
"	123	Aug., 1926	.....	.....	.....	.....	1	2	x	3	23	7·67	22	7·33
"	124	Aug., 1926	.....	.....	.....	.....	1	2	Nov., 1928	3	22	7·33	22	7·33
"	130	Aug., 1926	.....	.....	.....	.....	1	1	x	2	17	8·50	14	7·00
"	146	Feb., 1926	.....	.....	.....	.....	2	2	x	4	30	7·50	27	6·75
"	1627	Feb., 1927	.....	.....	.....	.....	.....	2	x	2	21	10·50	20	10·00
	19	.....	.....	.....	.....	.....	.....	.....	.....	85	812	9·55	660	7·76

POULTRY*

INTRODUCTION

At the conclusion of 1928 the Station flock, consisting entirely of White Wyandottes, numbered three hundred and thirty-five birds, including four adult males, forty-nine cockerels, ninety-one hens and one hundred and ninety-one pullets.

Although these numbers are not as great as the plant has had in several past years, the birds have been bred from the small nucleus which remained after the baccillus pullorum test forced a considerable decrease in the stock.

What has been lost in quantity has certainly been gained in quality. The records for the past year show far ahead of the previous years of the plant's existence.

The average production of the nucleus, mentioned above, which comprised twenty-five hens, was 213 eggs per bird. From these was bred a flock of eighty-four pullets which averaged 230·4 eggs per bird during their first year, without culling and without the loss of a single bird through disease. More than twenty-five per cent of these laid 250 eggs or more, and three of them passed the 300 egg mark.

The following is a table of the production per bird of these pullets from the time they began to lay in 1927 until the end of September, 1928.

October, 1927	17·8	eggs per bird
November	21·1	"
December	17·1	"
January, 1928	17·6	"
February	19·8	"
March	22·2	"
April	21·8	"
May	20·9	"
June	18·2	"
July	18·2	"
August	17·0	"
September	14·7	"

While these records are high, another lot of pullets, a year younger, at present in the laying sheds are doing just as well. During December these latter averaged 20·4 eggs per bird, following a record of 20·6 in November and 17·9 in October.

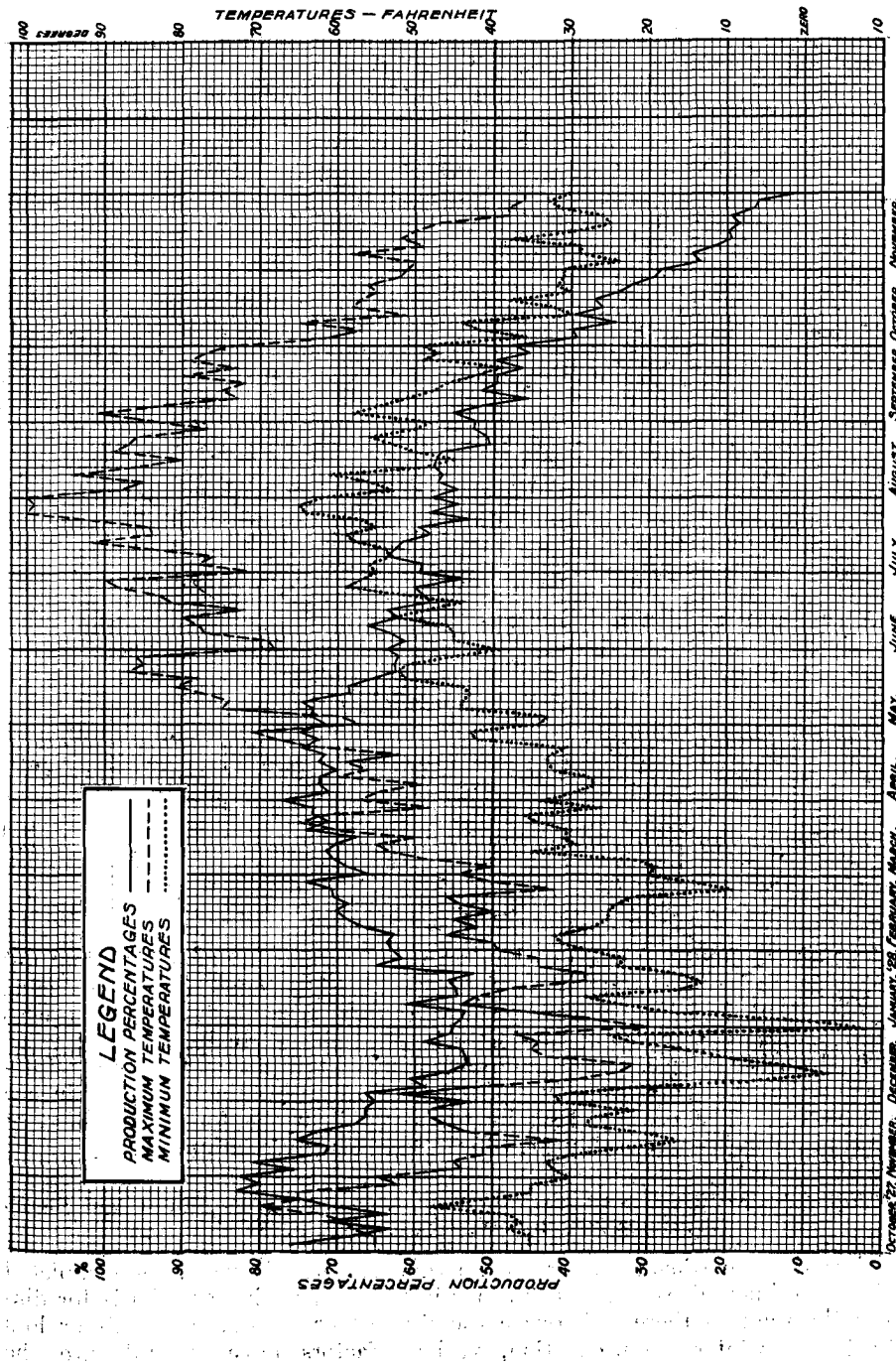
The hatching and rearing season, as regards weather conditions, was a good one. An average amount of moisture and bright weather was enjoyed. Fertility was lower than usual, due no doubt to the fact that the birds in all breeding pens were confined, which it is not proposed to do again, as soil contamination does not seem to have the same disastrous effects on adult birds as it does on the young stock.

Mortality in the chicks was remarkably low, 98·2 per cent of hatched chicks being alive when wing banded at three weeks old. Growth of the young stock was very good and the subsequent pullets had all commenced laying before the end of November.

INFLUENCE OF TEMPERATURE UPON PRODUCTION—Project P. 201

The details of this project take the form of a chart showing curves of production of the total pullet flock from October 1, 1927 to November 30, 1928, and the maximum and minimum temperatures over the same period. For convenience, averages have been struck for each three days in each month, except for the last period where there are more or less than three days according to the month.

* The work in this division is under the charge of Mr. D. G. Denny, head poultryman, who has been entirely responsible, under the superintendent, for this work and has prepared this section of the report



Influence of temperature on egg production.

In an examination of the chart it will be immediately noted how production followed the extreme variations in temperature. The peak of fall production followed closely upon the high peak of fall temperatures. Likewise the lowest winter production occurred around the periods of extreme cold. Production then mounted with a few setbacks on account of cold, a notable instance being the cold spell at the end of February.

Production commenced to drop in May just when the thermometer began to rise, and incidentally when broodiness would show to some extent in the flock records. Finally, when minimum temperature variations became acute, production dropped at a sharp rate. A number of interesting instances of change can be noted in a close scrutiny of this chart.

HEAVY VERSUS LIGHT LAYERS FOR CHICKS—Project P. 111*b*.

This project has not been reported on since 1921, but complete records have been kept covering the ten years, 1919-1928 inclusive, and are now published as giving definite results on the subject of heavy versus light layers for chicks.

For convenience and simplicity the birds have been divided into five groups, A to E, acording to the number of eggs laid by the birds in their first, or pullet, year.

Group	A	comprises	birds	laying.. .. .. 150-175 eggs.
"	B	"	"	.. .. 176-200 "
"	C	"	"	.. .. 201-225 "
"	D	"	"	.. .. 226-250 "
"	E	"	"	.. .. 250 and upwards.

A summary of results follows:—

TABLE 37.—HEAVY VERSUS LIGHT LAYERS FOR CHICKS, 1919-1928, INCLUSIVE

Group letter	Number of birds	Eggs set	Infertile	Hatched	Per cent fertile	Per cent fertile hatched	Per cent total eggs hatched
A.....	56	818	122	475	83·8	69·2	58·1
B.....	309	4,925	916	2,928	81·4	73·0	59·2
C.....	270	4,518	977	2,535	78·3	71·6	56·1
D.....	174	3,256	560	1,926	82·8	71·4	59·1
E.....	67	1,318	241	860	81·7	79·9	65·2

The above figures show that the first years' production of a bird does not influence in the least the fertility and hatchability of the same bird's eggs during the subsequent breeding seasons. Although the percentage of fertile eggs hatched and the percentage of total eggs hatched shows greater in group "E" than in the other groups, it may safely be assumed that this is merely a coincidence and that the variation is due to individualism rather than to any influence of production. The position held by group "E" in the foregoing summary was not held consistently each year, which disproves any relationship.

RELATION OF HATCHING DATE TO VALUE OF EGGS PRODUCED, USING EGG GRADE VALUES FOR COMPARISON—Project P. 200

Since the time when a number of experiments were conducted and completed on the Experimental Farms and Stations in Canada, having as a basis for discovery the relation there is between the time of hatch and the profit or loss derived from winter egg production, various factors have entered into the

situation to alter, or effect, the results. Most notable of these is the introduction several years ago of a compulsory egg grading system. This has been a great boon, in that it has caused breeders to realize the relation there should be between production and egg size.

Another factor is, that in those districts of British Columbia which are, more or less, ruled by the egg prices obtaining at the Coast markets, which in their turn are at the present time indirectly governed in fall and winter by the Eastern weather and consequent production, the bottom seems to drop out of the egg market around the end of December each year.

As this Station is situated in a district governed, as far as egg prices are concerned, more or less by what the Coast wholesalers pay, and as eggs from the Station flock are marketed through a co-operative organization, which grades and pays solely by these grades, an experiment to determine whether early hatched birds will lay eggs of greater total value than later hatched pullets, using the actual grading prices for comparison, would appear to be useful. It is assumed, of course, that the earlier the pullet is hatched the earlier it should commence to lay.

Another point which it would be useful to discover, is whether the later hatched pullets would lay longer into the following fall and winter, and so balance the extra value of eggs laid by the pullets which started sooner. Naturally, the egg size of these late hatched pullets laying into the second fall would be better than the egg size of the early hatched pullets the first fall; but the sequences or rhythms would no doubt be shorter. No attempt has been made in this experiment to show profits from the three different hatches. That is, no record of cost of feed, labour, etc., has been kept. Only the value of the eggs laid by each hatch, from the commencement of laying during the fall and winter of 1927 until the end of November, when there could be no appreciable difference in production due to time of hatch, has been considered.

Also, in order to make a better comparison, the following tables and figures have been worked out on the basis of one bird.

TABLE 38.—NUMBERS OF EGGS LAID BY BIRDS HATCHED ON DIFFERENT DATES

Month and year	March 24, 1927, hatch		April 16, 1927, hatch		April 28, 1927, hatch	
	Eggs laid per bird	Value	Eggs laid per bird	Value	Eggs laid per bird	Value
	No.	cts.	No.	cts.	No.	cts.
1927						
August	1·8	2·2	.....	.....	.....	.....
September	20·1	47·5	3·0	5·7	.....	.....
October	21·3	69·8	17·2	49·5	10·7	28·4
November	17·9	64·8	21·6	69·8	19·8	57·5
December	15·2	52·1	17·4	56·9	18·4	54·0
1928						
January	14·6	34·0	18·0	41·6	19·0	41·7
February	19·1	37·5	20·2	37·9	19·9	34·9
March	20·0	31·7	22·7	34·7	23·4	35·3
April	20·2	43·6	22·2	45·2	22·8	46·0
May	19·5	37·5	20·7	39·1	21·6	39·2
June	17·2	33·0	17·4	32·3	20·0	36·9
July	15·5	34·8	19·2	44·5	20·4	44·6
August	16·5	43·0	16·1	46·9	18·6	47·3
September	12·9	41·0	14·0	43·1	17·0	48·8
October	9·8	34·7	14·9	35·8	12·1	41·4
November	6·3	26·0	5·0	20·5	6·2	25·2
Totals	247·9	$6·33\frac{3}{10}$	249·6	$6·03\frac{3}{10}$	249·9	$5·81\frac{3}{10}$

SUMMARY.—It will be noticed that the egg production was high from all hatches. Although not shown on the foregoing table, the actual production of these same birds averaged around 231 eggs per pullet, without culling.

From the commencement of laying to the end of November, the eggs from each bird of the March hatch returned approximately thirty cents more than each bird of the April 16 hatch, and fifty-two cents more than each bird of the end of April hatch. In turn, the April 16 hatch returned eggs valued at about twenty-two cents more than each bird of the April 28 hatch. The birds in this experiment came on to lay at a fairly early date in relation to their hatching date; in fact earlier in this regard than the majority of birds in this district. If the average laying date had been later it is quite possible that the early-hatched birds would have shown a greater margin in their favour.

The later-hatched birds did not make up enough in the second fall to balance the value of eggs laid by the earlier birds the first fall, but once they settled down to business they gained a little each month with one or two slight exceptions.

BROODINESS AND PRODUCTION—Project P. 199

This study of broodiness in White Wyandottes has been made with the intention of showing what effect this condition has on the production of pullets during their first year of laying.

In Leghorns, and other light breeds, broodiness is not so marked, and in these days when the public is becoming better educated to the ill results which can be obtained by hens as a hatching medium, this lack of broodiness is an asset in a breed or strain, and is a state to strive for in breeding, being a safeguard and an incentive to use incubators. And this is apart from the fact that production may possibly be increased by a reduction of broodiness in a strain.

In some cases it has been found that hens have become broody a large number of times during their pullet year and yet have laid over two hundred eggs in that period, but these cases are more the exception than the general rule. It has not been the policy on this Station to breed from these hens recording high broody propensities, therefore it cannot be said how much of this characteristic is passed on to the progeny. From the limited observation it is possible to make, it might be said that hens going broody, say five times in their first laying year, will give female progeny that will record as many times as the dam, and also others which have no inclination whatsoever in this regard. This may possibly depend upon the male and opens up a field for further study.

It appears to be a fact that by using only males from non-broody or low-broody lines broodiness can be held down, if not greatly reduced. By maintaining broodiness at a minimum, production can be maintained at a very fair maximum.

If we admit into the category of " minimum broodiness " pullets which have not been broody more than twice during their laying year, then we have the following figures to partly prove the statement in the above paragraph. It has been stated previously that it has been an endeavour to use only males from " minimum broody " lines.

Broody More than Twice

1922-23—36 per cent of total under record.
1923-24—29 per cent of total under record.
1924-25—37 per cent of total under record.
1925-26—19 per cent of total under record.
1926-27—31 per cent of total under record.
1927-28—12 per cent of total under record.

This same category of birds showing limited broodiness will also show an average egg production well above the average for the entire flock under record during each year and every year since 1922-23. This proves that broodiness has a marked effect upon production.

The following table shows the average pullet-year production of birds going broody varying numbers of times during that same period. The results are taken from records covered by the past six years. It will be noted that the highest production falls into the first three groups, consisting of the birds which did not show broodiness over twice during the first laying year. There was one remarkable exception: the pullet which went broody twelve times and yet found time to lay 212 eggs.

TABLE 39.—EFFECT OF BROODINESS ON NUMBER OF EGGS LAID

Times broody	Number of birds	Average production	Times broody	Number of birds	Average production
Nil	312	211·9	7	14	156·6
1	70	207·0	8	4	174·7
2	80	207·5	9	2	162·0
3	31	198·1	10	3	190·3
4	52	185·9	11	1	168·0
5	27	198·1	12	1	212·0
6	26	192·3	13	1	163·0

INTESTINAL PARASITISM OF FOWL—Project P. 134

In establishing a poultry plant it was often the practice up until recent years to put poultry on any part of the farm which was unsuitable for other branches of agriculture. Fortunately poultry now receives greater attention when a location is being chosen for a plant, as experience has proven that many outbreaks of disease on numerous plants have been due to contaminated soil and the consequent infestation of intestinal parasites or worms. Poultry can only be successfully handled on good arable land. Owing to adverse conditions of location, and no facilities for sweetening the rocky soil on the poultry plant at this Station, intestinal parasites have been a source of trouble in recent years, so much so that a determined effort had to be made to break the life circle of the parasites. Experimental data collected from the Station flock proves that breeding from worm-infested flocks will produce chicks of weak vitality.

The methods followed have been to raise the young stock on clean ground, as far as possible away from the main plant in order to prevent the intermediate hosts (in the case of tape worms, at least) from carrying the infestation, and spreading the disease by direct contact. The ground was not used in succeeding years, one season between being allowed for sweetening the soil by cultural methods. If manure had to be piled temporarily on the range land, care was taken to have it fenced so that the chickens could not tramp over it. This, as well as other methods of good sanitation practice, is most important and is one that is quite often overlooked or negleced on many large poultry breeding establishments.

In an effort to clean up the adult stock, worm capsules were used without satisfactory results, the greatest success being obtained by employing every possible method of sanitation.

The chicks were confined to the brooder house for the brooding period, and the sheds cleaned out more often than necessary rather than just often enough.

Pullets raised on clean fresh ground go into the winter laying sheds in splendid condition, and once in they are not allowed out in yards, being strictly confined until the following fall. Under these conditions, they have maintained their excellent condition throughout, but it might be noted here that cannibalism has to be guarded against. Should an outbreak of this occur, this can be remedied by dubbing the upper mandibles of the offending birds and smearing the victims with pine tar.

During the past two years since these control practices have been in effect, no deaths have occurred that could in the remotest degree, be attributed to worm infestation. Production has been the best in the history of the plant and greatest credit for this should be given to the control of these parasites.

During wet weather, or when the snow is thawing in the spring, particular attention must be given to the fact that the trouble can be carried around on the poultryman's boots. Because of this, the poultry attendants disinfect their footwear before entering the poultry sheds.

The precautions mentioned under this heading may sound, or read, as being unnecessarily drastic, but it must be remembered that the Station flock has been housed in infested land, where, in the past, mortality has been high. In fact, the results were such that a commercial concern might very easily have been put out of business. From the same stock and on the same main plant, under close confinement and with no access to dirty yards or runs, in two years an average flock production of 230·4 eggs per bird has been reached which will compare favourably with any flock in Canada.

In conclusion, it would appear that if the birds can be reared worm-free to maturity, they will have sufficient constitution, and reserve sufficient strength to ward off attacks from parasites and germs emanating from contaminated ground.

But it should never be forgotten throughout the poultryman's year that the danger is there, and a little neglect may mean a tremendous lot of worry and trouble.

BACILLUS PULLORUM INFECTION OF FOWL—Project P. 186

In the spring of 1927 the entire flock, consisting of males kept for breeding purposes, pullets and adult females, was tested for bacillus pullorum. The results of this test were, to say the least, discouraging at that time, but have since proved a blessing in disguise, in that they have caused changes which have brought about increased success in a number of directions. All re-actors were slaughtered as soon as possible after receipt of details of the blood tests carried out, and the negatives were again tested in 1928 prior to the breeding season. The table below gives the results of all tests carried out to date and speaks for itself.

TABLE 40.—RESULTS OF TESTS FOR BACILLUS PULLORUM

Description	Test—March, 1927			Test—January, 1928			Test—November, 1928		
	Birds	Reactors	Per cent	Birds	Reactors	Per cent	Birds	Reactors	Per cent
Males (1926)	9	0	0·0	3	0	0·0	.....	.....	.....
Adult females	110	77	70·0	18	0	0·0	.....	.....	.....
Pullets (1926)	265	199	75·1	24	1	4·2	.....	.....	.....
Pullets (1927)	.....	.....	.....	.....	.....	.....	79	0	0·0
	384	276	71·9	45	1	2·2	79	0	0·0

Through testing and consequent slaughter of all reactors, with necessary methods of disinfection to combat this disease chick mortality has been decreased in marked degree. Although no females were bloodtested until 1927, the presence of the trouble was suspected and precautions taken along sanitary lines in 1926. These same precautions seem to have lessened mortality considerably, even although seventy-five per cent of the resulting pullets were proved by subsequent blood testing to be carriers of bacillus pullorum. A table showing chick mortality over a number of years follows:—

TABLE 41.—CHICK MORTALITY OVER PERIOD OF YEARS

Year	Chicks hatched	Mortality in three weeks	Per cent alive at end of three weeks	Remarks
1924	835	522	37·5	
1925	1,366	438	67·9	
1926	953	69	92·7	Chicks confined first month.
1927	205	15	92·7	Breeding stock tested.
1928	384	7	98·2	

It might not be out of place to state here some of the sanitary measures adopted to control and eradicate this disease.

The chicks have been raised to maturity on new soil each year and confined to the brooder houses (which have been disinfected and cleaned often) for the first four to six weeks of their lives. The pullets have been confined to the laying sheds from the time when they were brought off the range in the fall until the following fall, and by the use of cod liver oil held their good condition throughout.

At the entrance to all the pullet laying houses a compartment has been reserved for the disinfection of the poultrymen's boots before entering.

Bloodtesting of all stock will be carried out in the future at periodic intervals to maintain the control of the trouble.

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