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DEPARTMENT OF AGRICULTURE
EXPERIMENTAL FARMS SERVICE

DOMINION EXPERIMENTAL STATION

SAANICHTON

BRITISH COLUMBIA

J. J. WOODS, B.S.A., M.S.A., SUPERINTENDENT

PROGRESS REPORT
1947-1953

A YOUNG HOLLY ORCHARD THAT HAS BEEN SURFACE-MULCHED WITH SAWDUST.

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PERSONNEL

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INTRODUCTION

The Dominion Experimental Station at Saanichton, B.C., is located on Vancouver Island, about 15 miles north of Victoria. With five associated Illustration Stations it serves the interests of the farmers on the Island. The average farm holding is small, but the kinds of farming are very diverse. The problems under study are therefore diverse and numerous and apply alike to small and large operations. Horticulture and poultry typify many of the small-scale activities, the former with such crops as tree fruits, small fruits, bulbs, holly, cut flowers, vegetables, and seed production. In the larger-scale activities mixed farming predominates.

Progress reports have been published covering the years 1932-1936 and 1937-1946. The present report covers the period 1947-1953. The predominant thought in preparing this report has been to present information from experiments that have been conducted in whole or in part during this period. Many of the present recommendations obtained from previous experiments can be had from the publications that are listed at the end of this report. The projects also listed at the end of this report give a further insight into work in progress at the present time.

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METEOROLOGICAL RECORDS

The following tables summarize the weather conditions that have prevailed during the last six years. Further information regarding local conditions at other centres can be obtained from the publication, "Climate of British Columbia", published by the Provincial Department of Agriculture, Victoria, B.C.

TABLE 1.—Mean Temperature Records

EXPERIMENTAL STATION, SAANICHTON, B. C., 1948–1953

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1947.....	35·1	41·9	45·0	49·3	54·9	58·8	61·9	60·3	57·3	49·5	41·9	40·7
1948.....	38·5	37·5	41·3	44·8	52·1	60·1	60·2	60·5	54·8	48·9	41·2	35·5
1949.....	31·9	36·5	43·6	47·7	55·5	57·0	60·5	59·2	59·4	47·7	48·8	36·9
1950.....	25·0	39·0	40·5	45·7	50·4	59·0	61·9	61·5	57·3	48·4	42·8	43·5
1951.....	36·8	39·1	39·0	49·8	53·6	60·1	62·6	60·6	58·9	50·2	43·8	36·2
1952.....	36·1	40·0	41·2	47·8	52·8	54·9	62·6	61·3	58·7	52·9	42·5	41·1
1953.....	41·8	40·1	42·4	46·9	53·0	54·9	61·4	61·5	57·9	50·9	46·0	41·4
40-year mean.....	36·4	38·4	42·7	47·5	53·7	58·5	62·4	61·9	56·8	50·0	43·1	39·2

TABLE 2.—Evaporation from Free Water Surface

DOMINION EXPERIMENTAL STATION, SAANICHTON, B. C., 1948–1953

Year	May (in.)	June (in.)	July (in.)	August (in.)	Sept. (in.)	Total (in.)
1948.....	M	4·08	3·88	2·75	2·86	13·57
1949.....	4·24	4·65	4·59	3·54	2·94	19·96
1950.....	3·21	4·77	5·14	4·28	2·77	20·17
1951.....	3·55	4·98	6·10	4·74	2·67	22·04
1952.....	3·88	4·16	5·35	4·52	2·94	20·85
1953.....	3·22	2·99	4·90	3·49	2·74	17·34
MEAN.....	3·62	4·27	4·99	3·89	2·82	19·59

TABLE 3.—Precipitation Records

DOMINION EXPERIMENTAL STATION, SAANICHTON, B. C.

Monthly and Annual Precipitation Records (inches) 1947-53, inclusive, with 40-year averages and monthly extremes

Year		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Annual Snowfall	Total Annual Rainfall	Total Annual Precipitation
1947		6·95	4·65	2·10	2·73	0·21	1·28	0·70	0·27	0·95	5·81	2·47	7·99	19·10	34·20	36·11
1948		3·64	6·91	2·78	1·42	4·01	1·79	1·77	2·75	1·83	1·77	6·96	5·71	.8·80	40·46	41·34
1949		0·77	6·86	2·07	1·19	0·68	1·30	0·99	0·77	0·83	2·33	8·87	8·05	29·65	31·77	34·73
1950		4·31	5·01	4·21	1·84	0·52	0·34	1·26	2·22	0·53	5·26	3·95	5·48	30·40	31·89	34·93
1951		7·81	6·42	3·41	0·47	1·30	0·07	0·07	0·67	2·05	4·95	3·64	3·39	19·50	32·30	34·25
1952		4·65	4·10	2·05	1·43	0·89	0·93	0·44	0·60	0·17	1·20	1·47	5·32	27·40	20·51	23·25
1953		13·80	2·94	1·75	0·89	1·24	1·24	0·73	0·45	2·95	1·60	4·90	6·93	3·50	39·07	39·42
40-year average		4·87	3·66	2·70	1·52	1·12	1·08	0·68	0·79	1·39	2·99	4·07	5·66	14·05	29·12	30·52
Extremes for the 40-year period 1914-1953	Low	0·77	0·33	0·47	0·21	0·16	0·03	0·00	0·03	0·16	0·61	1·10	10·7	Nil	16·06	18·66
	Year	1949	1928	1924	1918	1924	1938	1922 1937	1915	1918 1943	1917	1943	1930	1925 1928	1929	1929
	High	13·80	6·91	5·22	4·09	4·01	5·61	2·86	2·75	3·51	5·81	8·87	12·43	66·70	40·46	41·55
	Year	1953	1948	1932	1917	1948	1931	1932	1948	1933	1947	1949	1933	1916	1948	1933

Snow is converted to rain by the formula: 10 inches of snow equals one inch of rain.

NOTE.—Annual precipitation records prior to 1947 may be obtained from the previous Progress Report for this Station.

TABLE 4.—Frost Records

DOMINION EXPERIMENTAL STATION, SAANICHTON, B. C.

Frost: 32°F. or lower, Killing frost: 28°F. or lower

Year	Last frost in spring		First frost in fall		Number of frost-free days	Last killing frost in spring		First killing frost in fall		Number of crop days. (above 28°F.)
	Date	Temp.	Date	Temp.		Date	Temp.	Date	Temp.	
		°F.		°F.			°F.		°F.	
1947	Apr. 3	32	Nov. 22	32	231	Feb. 2	28	—	—	331
1948	Apr. 26	30	Nov. 7	32	193	Feb. 11	27	Dec. 21	26	311
1949	Mar. 28	30	Dec. 6	32	251	Feb. 20	26	Dec. 18	28	299
1950	Apr. 23	31	Nov. 13	32	202	Feb. 4	28	—	—	329
1951	Mar. 28	31·5	Dec. 6	29	252	Mar. 10	23	Dec. 19	26	282
1952	Apr. 29	32	Nov. 23	32	206	Feb. 21	26	Nov. 29	27·5	280
1953	Mar. 29	32	Dec. 7	30	252	—	—	—	—	365
35-year average	Mar. 31	—	Nov. 16	—	229	Feb. 14	—	Dec. 13	—	301

Earliest and latest frost dates (32°F. or lower)

1919–1953

Latest spring frost	Apr. 29, 1952	32°
Earliest last spring frost	Jan. 13, 1940	32°
Earliest fall frost	Oct. 25, 1919	30°
	Oct. 25, 1939	30°
Latest first fall frost	Dec. 10, 1943	30°
Shortest frost-free season	186, 1922	
Longest frost-free season	331, 1926	

Earliest and latest killing frost dates (28°F. and lower)

1919–1953

Latest spring killing frost	Apr. 4, 1929	28°
Earliest last killing spring frost	Feb. 2, 1947	28°
Earliest fall killing frost	Nov. 8, 1945	26°
Latest first killing frost of fall	Dec. 31, 1941	25°
Shortest killing-frost-free period	229, 1921	
Longest killing-frost-free period	365, 1953	

NOTE:—Annual frost records prior to 1947 may be obtained from the previous Progress Report of this Station.

FRUITS

E. R. HALL

Marketing

The marketing of some tree-fruit crops presents a considerable problem as little is being done by growers or other associations to regulate prices, supply, grade, and varieties. For many years there has been a satisfactory canning market for pears, but in 1952 this was unexpectedly curtailed. This may be a temporary condition, but there is little room for expansion unless the canning market is open.

The marketing conditions for sweet and sour cherries are satisfactory through growers' associations and canneries. With other fruits, marketing is done by individual growers, who sell to wholesalers, retailers, and directly to consumers through roadside stands. The market is therefore highly competitive, is quite unorganized and makes heavy demands on a grower's time. To a great extent the marketable fruit crops are produced by many growers who individually have a small number of trees, income from which supplements other major sources of income.

Apples

Varieties

Since 1914 more than 100 varieties have been grown and have fruited in the Station orchards. These have been varieties distributed by Canadian and American nurserymen as well as a number of varieties originating at the Central Experimental Farm and the Summerland Station, and are now in the process of being evaluated. Varieties recommended are discussed in pamphlet No. 133 prepared at this Station.

As most apple varieties are self-fertile, and as usually trees of two or more varieties are planted together, there is little or no difficulty in obtaining a set of fruit.

For many years it has been observed that prices on the local market (Victoria) have been quite attractive for varieties maturing in August and early September, such as Yellow Transparent, Early McIntosh, Red Melba, and Crimson Gravenstein. Seven to ten cents per pound have been prevalent prices to the grower for fruit of good size, quality, and color. Late winter varieties offer greater possibilities to the commercial grower than fall and early winter varieties.

For home use, it is recommended that dwarf trees on No. IX rootstock be planted.

Apple Tree Rootstocks

Malling No. IX rootstock is the most dwarfing of all apple rootstocks and this habit allows the stock to be used where small trees are required. The anchorage of trees on this stock is rather weak on many soils, making it necessary to give some support. Another reason for bracing these trees is because roots tend to be brittle. Trees on this rootstock usually bear a few fruits the year after planting. These small trees, even when mature, permit all operations of pruning, thinning, and picking to be carried out without the use of a ladder. Fruits are large and well colored and often early maturing. New wood tends to be somewhat weak and requires to be shortened more than on standard seedling rootstocks. Trees may be planted as close as ten feet apart where only a single row is required In a block planting, trees should be 12 by 12 feet or even wider to permit the use of implements. Trees on Malling No. VII rootstock are larger than those on M. No. IX, but smaller than trees on seedling stock.

Cherries

Varieties

Since 1914, sixty varieties of sweet and sour cherries have been grown in the Station orchards. Nearly all trees have now been discarded and the orchard area given over to other work. All sweet cherry varieties are considered to be self-sterile which means that suitable pollen must be obtained from another variety before a set of fruit can be obtained. Van is a good pollenizer for Bing and Lambert and probably for other sweet varieties as well. Varieties considered to be the most suitable for planting in this coastal area are Bing and Lambert with Van or Deacon as pollenizing varieties. Montmorency is probably the best of the sour cherry varieties.

Pears

Varieties

This fruit is valuable for home and commercial canning. Pears should be picked while still firm and hard. Usually when the first pears begin to fall, it is time to pick the whole tree. More than sixty varieties have fruited in the Station orchards. Varieties considered to be the most suitable for planting are:—Bartlett, Conference, Anjou and Bosc.

For home use, it is recommended that pear trees be grown on dwarf stock.

Self-sterility is common among pear varieties. Thirty-five varieties of those grown here proved to be self-sterile, while only six varieties gave normal sets of fruit with their own pollen. Cross-pollination should be provided for in planting. Conference is the best general pollenizer of varieties tested, but Anjou and Bosc are also effective.

Cultural

Ferbam has been used during the past four seasons for scab control in place of lime-sulphur which had been used as an orchard spray for thirty years at this Station, with good results. However, some foliage injury and russeting of fruit attended its use. Ferbam has given excellent control of scab, and orthocide, another new fungicide, promises to be valuable in scab control. For commercial pear growing rigid thinning, along with irrigation or possibly a sawdust mulch, are essential if fruit of marketable size is to be grown.

Frameworking has been shown to be a rapid method of working over pear trees to another variety. A pamphlet discussing this method of grafting is available.

A blossom- and spur-blight condition exists in many local pear plantings, but has not been a factor in Station orchards. Affected blossoms wilt three or four days after opening. Leaf buds and spurs are generally affected and frequently killed. Badly affected trees show the trouble in April, May, and June, but by midsummer the damage is largely repaired, only to manifest itself the following spring. The condition is being studied from nutritional and disease angles.

Plums and Peaches

Plums have a more limited use than either apples or pears. Many varieties have been grown. Those most suitable for planting are:—Gold, Mallard, Victoria, Green Gage, and Golden Drop (Coe's). Many varieties are self-sterile or nearly so. These are discussed in a pamphlet issued by this Station under the title, "Pollination Studies in Tree Fruits".

Most peach varieties are self-fertile. Rochester and Vedette are recommended, but other new early varieties such as Red Haven and Wynsum are appearing and may prove worthy of planting. Good control of leaf curl is being obtained by

careful spraying, as soon as leaves are off in November, with bordeaux or lime-sulphur at dormant strength. An after-harvest spray of bordeaux is also helpful on susceptible varieties.

Filberts

The most suitable varieties for planting, out of 35 varieties tested are: Barcelona, Du Chilly, and Nooksack. In making a planting all three varieties should be used to provide for cross-pollinations. All three varieties produce attractive nuts of medium to large size. At eight years of age, Nooksack trees had produced 16 pounds of nuts each. Reference is made to the publication on Nut Culture prepared on work done at this Station.

Blueberries

Blueberry plants do not thrive and fruit well on mineral soils. Small plots of several varieties have been maintained for several years without success.

Brambles

The Himalaya is the best of the European blackberries. A number of good hybrid berries, with wild dewberry (blackberry) parentage, have arisen. These include Loganberry, Boysenberry, Youngberry, Pacific, Chehalem, Olallie, Kayberry, and others. Many promising hybrid berries have resulted from the work of George F. Waldo, Corvallis, Oregon, and are slowly becoming available for more extended trial.

The Loganberry and Boysenberry are well known and considered the most suitable for general planting, though the latter is not so productive as the logan. The thornless logan is very similar to the standard type and well worthy of trial.

Other hybrid berries worthy of trial are Pacific, Olallie, Chehalem and Oregon 742.

Currants

Varieties recommended for planting are:

Black—Boskoop Giant, Baldwin, Stephens No. 9.

Red—Cherry, Perfection, Red Lake.

Gooseberries

Fifteen large-fruited English varieties have been grown in the trials in recent years. Of these, Industry and Lancashire Lad have been the best. Champion and Poorman are the best American varieties. These are smaller fruited, but less susceptible to mildew.

Grapes

Variety trials have been conducted since 1914. Recommendations have changed from time to time as new varieties came into prominence. Campbells Early is still the best black grape and ripens during the period October 6-16. Fredonia, Worden, and Van Buren are also good black varieties slightly earlier than Campbells Early.

The best white (green) varieties are: Portland, Emerald, Brocton, and Seneca.

Raspberries

Only limited variety trials have been carried out with raspberries. Without irrigation water, on the red mineral soils of the Station, cane growth lacks vigor

and berries are too small to be of use. Under irrigation, growth and fruit are very satisfactory. Washington is the most popular variety to grow at the present time. This berry is large, attractive, and of excellent quality. It also freezes well. Other good varieties are: Willamette, Milton, Taylor, Newburgh, and Viking. Both Washington and Viking are susceptible to yellow rust, but up to the present time this disease has not been a serious factor.

Strawberries

Varieties

The British Sovereign continues to be the chief commercial variety in this coastal area. However, this variety is restricted to the lighter and better drained soils as on heavier soils and in the presence of considerable winter moisture, it is subject to root rot. Varieties resistant to root rot (red stele) have been developed by breeders in various parts of America and Britain. The most promising of these varieties have been acquired and added to the trials at this Station. Those of note are Sparkle and Red Crop from New Jersey, Temple and Aberdeen from Maryland, Climax, and Perle de Prague from Scotland. Of these varieties, Climax acquired in 1948, is becoming the best known. Fruit of Climax ripens twelve days after British Sovereign, but is of good quality, yields heavy crops and retains its vigor in the presence of excessive winter moisture.

Several selections of Magoon parentage and arising from breeding work carried out at this Station are being given extensive trial among growers. These have been selected on the basis of vigor, freedom from mildew, yield and quality of fruit, and resistance to root troubles.

Breeding

The objective has been to obtain one or more strawberry clones that will thrive and produce heavy crops on heavier and wetter soils than does the British Sovereign. Such a berry of course must be of acceptable size, quality, and color. Large populations of seedlings from controlled crosses have been fruited and single plant selections made. These selections have in turn been tested for root-rot resistance by growing them in infected soil under conditions favorable for the development of root rots.

FIG. 1. Strawberry plants growing under soil conditions favorable for the development of root rot. British Sovereign in foreground at centre and seedlings of Magoon parentage at right. On left, red-stele-resistant clones from Oregon.

The Magoon variety was used as a parent in 8 of the 18 controlled crosses made in 1945-47. Other parent varieties used were British Sovereign, Marshall, Paxton, Premier, Oregon 1639, Saanichton 3901, and Fraser. A seedling population of 10,514 plants resulted from these crosses from which 223 single-plant selections were made. Sixty-eight of these selections showed definite resistance to root rot and all were of Magoon parentage. Fifteen selections remain active. Since 1950, only varieties known to exhibit root-rot-resistant characters have been used as parent material in controlled crosses. These include Magoon (B.C.), Climax (Scotland), Fairland and Temple (Maryland), Red Crop and Sparkle (New Jersey). With the exception of Magoon, all of these varieties are of recent origin and have gained prominence in their respective areas because of resistance to root rot and suitability for commercial production. Magoon was an important commercial variety in this coastal area for more than twenty years prior to 1927 In the space of a few years Magoon plants wherever grown failed to produce normal fruit for reasons not clearly understood.

BULBS

J. H. CROSSLEY

Experimentation during the period covered by this report, deals chiefly with tulips. The more important phases of investigation are covered in the following paragraphs. Publications available and experimental projects are listed at the end of the report.

Variety Testing

Variety testing consists of determining the suitability of varieties for greenhouse and garden purposes. Tulip and narcissus are featured in particular, followed next by bulbous iris and hyacinth. Approximately 125 varieties of tulips, 175 of narcissus, 25 of hyacinth and 12 varieties of iris are maintained in the Station plots each year, along with 43 other species and varieties of minor importance.

The general procedure of handling these crops in the test plots is each year to lift and replant tulip and iris and most other annual-type bulbs in freshly prepared ground in a five-year rotation. A rotation of this length is desirable from the standpoint of control of disease and bulb volunteers. Narcissus and most perennial types are left down for two or more years. When a variety receives a low rating, it is discarded and a new one acquired.

Tests show that of a great number of available varieties, comparatively few are fully suitable for forcing. Requirements of garden varieties, however, are less exacting and depend largely on the varied taste of the public thus a list of suitable garden sorts tends to be lengthy and needs frequent revision. For a suitable list of varieties for both greenhouse and garden, write for the Station publication, "Recommended Varieties of Bulbs".

Gladiolus Seedling Co-operative Test

In co-operation with the Canadian Gladiolus Growers Council an organization of commercial growers which fosters the improvement of the gladiolus flower—this Station has maintained, since 1949, one of five test gardens in Canada for evaluating new gladiolus seedlings. Introductions are rated by a comparison with high rating named varieties. Data from the different test gardens are pooled through the supervisor of test gardens who then makes it available to the breeder and the public. To date a total of 441 seedlings have been

rated at Saanichton. A list of selected varieties maintained in the Saanichton test gardens is available on request in the revised publication, "Gladiolus Culture in British Columbia".

Greenhouse Forcing of Tulips

Storage temperature and embryo flower studies in relation to greenhouse forcing of tulips were undertaken in 1949 to study uneven flower grade and flowering in early forced British Columbia tulips—a subject of sporadic complaint by greenhouse operators.

The procedure followed in the investigations at Saanichton was to take Vancouver Island-grown Wm. Pitt tulips (Fraser Valley-grown Wm. Pitt, Golden Harvest, and Nivea tulips were added in 1952) and observe the effect of a series of different warm-storage temperatures between 65 and 95° F., on the developing flower embryo from sample lots taken periodically from each of the different treatments. Similar lots of warm-stored bulbs were also forced in the greenhouse after receiving varying periods of storage at a constant temperature of 48° F. The results and conclusions are summarized as follows:

1. It was generally shown that uniform production and early flowering is dependent more on factors pertaining to (a) the time of precooling (an advanced stage of embryo flower development seems preferable to an immature stage or partially completed differentiation), (b) length of time rooted at 48° F., (c) date brought into the heat, and (d) greenhouse temperature, than on temperature treatment between harvest and precooling time.

2. Preheating B. C. tulips at 75, 80, or 95° F., for short periods after harvest, has resulted in no consistent or practical benefit in quality or uniformity of flowering. In most cases the final effect was negligible. While preheating had a more pronounced effect on flowering date, resulting in earlier blooming by three or four days in some instances, on the whole it was relatively ineffectual.

3. It was shown in all four years that great variability existed in embryo flower stadia between individual bulbs regardless of temperature treatment during storage. This fact explains the difficulty experienced in correlating precise stages of embryo flower development with temperature treatment. Experiments are continuing.

4. Successful and uniform early flowering (January and the beginning of February) with B. C. tulips is obtained by (a) precooling at 48° F., for one month commencing at the approximate dates August 10 to 15 for South Vancouver Island tulips and August 26 for Fraser Valley tulips, (b) rooting at a steady cool temperature, (48° F. is satisfactory—too long at this temperature reduces quality) (c) holding greenhouse temperature at 63° F., until growth starts, then raising to 68°–70° F., until buds show color, then lower again to 63° F., (d) using certified tulips of uniform, large size.

Forcing Bulbs Under Electric Lights

This project was begun in 1950 to study the value of forcing bulbs under electric lights in opaque plant houses, and to compare results obtained with similar bulbs grown in a greenhouse. Altogether a total of 25,900 bulbs of narcissus, tulip, and iris were forced under various light and temperature conditions during the winter months of 1950-1952, inclusive. This included 15,000 narcissus, 8,620 tulip, and 2,280 iris. In addition another 5,960 bulbs were forced under glass for comparison with those forced under electric lights. The results obtained, and the conclusions arrived at from the three season's tests are summarized in Station mimeograph No. 143, "Forcing Bulbs Under Electric Lights." Copies are available on request.

Heating Greenhouses with Electricity

This project was begun in 1949 to determine the number of kilowatts of electrical energy required to heat a greenhouse to a predetermined temperature in relation to existing outside temperatures, and to determine the value of this method of heating for horticultural crops. The structure used in the test was an end section of a greenhouse constructed in 1948. The electrically heated section measured $34\frac{1}{2}'$ long, $21\frac{1}{2}'$ wide, and 11 feet high, the volume of which was 6,212 cubic feet. Fully exposed surfaces measured 1,405 square feet, of which 82 per cent was glass and 17 per cent was 6-inch cement wall. A glass partition separated the test section from the adjacent portion of the greenhouse where the temperature varied between 50° and 76°, depending on the crop grown. Electric heat was supplied by six 4-kilowatt, portable fan-type electric heaters. The full complement of heaters was tested for part of the 1952-53 season only. On all other occasions either three or four were employed. The heaters were situated under the benches adjacent to the walls so that the distribution of heat was either clockwise or anti-clockwise around the perimeter of the wall. Greenhouse temperature was controlled by thermostats operating the heaters and a greenhouse exhaust fan. Crops grown during the test period included snapdragon, and bulbous iris. Data pertaining to crop response, greenhouse and outside temperature, and total consumption of electric energy for heat are available on request. Results, in general, indicate that electric heating is a satisfactory method for heating greenhouses for horticultural crops, but that cost of electricity is the chief limiting factor. Results indicate that electric heat would be most applicable for cool season crops for small commercial houses, or for the amateur gardener. Installation costs are low in comparison with hot water systems. Four watts for each cubic foot of greenhouse space seems a satisfactory basis for computing the electric requirements for a greenhouse temperature of 60° F., under Saanichton conditions where the outside air temperature registers occasionally as low as 10 degrees above zero.

FIG. 2. Tulips and irises (background) flowering in an experimental chamber illuminated with fluorescent lights.

FIG. 3. Sir Watkin narcissus flowering under neck reflector type incandescent lamps.

HOLLY CULTURE

This project is designed to obtain information on holly culture, more particularly on varieties, propagation, soils, orchard management, fertilizers, pruning, harvesting, storage, packing and shipping. As holly trees do not come into commercial production for 7 to 10 years after planting, it is obvious that many of the problems will require several years to reach a solution. However, there has already been set out a variety test consisting of over a dozen varieties and species with provision made for additional varieties and selections of the best types from producing plantings in the area. Of more immediate interest to the industry are the results already obtained from the first experiments on propagation and shipping. Results dealing with propagation are summarized in the following paragraph "Propagation From Cuttings". Results pertaining to the latter are summarized in mimeograph No. 146 entitled "Instructions for Cutting, Dipping, Packing and Shipping Holly". Copies are available from the Station on request.

Propagation from Cuttings

To determine a satisfactory method and time for propagating, cuttings were taken from specially selected clones at monthly intervals from August to April and variously treated. The results obtained to date are summarized as follows:

1. Holly can be propagated from cuttings of the current season's growth taken from August through to March, although indications are that early fall cuttings taken about October are probably the most satisfactory.

2. Cuttings of terminal wood up to six inches long with all but the top two or four leaves removed are satisfactory. More than one cutting per twig and leaf

cuttings are being tested since they are more economical than single cuttings and considered to be satisfactory also.

3. A hormone solution appears to shorten the time of rooting and increase the amount of roots. This was demonstrated particularly with cuttings taken in March.

4. Indolebutyric acid at a concentration of 50 p.p.m. in water is a satisfactory hormone rooting solution. The cuttings are allowed to stand in a glass, earthenware or enamel container so that the basal ends of the cuttings are immersed in the solution to a depth of 2 to 3 inches. They are left in the solution for 24 hours in a moderately dry atmosphere out of direct sunlight, and with air and solution temperature about 65 to 70 degrees F. Absorption of the chemical seems best under these conditions.

5. Sand, or a fifty-fifty mixture by volume of sand and sphagnum peat moss makes a satisfactory rooting medium.

6. A propagation frame in an unheated greenhouse was shown to be superior to a glass-covered frame outside for rooting the cuttings.

7. An electric soil-heating cable appears to offer no particular advantage, whether or not cuttings are treated with the hormone under propagation conditions in an unheated greenhouse.

8. Air temperature and humidity in and around the propagating frame appear to be the most important considerations in rooting holly successfully. With air temperature in the frame maintained between 58 and 70 degrees F., the temperature of the rooting medium does not appear to be a vital consideration and good rooting will be obtained. Syringing the cuttings frequently prevents unnecessary drying out of the leaves and stems, but leaves are likely to discolour and drop under conditions of high temperature and saturated atmosphere. Ventilation helps to reduce this hazard and partial-shade during rooting appears to be beneficial.

VEGETABLE CROPS

R. M. Adamson

Work with vegetable crops includes production of foundation seed and cultural experiments with seed crops, variety trials, and breeding. Results of cultural experiments with seed crops done during the period covered by this report may be found in Station Mimeo. No. 150. Results of irrigation studies and the use of sawdust as a mulch and soil amendment are reported in the section on Plant Nutrition. Projects active in the vegetable section and publications available are listed at the end of this report.

Foundation Seed Production

The production of foundation seed continues to be an important undertaking. Southern Vancouver Island lends itself to the production of disease-free seed of such vegetables as peas and beans. Because of the mild winters, other crops are also well adapted for seed production, including cabbage, cauliflower, turnip, and leek. One or more varieties of all these kinds are maintained at the Station.

Processing and maintaining foundation seed involves the growing of seed from carefully selected plants. The foundation seed is made available to growers of registered seed for seed production. The following varieties are maintained at the foundation level: Bean, *Broad*—Broad Windsor, Long Pod; *Bush*—Bountiful, Tendergreen, Unrivalled Wax; *Pole*—Kentucky Wonder Green Pod. Cabbage—Golden Acre. Cauliflower—Snowball (Perfected). Cucumber—Longfellow. Leek—Musselburgh. Lettuce—New York 515. Onion—White Portugal.

Pea—Giant Stride, Lincoln, Stratagem. Radish—French Breakfast, Icicle. Spinach—Dark Green Bloomsdale. Squash—Banana Pink. Tomato—Scarlet Dawn. Turnip—White Egg. Watermelon—Honey Cream.

Vegetable Variety Testing

To keep abreast of the changing variety situation trials are conducted each year for the purpose of ascertaining the adaptability to local conditions of new varieties and to compare them with standard varieties. A committee of federal and provincial officials reviews the results of these trials, which form the basis for the annual list of varieties recommended for Vancouver Island. (See reference under publications at the end of this report.) New varieties of merit under local conditions are included in the new list, or if older varieties become obsolete, they are removed. In order to make it of greater value, a brief description is included with each variety.

Cabbage Breeding

This project had its origin in the work done on the Station in developing a foundation stock of the variety, Golden Acre. In 1946 experimental crosses were made between different lines of this variety to determine whether the first-generation hybrids so produced would exhibit desirable characteristics. Tests between the parents and these hybrids showed a number to be superior in many characteristics such as yield, uniformity and earliness of maturity.

It was, of course, evident that emasculation of the female parent and cross pollinating by hand were not practical in producing commercial quantities of hybrid seed. The only feasible method would be for insects to do the cross pollinating, and to achieve this, a self-sterile or self-incompatible line to serve as the female parent would have to be found. A program to isolate such lines from this normally self-fertile variety has been under way since 1949, and a number of plants have been confirmed as being self-incompatible. Backcross populations are being studied to determine the nature of the inheritance of this character, a necessary preliminary in the attempt to produce hybrid seed in the field. Further tests of experimental hybrids produced by hand pollinations are also being made in a study of their ability to combine in producing a superior type of cabbage.

Weed Control

The possibility of using herbicides to lower production costs in the face of the increasing cost of labor has made chemical spraying for weed control the subject of intensive investigation.

On Vancouver Island the weed problem is very important and in one respect unique, since fall germinating weeds keep growing during the mild, wet winter months when it is impossible to cultivate. As a consequence, competition for moisture and plant food in the spring is keen, often to the detriment of over-wintering crops. With this in mind, investigational work at Saanichton has been commenced with particular emphasis on the control of weeds in row crops, including vegetables, fruits and bulbs, with treatments being made both before and after emergence of the crop. The control of woody growth along roadsides and fence lines in both dormant and summer sprays is also receiving attention, as is the control of persistent perennial weeds, including Canada thistle and field and hedge bindweed.

In vegetable crops stove oil has been found a safe and effective treatment for the pre-emergent control of weeds during warm, dry weather and is recommended for such conditions. For cool, moist conditions, and in the fall, oil has been relatively ineffective, and here other herbicides have more promise. These include C.M.U. (3-p-chlorophenyl-1, 1-dimethylurea), I.P.C. (isopropyl-N-

phenylcarbamate), C.I.P.C. (isopropyl-N-(3-chlorophenyl) carbamate) and dinitro compounds. Timing and rates of application are very important and require careful working out. The number of crops that can be sprayed post-emergently is limited. However, carrot, parsnip, and parsley can be sprayed with stove oil in the seedling stage, and Stoddard's solvent for a later application. Potassium cyanate is effective for killing weeds in leeks and onions. In all cases where herbicidal treatments are made to row crops, the weeds must be small to be effectively controlled.

Tests have shown that most brush and weeds along fence lines and roadsides can be controlled by the use of 2,4-D plus 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) using approximately 3 pounds of acid per acre. A delayed dormant spray with oil as the diluent followed by a full foliage spray with water as the diluent, has shown promise and has the further advantage in that there is less spring growth and consequently less unsightliness than where the delayed dormant spray is omitted.

The number of herbicides has increased greatly in recent years, and a constant screening process is necessary to determine which will be most effective under local conditions. While many of them show great promise, it is emphasized that their use should be regarded as an aid to lowering the cost of production rather than a means of eliminating mechanical cultivation. Recommendations for the chemical control of weeds in British Columbia are being printed in 1954 for the first time by the B.C. Department of Agriculture. This Station has contributed to these recommendations.

PLANT NUTRITION

G. R. WEBSTER

Strawberry Fertility Trials

The strawberry is one of the most important fruit crops grown on the Saanich Peninsula. Several Station and off-station fertilizer experiments have been conducted on British Sovereign strawberry plantings. The treatments had no significant effect on yield. The plantings were not irrigated. Yields for all plantings were below average indicating that fertilizer is not the solution to declining strawberry yields. Many other crops respond markedly to fertilizer, particularly nitrogen, on the same soil. It is known that strawberries grow better on soils of high fertility than on soils of low fertility. Fertilizing strawberries will be investigated further.

Strawberries appear to do well on newly cleared land. However, after a few years of cropping plant vigor and yield decrease. An experiment is under way to determine whether the fertility level of newly cleared land can be maintained by green manure crops. Various amounts of organic material, including equal and double amounts as produced on the area, are incorporated with the soil. These treatments are compared with plots cropped continuously with strawberries, plots cropped with strawberries and hoed crops, and plots cropped with strawberries and then summerfallowed. A basic fertilizer application is applied to all plots. Results are not yet available.

Since 1944 strawberries have been grown in a rotation along with broad-beans, potatoes, and bulbous irises. Annual applications of barnyard manure were made at the rate of 40 tons per acre. In 1948 strawberry plants set in the spring began to deteriorate by mid-July, and by late autumn were practically dead. Each subsequent planting in the rotation (following bulbs) followed the same pattern regardless of plot location. Many plants were carefully examined by several pathologists and pot cultures made, but no satisfactory explanation of this condition was found. Recent soil treatments with brassicol, dithane and methyl bromide (March) were made on a plot basis. Results with brassicol and

dithane showed that they were ineffective in arresting plant deterioration which was very evident by early July. Plants in the plots treated with methyl bromide retained normal vigor throughout the season. A further study of affected plants by workers at the Saanichton Plant Pathology Laboratory has revealed severe nematode infection in plant roots, and there is good reason to believe that this has been the cause of strawberry plant deterioration in this plot area during the past several years.

Mulches

Strawberries

Studies are under way to determine the effect of several fertility treatments on the production of strawberries. Plot yields for 1952-53 seasons averaged as follows: 2·5 inch continuous sawdust mulch, 4·45 tons per acre; 1 inch of sawdust incorporated annually, 4·08 tons per acre; cut straw at 2 tons per acre incorporated annually, 3·53 tons per acre; compost 20 cubic yards per acre, 3·55 tons per acre; manure at 20 cubic yards per acre, 3·78 tons per acre; check, 3·03 tons per acre. The sawdust mulch treatment gave the highest yield and did not delay maturity. Strawberries net 13c. a pound, making sawdust mulching and incorporating sawdust a profitable undertaking. More work remains to be done before a final answer can be given.

Loganberries

A plot in a commercial planting was mulched with three inches of sawdust in 1948. Yields were compared with those of a clean cultivated plot. The mulched plants produced an increased yield of 2,828 lb. of fruit annually for the period 1948 to 1952. At the prevailing cannery price of 16 cents per pound, this increase in yield meant a gross increased income of $452.00 per acre per year. With an initial cost of $128.00 per acre for sawdust, approximately $40.00 per acre spreading charges, and a small annual cost of $6 to $10 per acre for additional fertilizer, mulching with sawdust has been a sound investment. The mulch controlled annual weeds effectively, but did not control grass and thistle.

In 1951 plants mulched with sawdust produced an average of 10·74 canes per plant, and those kept clean cultivated 5·20 canes per plant. The weight of prunings produced by the mulched plants was also much greater than those kept clean cultivated. The increased yield and vigor was chiefly due to the moisture conserved by the mulch.

Cherries

In 1949 two plots of old sweet cherry trees in a commercial orchard were mulched with three inches of sawdust. Two check plots were kept in sod during 1950, and under clean cultivation during 1951 to 1953. The object was to determine whether decline in growth and production in these trees could be arrested through conservation of moisture by mulching with sawdust. A rating was made in 1953 of yield of fruit, tree vigor, and percentage of dead wood present. Terminal and circumference growth measurements were made in the fall. It was found that the mulched trees produced more fruit, had greater vigor, less dead wood, made more terminal and circumference growth than those in the cultivated plots. Several of the trees in the cultivated plots were dying, and presumably will be dead in a year or two. The trees mulched with sawdust are also approaching the end of their life and will probably die in a few years. Cherries are being sold for 20c per pound, making it evident that mulching in this orchard has been profitable.

An experiment comparing mulch and clean cultivation was conducted on old cherry trees being grown on the Experimental Station. Hay was applied as a mulch to a plot in 1945 and 1946, straw 1947 to 1950 and hay in 1951 at 7·5 tons per acre. A plot was kept clean cultivated. Decline in vigor and yield was arrested considerably by mulching. In 1951 the clean cultivated plots

were mulched also. Hay is currently valued at $20.00 per ton, which is too expensive for mulching purposes. It was replaced with sawdust in 1952.

Mulching old cherry trees to prolong their bearing life appears to be a sound investment.

Pears

A hay mulch versus clean cultivation experiment on mature Bartlett pear trees was commenced in 1942. Annual applications of hay applied as a surface mulch at 7·5 tons per acre have been made. The average yield for the period 1942 to 1951 for the mulched trees was 21·52 tons per acre, and for the clean cultivated trees 15·71 tons per acre. Terminal growth and circumference measurements indicate that the mulched trees had greater vigor. In the spring of 1952 the hay was removed and sawdust applied to both the formerly hay mulched plots and clean cultivated plots. The increased revenue has made mulching profitable.

Peaches

Eight peach trees were planted in 1950. Four were mulched with three inches of sawdust and four were kept clean cultivated. The mulched trees made remarkable growth; the unmulched did little more than survive. However, during a gale two of the mulched trees blew over. This was attributed to the fact that the trees had large tops and shallow root systems. Plants tend to root shallowly under mulch. Further observations are being made.

Sod Mulch versus Clean Cultivation

Apples and Pears

An experiment was conducted to determine whether apple and pear trees could be maintained in good vigor and fruiting under sod mulch rather than clean cultivation. The sod plots were mown and the hay placed around the trees.

The yields from the apple trees during the period 1941 to 1951 were low and there was little yield difference from trees under the two treatments. Terminal and trunk measurements indicated that trees under the sod mulch treatment were not so vigorous as those under clean cultivation, and sooner or later this must affect yield. The effect of the two treatments on the production of pears was more marked than with apples. The level of production in both treatments was high. The 1942-51 total showed a yield increase of 26·60 per cent for the clean cultivated trees over the sod mulched trees, representing an increase of 1,211 lb. of fruit per acre per year. The sod mulched trees were not quite so vigorous as the clean cultivated trees.

Sod mulching tree fruits is not recommended in this area where rainfall during the summer months is light. Sawdust mulching, irrigation or clean cultivation are alternatives.

Mulches

Bulbs (Tulip and Iris)

The purpose of this experiment was to determine the effect of sawdust mulch on flower and bulb production. The mulch increased the number of No. 1 grade tulip bulbs (12 cm. and larger) by 86·5 per cent, and the total weight of bulbs by 28 per cent over the clean cultivated plots.

The total weight of iris bulbs was increased 30·7 per cent by mulching. These increases are important and are considered economically significant. The mulch did not affect the quality or quantity of flowers produced. Soil moisture is normally in good supply at flowering time. A large part of the increase in bulb

size, however, takes place after flowering when moisture is in short supply. Sawdust mulch is also effective in controlling annual weeds as shown in Fig. 4.

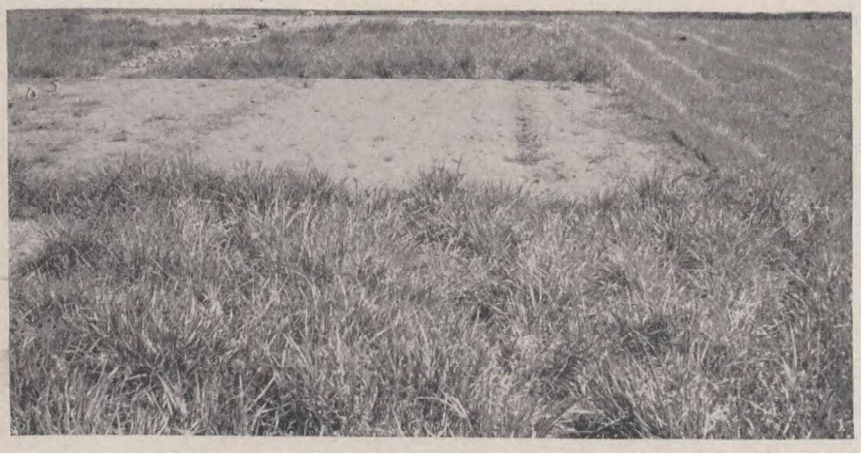

FIG. 4. View showing the effective control of weeds by a 2-inch sawdust mulch.

Effects of Sawdust Mulch and Incorporation

On Vegetables

A preliminary sawdust mulch experiment with vegetable crops was laid out in 1950 on a heavy clay soil, with two inches of fresh fir sawdust applied in the spring before sowing. The most satisfactory method of sowing was to rake back the sawdust from the surface of the soil, sow the seed on the soil surface and replace one inch of sawdust. Cool season crops in particular, were very vigorous and productive in the mulched plots. Warm season crops, however, tended to germinate less evenly and were delayed in maturity, due to lower soil temperatures.

The investigations were extended in the spring of 1951. Treatments were (a) 2-inch sawdust mulch, (b) 1-inch sawdust application incorporated each year, (c) 4-inch initial incorporation only and (d) barnyard manure. Yields for 1951-1952, and 1953, including spinach, carrot and tomato, are given in Table 5.

TABLE 5.—Effect of Different Sawdust Treatments on the Yields of spinach, carrot and tomato in 1951, 1952 and 1953 in pounds per acre

Treatment	Crop	Yield		
		1951	1952	1953
2 inch sawdust mulch	Spinach	5,905	3,485	774
	Carrot	16,655	16,399	8,050
	Tomato	21,780	23,232	18,513
1 inch sawdust incorporated annually	Spinach	2,130	3,485	678
	Carrot	1,281	12,043	17,552
	Tomato	4,719	13,794	21,417
4 inch sawdust initial incorporation	Spinach	2,323	8,131	581
	Carrot	5,723	18,790	14,904
	Tomato	23,958	17 787	14,157
Manure 10 to s/acre	Spinach	2,420	4,743	4,937
	Carrot	940	6,235	4,313
	Tomato	2,904	3,993	11,616

In general the effects of sawdust, either as a surface mulch or incorporated in the soil, were marked. In each case the soil moisture was retained much better than in manured plots. However, in the incorporated treatment the surface inch of soil dried quickly. This frequently resulted in patchy germination and a reduced yield, even though the plants which did become established grew well.

These experiments were conducted to determine the effect upon vegetables under dryland conditions. During the summer all plots tended to dry out and it was not possible to secure a stand of plants of late crops of spinach and carrots. It was evident, therefore, that with crops sown at this time, irrigation water must be applied to ensure good germination.

Investigations on the use of sawdust for vegetable crops are continuing and no final recommendations can yet be made. It appears, however, that sawdust mulch and sawdust incorporation can be used to advantage in a rotation for vegetable crops.

Other crops being mulched, but not mentioned in this report include gooseberries, currants, boysenberries, peaches, apples grown on No. IX rootstock, roses, lawns, and home garden crops.

On Soil Temperatures

Soil temperature in sawdust mulch, sawdust incorporated and clean cultivated plots were recorded. Temperatures were taken at a point four inches below the surface of the soil or sawdust surface at 7.30 a.m., 12.00 noon and 5 p.m., three times weekly throughout the growing period. The following trends were noted for the 1951 to 1953 seasons. From April 15 to May 31, when the air temperatures were in the low fifties, the average soil temperature at 7.30 a. m. under the sawdust mulch was 3·1°F. cooler, and in the four-inch-incorporated plots, 0·8°F. warmer than at a comparable depth in the bare soil. The temperatures in the other plots were approximately the same.

The 12 noon readings for the period April to September 30 averaged 55·8, 62·3, 62·9, 61·6°F., for the two-inch-mulch, one-inch-incorporated, four-inch-incorporated and bare-soil plots respectively. The maximum differences in soil temperatures occurred at 5 p.m. From April 1 to October 15 soil temperatures averaged 57·9, 66·4, 67·4 and 66·4 for the two-inch-mulch, one-inch-incorporated, four-inch-incorporated, and check plots, respectively. Temperatures under the mulch were 8·5°F. cooler than at a comparable depth in the bare soil. The highest temperature, was registered in the plot with four inches of sawdust incorporated. Darkening the mulch with breeze dust raised the soil temperature considerably, making it almost comparable with the bare soil.

On Soil Moisture

Soil samples were collected from sawdust mulch and sawdust incorporated plots at the 0- to 2-inch and 6- to 8-inch depths once a month during the growing period. The soil moisture levels for all sampling dates and at both depths were significantly higher in the sawdust mulch and sawdust incorporated soil as compared with the bare soil.

On June 2 the four-inch-sawdust-incorporated plot had a significantly higher moisture content than any of the other treatments. On July 2 there were not significant differences between the sawdust mulch and incorporated plots. The sawdust mulch treatment had the highest moisture content on August 2 and September 2. The mulch reduced the soil moisture lost by evaporation. There was no competition from plants in the sampled areas. Sawdust mulch is very

effective in conserving soil moisture; incorporating sawdust is also beneficial in this respect. The increased crop yields reported in the foregoing paragraphs are mostly attributed to the soil moisture conserved by mulching and incorporation.

On Soil Fertility and Structure

It has been reported by many workers that large amounts of nitrogenous fertilizers must be incorporated with sawdust, otherwise depressive plant growth effects will occur. Some additional nitrogen is also required for sawdust mulches. Studies are under way to determine the additional nitrogen required under our conditions. It appears to date that 80 lb. of additional nitrogen should be added to each acre-inch of sawdust incorporated. This amount should be reduced by one-half the second year, and by a further one-half the third year. More sawdust, not exceeding two inches, can be incorporated the fourth year. For mulches, 60 lb. of additional nitrogen per acre is required. These values were determined on shallow-rooted vegetable crops. Values for deep-rooted crops are not yet available

Sawdust incorporated markedly improved the friability of a heavy-textured soil. Root crops such as carrots produced much longer, smoother roots than in the mulched or manured plots as illustrated in Fig. 5. The soil under the sawdust mulch, particularly after the first year, became very compact. It appears that incorporation and mulching should be used concurrently, that is sawdust incorporated and a mulch superimposed on the surface for best effects.

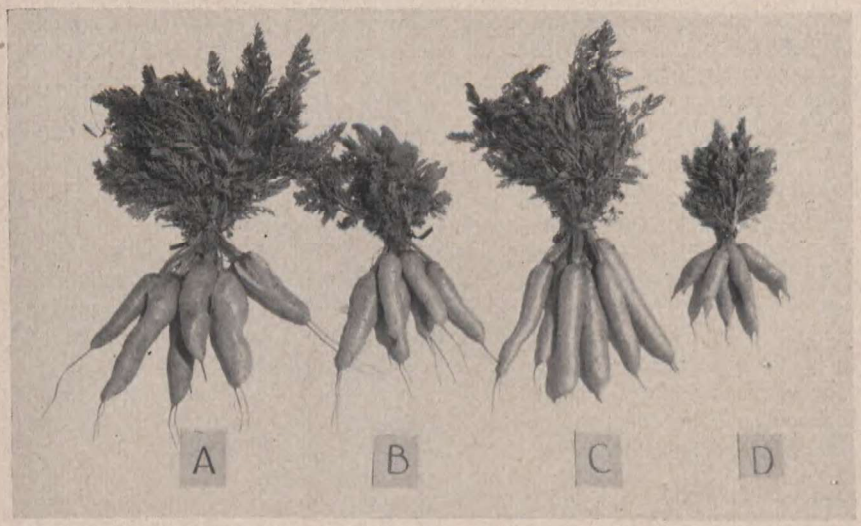

FIG. 5. Carrots from (A) 2-inch sawdust mulch, (B) 1 inch of sawdust incorporated annually, (C) 4 inches of sawdust incorporated initially, and (D) 10 tons manure incorporated annually. The soil was a heavy clay loam, difficult to work.

Irrigation for Horticultural Crops

The quantity of water available for irrigation use on Vancouver Island is limited. In recent years growers have constructed dugouts (Figure 6), dammed creeks and dug wells for irrigation purposes. Irrigation has been applied mostly to crops of high value and low water requirements.

FIG. 6. Typical dugout on Saanich Peninsula. Capacity approximately 945,000 gallons.

Raspberries

An irrigation trial on raspberries has been conducted over a three-year period. During the summer months an average of 5·62 inches of irrigation water was required. During this irrigation period an average of 2·22 inches of rain fell. The irrigated plants yielded 5·97 tons per acre, while the dry plots produced very little marketable fruit. Plants which received no water the first three years of the test failed to regain vigor when watered for three consecutive years.

Potatoes

An irrigation trial to determine the response of main-crop potatoes to irrigation water was conducted during 1949, 1950, and 1951. The irrigated plots received an average of 6·09 inches of irrigation water during the period and yielded 13·07 tons per acre. The non-irrigated plots yielded 4·22 tons per acre. The average rainfall during the irrigation period was 3·64 inches. Irrigation water increased the yield threefold. (Fig. 7). In dry years such as 1951 approximately 8 inches of water will be required. Keeping and cooking qualities were not affected by irrigation. The cooking test included color, sloughing, dryness, mealiness, and flavor.

FIG. 7. Potato Irrigation. Irrigated on right. Non irrigated on left.

Late Cauliflower

A three-year experiment was conducted on the response of late cauliflower to irrigation water. An average of 4·7 inches of water was applied during the three-year period. The average rainfall during the irrigation period was 1·20 inches. The irrigated plots averaged 10·63 tons per acre of marketable cauliflower, and the dry plots 5·92 tons per acre. In 1951 and 1952 highly significant yield benefits were obtained from applying water. In 1950, when the month of August was much wetter than usual, with 2·22 inches of rain as compared with an average of 0·80 inches, there was no significant yield benefit. It is considered, however, that in most years a marked benefit from irrigation water will be obtained.

Bulbs (Hyacinth, Tulip, Iris, Daffodil and Gladiolus)

The effect of irrigation water on flower and bulb production, and also its effect on storage and forcing quality have been studied. The irrigation requirements for the various crops, and the rainfall during the irrigation period are listed in Table 6.

TABLE 6.—Amounts of Irrigation Water Applied and Rainfall During the Irrigation Period

Crop	Irrigation interval	Amount applied in inches	Rainfall during irrigation period
Hyacinths—3-year average	May 7 to June 30	2·70	0·45
Tulip—3-year average	May 9 to July 8	3·07	1·11
Iris—3-year average	May 9 to July 8	4·07	1·26
Daffodil—3-year average	May 9 to July 8	4·07	1·26
Gladiolus—3-year average	May 8 to Aug. 19	6·71	2·27

The following summary and conclusions were made from the 3-year experiment.

Spring Flowering Bulbs

1. Hyacinths received an average of 2·70 inches of water which increased the number of No. 1 grade bulbs (18 cm. and larger) by 63·3 per cent. The total weight of bulbs was increased by 17·5 per cent.

2. Tulips received an average of 3·07 inches of water which increased the number of No. 1 grade bulbs (12 cm. and larger) by 87·1 per cent. The total weight of bulbs produced was increased by 18·5 per cent.

3. Iris received an average of 4·07 inches of water which increased the number of top grade bulbs (10 cm. and larger) by 37·3 per cent. The total weight of bulbs produced was increased by 29·6 per cent.

4. Daffodils received an average of 4·07 inches of water which increased the number of double nose No. 1 bulbs produced by 204·2 per cent. The total weight of bulbs produced was increased by 17·3 per cent.

5. The increase in the number of top grade bulbs is particularly important. All bulbs gave substantial and economical increases in this respect. Daffodils gave the greatest response.

6. Storage quality of bulbs was not affected by irrigation.

7. Irrigation had little effect on flower production in the field.

8. Number and quality of the flowers produced in the greenhouse were not affected by irrigation. However, the time of flowering was slightly retarded. Daffodils were affected most and flowering was retarded by two to three days.

Summer Flowering Bulbs

Gladiolus received an average of 6·71 inches of irrigation water. The number of No. 1 grade bulbs was increased by 439·0 per cent, and the total weight of corms and cormels by 134 per cent.

Time to Irrigate

Bouyoucos blocks were placed in the root zone at depths of 6, 12, 18, and 24 inches for the various crops. Irrigation water was applied when the block in the zone of maximum root concentration reached a resistance of between 15,000 and 20,000 ohms. Sufficient water was applied at each irrigation to replenish the entire root zone with moisture. Soil samples were taken at intervals and the per cent moisture determined by gravimetric means. Samples of soil were also examined by removing a portion of soil from the various depths with an auger and subjecting it to the "hand feel" test. This latter method is designed primarily for field examination of the soil for moisture content.

Other crops being irrigated, but not mentioned in this report include loganberries, strawberries, apples grown on M. IX Rootstock, early potatoes, and pasture.

FIELD HUSBANDRY

G. R. Webster and C. E. Jeffery

Lime Requirement

Most soils on Vancouver Island are acid in nature. The degree of acidity, however, varies from slightly acid to very acid.

The lime requirement of Tolmie Sandy Clay Loam, an important soil type on the Saanich Peninsula, has been studied. Hydrated lime was applied in 1945, and again in 1950, at 0, 2, 4 and 6 tons per acre. A rotation of crops including grass hay, corn, wheat, grass hay, grass pasture, wheat and grass hay, were grown. There were no significant yield increases. The pH readings for the treatment plots were 6·39, 6·79, 6·94, and 7·06, respectively. The lime applications increased the pH significantly. The per cent base saturation readings in 1951 were 86·73, 91·83, > 100 and > 100 respectively. The pH and per cent base saturation levels of the unlimed soil were in the optimum range for most plants. These values, together with yield data, indicate that this soil type does not require lime. These findings are in agreement with other studies conducted on this soil. Experiments are under way to determine the lime requirement of soil types in the Nanaimo and Duncan areas.

Time of Fertilizer Application for Grass Pasture and Hay

Under dry land conditions the time of fertilizer application to pasture and hay crops is usually quite critical owing to the frequent occurrence of dry weather in late spring.

A series of N, P, K treatments have been applied to a perennial rye grass, orchard grass and Alta fescue sod on March 15, September 1, and October 15. Pasture and hay yields have been recorded for the 1951 to 1953 seasons. Nitrogen applied at 80 lb. per acre on March 15 gave the highest net return from pasture clips. The same rate applied on October 15 gave the second highest net return. Pasture yields for all treatments were low, owing to the dry summer months.

Hay yields were much heavier than the pasture yields. Nitrogen applied at 80 lb. per acre on March 15 gave the highest net return, followed by nitrogen applied on September 1. The yield averages for the two treatments were 2·48 and 2·52 tons per acre dry weight basis. Nitrogen applied at 40 lb. per acre on September 1 and again on March 15 would appear to be a good treatment for both hay and pasture.

Grass will give an aftermath only in years when the rainfall is above average for the months of June and July.

Fertilizer for Clover

Clovers are usually included in pasture and hay mixtures. They are also grown as soil-improving crops and sometimes in pure stands for seed. It is known that the stand and yield of clover can be greatly affected by the fertilizer treatment given.

A variety of field and greenhouse experiments have been conducted, including the application of varying rates of N, P, K applied prior and subsequent to the seeding of clover grown as pure stands and in mixtures with grasses.

A greenhouse trial was conducted where rates of N, P, K were applied just prior to seeding of clover. Nitrogen applied at 80 lb. per acre seriously affected the germination, having 26 per cent germination, as compared with 77 per cent for the check. Nitrogen applied at 40 lb. per acre gave a germination of 61 per cent. Applications of P_2O_5 and K_2O at 108 and 50 lb. per acre respectively, did not affect germination and increased yield as indicated in Fig. 8. Similar results were obtained from a field experiment conducted on the same soil type. Many of the seeds germinated in the nitrogen plots, but the seedlings died.

A range of N, P, K treatments were applied subsequent to the spring seeding of red clover sown on a fall seeding of cereal and grasses. The treatments produced highly significant effects on the composition of stand. Plant counts indicated that a mixture of N, P, K at 40-108-50 lb. per acre gave approximately a fifty-fifty stand. Higher amounts of nitrogen reduced the clover stand; lower amounts increased the clover stand.

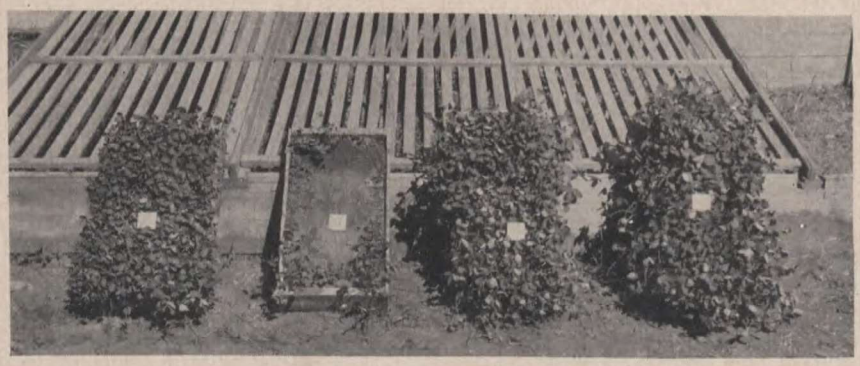

FIG. 8. A. Check. B. 80 lb. nitrogen/acre. C. 108 lb. P_2O_5 /acre. D. 108 lb. P_2O_5, 50 lb. K_2O/acre.

Soil Organic Matter

The maintenance of soil organic matter is considered important. Levels are difficult to maintain in coastal soils because decomposition takes place the year around.

Straw was incorporated each year for four years at 3 tons per acre dry weight basis on one plot series. Check plots had only the stubble incorporated. Wheat and oats were grown as indicator crops from 1942 to 1949, and grass hay from 1950 to 1952. The straw incorporated plots have a significant increased yield for one year only and that in 1949, indicating little response from the incorporated straw. The organic-matter content of the soil was not affected significantly.

Waste hay was applied to a series of plots at 3 tons per acre oven-dry-weight basis for the years 1943 to 1948. Spring and fall applications were made. Equal amounts of fertilizer were applied to all plots. The hay applications had little effect on the yield of indicator crops grown or on the percentage of organic matter in the soil.

Compost applications of 200 and 400 cubic yards per acre were applied to a plot series in 1945 and 1946. The check plots received no compost. The yields of indicator crops have been increased significantly over the check for every year except 1952. This is the only treatment that has increased significantly the organic-matter content of the soil, which indicates that large amounts of organic matter must be applied to have any appreciable effect on soil organic matter content and subsequent yields.

The effect of green manure crops and sod crops on organic-matter content and on soil fertility is being investigated.

CEREALS

C. E. JEFFERY

Autumn-sown cereals, especially wheat and barley, do exceptionally well on parts of Vancouver Island, producing almost twice as much grain as when spring sown. The spring sowing of these grains on the southern part of Vancouver Island is, therefore, no longer recommended. The growing of winter oats is at present restricted to the southern part of the island where the winters are comparatively mild, and the summers usually very dry. Good soil drainage is essential to the successful growing of winter cereals. Excessive water in the soil will frequently cause greater damage than low temperatures. Well-drained clayey loams are considered best for winter cereals, but winter barley and winter oats, both of which mature early in July before the peak of the summer drought is reached, can also be grown successfully on light upland soils. The sowing of winter oats on soils capable of retaining a satisfactory level of summer moisture is not advised; on such soils spring-sown oats will outyield winter oats by a substantial margin.

Variety Tests

Winter Wheat, Oats and Barley

During the six-year period under review, 27 varieties of winter wheat, 92 varieties of oats, and 25 varieties of barley were tested for yield and general suitability. As a result of these tests, Sun, because of its high yielding ability and outstanding strength of straw, is recommended as the best wheat for autumn seeding for all parts of Vancouver Island. In a ten-year test, 1942 to 1951, Sun averaged 49·2 bushels per acre as compared with 43·8 bushels for Dawson's Golden Chaff. It also outyielded the newer varieties, Cornell ·595, Fairfield, Rideau, and Holdfast. Autumn-sown cereals are used extensively for ensilage, and for this purpose Sun wheat with its strong straw and wealth of broad leaves is well suited for seeding with winter peas and vetch.

Winter Turf is at present recommended as the best all round oat for autumn seeding. It averaged 60·5 bushels per acre during the 16 years it has been on

test at the Station, and 70·9 bushels per acre during the period covered by this report. Pioneer and Lemont are two promising new varieties.

Trebi is the best barley for autumn sowing. Tested for three years only, Olympia averaged 54·9 bushels per acre as compared with 53·6 bushels for Trebi. It is weaker in the straw than Trebi and therefore less desirable.

A stock of foundation seed of Sun wheat and Winter Turf oat is maintained at Saanichton.

Spring Wheat and Oats

Twenty-eight years of variety testing of spring wheats has conclusively shown that soft and semi-hard white spring wheats will outyield hard red spring wheats, and that neither the soft nor the hard spring wheats can compare favorably with winter wheat in yields. A comparison of the average yield obtained from Marquis, Cascade and Sun, the leading varieties in their respective groups, is given in the following table.

TABLE 7.—Comparison of Average Yield of Spring and Winter Wheat 1944-50

Class	Variety	Average yield per acre 7 years
Hard red spring wheat	Marquis	27·0 bushels
Soft white spring wheat	Cascade	31·4 bushels
Winter wheat	Sun	53·7 bushels

It will be seen from Table 7 that winter wheat yields almost twice as much grain as spring wheat. Considering long-term yields, Sun has produced an average yield of 39·4 bushels per acre over a period of 30 years as compared with 26·6 bushels for Marquis over a term of 26 years.

Spring-sown oats is the most important of the cereal crops on Vancouver Island, more land being devoted to its use than to any other cereal grain. Comparable yields over a period of six years, 1946-1951, show that Abegweit with an average yield of 50·7 bushels is the best oat for the clayey type of soils which predominate on the Island. Tests conducted at Duncan, Cobble Hill, Alberni, and Courtenay in 1952, indicate that Eagle, Victory, and Abegweit, in the order named, are the best varieties to grow where summer moisture is maintained at a satisfactory level. Ajax is the best of the early maturing oats.

Winter Oat Breeding

Progress is being made in selecting a high yielding winter hardy oat for this area. A cross made by the Cereal Crops Division, Ottawa, between Wintok and Hermit No. 7 is being selected and is now in the fifth generation. Fifty-four promising lines have been obtained.

FORAGE CROPS

R. H. Turley

In addition to the experiments listed below, the following work is in progress: orchard grass breeding, pasture renovation, variety trials with creeping-rooted alfalfas and double-cut red clovers, and turf grass investigations.

Introductory Nurseries

Varieties and strains of grasses, legumes, and miscellaneous forage crops are given a preliminary trial under nursery conditions to determine their adaptability to local soil and climatic conditions. These nurseries contain many named varieties of commonly grown crops, as well as a large number of introduced species not grown in this area. Many of the species are not adapted and can be discarded while the more promising ones are moved into more refined tests.

Alfalfa

Twenty-seven varieties and strains of alfalfas have been tested during the period covered by this report. The most outstanding variety tested was the French introduction Du Puits. This alfalfa, while not winter hardy in the colder areas of Canada, winters well at Saanichton and is a particularly early, vigorous type. It is more productive than Grimm or other commonly grown varieties and recovery after harvesting is extremely rapid. Du Puits is an early maturing variety—approximately two weeks earlier than Grimm—and combines well in a mixture with grasses. It is a strong strawed, upright growing variety showing little tendency to lodge. It produces an excellent crop of seed.

Grimm alfalfa is the recommended variety for this area and is used as the standard for comparing other varieties on this Station. Ladak, Rhizoma, Buffalo and Ranger are all promising varieties for this area and yields compare favorably with Grimm.

None of the other varieties tested, such as Canauto, Viking, Hardistan, Cossack, Argentine group, Chartainvilliers, etc., proved superior to Grimm.

Clover

Nineteen miscellaneous clover species and eight named varieties have been tested in the clover nurseries. None of the imported species has proved superior to the species in common use. The double-cut red clovers produce higher yields of hay than the single-cut types. Ottawa and Dollard are two of the highest yielding, double-cut, named varieties tested in the nursery. Crimson clover is well adapted for annual hay and pasture or as a winter-annual cover or soil improving crop. White Dutch clover is excellent for pastures in drier areas, while ladino clover is especially suited to pasture conditions under irrigation.

Trefoil

Three species of the genus *Lotus*, namely *L. corniculatus*, *L. tenuis*, and *L. uliginosus*, have been tested and found to be well adapted to this area. On dry upland soils *L. corniculatus* has consistently given higher forage yields than either *L. tenuis* or *L. uliginosus*. *L. uliginosus* was not adapted to these dry conditions and died out entirely in the second year; *L. tenuis* remained but made relatively poor growth as compared with *L. corniculatus*. In a wet location *L. uliginosus* was much better adapted than either of the other species and produced a heavy yield of high quality forage. *L. tenuis* was slightly better adapted to these wet conditions than *L. corniculatus*. *L. tenuis* thrives on fertile soils with good summer moisture.

Fleshy Annuals

Seven varieties of fleshy annuals were tested in the nursery under dry-land conditions. During the period of this test the summers were extremely dry and growth of all varieties was relatively poor. However three varieties, Marrowstem Kale, Thousand Headed Kale, and Colza (French variety), produced much higher forage yields than Hungary Gap Kale, Winter Rape (German variety), Rape Kale, and Fodder Beets. It is evident from this test that maximum production can be obtained only in abnormally wet seasons or under irrigation.

Grass Nurseries

A large number of species of perennial, biennial, and annual grasses have been tested in nurseries, but few have been found to equal orchard grass. These tests indicate that orchard grass, perennial rye grass, and Alta fescue are the most suitable grasses for hay and pasture production on Vancouver Island.

Rye Grass

Eleven perennial and one annual rye grass varieties were tested in the nursery from both spring and fall seedings. The annual variety Wimmera produced excellent crops of hay, pasture, and seed. From fall seeding it established itself quickly, made rapid growth for controlling erosion, and produced a heavy forage crop. Vic Gin and the Aberystwyth strains S-23, S-24, and S-101 were the highest yielding perennial strains. Vic Gin tends to lodge more readily than the Aberystwyth strains.

Orchard Grass

Four varieties of orchard grass, Avon, Oron, Hercules, and Akaroa, have been tested in the nursery. The forage yield from all varieties was similar. Hercules, a variety released by the Forage Crops Division, Ottawa, was two weeks later maturing than the other varieties. Commercial orchard grass and most of the named varieties matured prior to good haying weather and were too early to combine well in mixtures with legumes. It is recommended that all orchard grass seedings for hay production should be of the Hercules variety.

Agropyron-Wheat

Tall and intermediate wheat grass has been crossed with common wheat at the Forage Crops Division, Ottawa, in an attempt to develop a perennial wheat of high forage quality. Thirteen of these crosses have been tested in nurseries with rather disappointing results. Some of the crosses appeared rather promising from the standpoint of forage yield, but all were short lived. None of the crosses produced yields equal to orchard grass.

Drought-Resistant Prairie Grass

This nursery included Canadian wild rye grass, Russian wild rye grass, crested wheat grass, intermediate wheat grass, tall wheat grass, tall oat grass and brome grass, and was not promising from a forage crop standpoint. All of these grasses yielded considerably less than orchard grass and were short lived under our conditions. Brome grass gave a particularly heavy yield the first crop, but the yield of succeeding crops rapidly declined.

Hay and Pasture Crops

Hay and pasture work has been conducted under three phases, namely "Pure species of grasses and legumes for hay and pasture," "Mixtures for hay and pasture", and "Irrigated pasture."

Pure Species

Twenty varieties of perennial and biennial grasses and legumes have been grown in pure stands under both hay and pasture methods of production. One of the outstanding results of this experiment was the superiority of deep-rooted legumes over the grass species. Alfalfa proved superior to all other species under dry conditions. Dry-matter pasture yields, averaged over a five-year period, show that alfalfa outyields orchard grass by 149 per cent and broadleaf trefoil, *Lotus corniculatus*, by 41 per cent. *Lotus corniculatus* produced 76 per cent more dry matter than orchard grass. Red clover produced yields equal to the trefoil. Among the grasses tested orchard grass, Alta fescue, and perennial rye grass

were outstanding. The herbage yields of orchard grass and Alta fescue were very similar from both hay and pasture tests. Averaging five years' results, orchard grass yielded 28 per cent more dry matter than perennial rye grass. In addition to the above varieties, many species are adapted in certain restricted areas. Full descriptions, including use and adaptation, will be found in Saanichton Experimental Station Mimeograph publications No. 111 and No. 131.

Mixtures

To determine the most suitable, a test was conducted with six pasture mixtures, varying the seeding rates of orchard grass and perennial rye grass with different species of bottom grass. The same basic legume mixture was used.

A key to the mixtures is given in Table 8.

TABLE 8.—Mixtures of Perennial Grasses and Legumes for Pasture and the Amount of Each Sown per Acre

—	A	B	C	D	E	F
	lb.	lb.	lb.	lb.	lb.	lb.
Alfalfa	8	8	8	8	8	8
Red clover	2	2	2	2	2	2
White Dutch clover	2	2	2	2	2	2
Perennial rye grass	9	6	6	6	6	3
Orchard grass	9	6	6	6	6	3
Crested dogstail	—	6	—	—	—	3
Creeping red fescue	—	—	6	—	—	3
Meadow fescue	—	—	—	6	—	3
Tall oat grass	—	—	—	—	6	3

The average yield of dry matter per acre for four years is given in Table 9.

TABLE 9.—Pasture Variety Test—Four Years Average Yield

Pasture mixture	A	B	C	D	E	F
Dry matter—Tons per acre	1·64	1·74	1·42	1·54	1·69	1·49

The alfalfa failed to become established because of strong competition from the grasses and weeds the first season after planting. The red clover, as expected, practically disappeared from the plots after the second year, but the white Dutch clover increased. The percentage of orchard grass increased in all plots except C and F, while perennial rye grass, crested dogstail, meadow fescue, and tall oat grass decreased. Creeping red fescue in treatment C increased from 30 per cent to 66 per cent, and in treatment F from 18 per cent to 64 per cent. The creeping red fescue provided strong competition to the orchard grass, which showed a decline of 58 and 47 per cent, respectively.

Orchard grass was the outstanding pasture species in this test. In addition to contributing the bulk of the dry herbage in the mixtures, it established readily, withstood competition from other species, and was very persistent.

Creeping red fescue—treatments C and F—decreased the yield of herbage and proved to be a poor pasture species.

Crested dogstail—treatment B, and tall oat grass—treatment E, contributed materially to the high yield of forage.

In addition to the above mixtures many others have been tested for hay and pasture production and found to be well adapted to limited areas. Hay and pasture recommendations for Vancouver Island will be found in the Station's mimeograph publication No. 131.

Irrigated Pastures

During the period covered by this report several preliminary experiments, and one standard pasture irrigation experiment have been conducted. From the results of this work the following recommendations can be made.

It does not pay to irrigate poor, run-down turf. For irrigation to be economical the turf must be in a highly productive state, containing the more productive species of grasses and legumes, and all growth factors must be at an optimum level. A very poor run-down turf receiving five acre-inches of water during the growing season gave less than one-quarter of a ton increase dry matter per acre while a highly productive turf receiving the same treatment gave an increase of slightly more than $1\frac{3}{4}$ tons dry matter per acre.

The water requirements of pastures are relatively high in comparison with most other crops. The following table illustrates the response of highly productive sward to different rates of irrigation.

TABLE 10.—Dry Weight Yields of Irrigated Pastures in 1952

Treatments	Dry-matter yields in lb. per acre	Percentage increase over check
A. Check—non-irrigated	5,137	
B. 5 acre-inches of water in 5 applications	6,845	36%
C. 10 " " 5 "	9,678	93%
D. 10 " " 8 "	8,974	79%
E. 15 " " 5 "	11,400	128%

L.S.D. at P .05=.18 tons per acre.

Examination of the above data shows that the greatest forage response was obtained from the plots receiving the greatest amount of water in heavy applications. Treatments C and D received the same total amount of water but treatment C—receiving heavier, less frequent applications—significantly outyielded treatment D. From an economic standpoint under normal weather conditions a minimum of six acre-inches of irrigation water should be applied throughout the growing season. Each application should consist of two acre-inches.

Fertilizer Requirements

To obtain maximum returns from irrigation optimum conditions for plant growth must be maintained. Experiments at this Station show that fertilizer requirements are greatly increased under irrigation. The results recorded in the following table illustrate the response from increased fertilization and also the necessity of application at the proper dates. One fertilizer, Nitraprills (32·5 per cent N), was used for all treatments.

TABLE 11.—Dry Weight Yields from Irrigated Fertilized Plots in 1950

Fertilizer treatments	Dry-matter yields in lb. per acre	Percentage yield after June 13
A. 150 pounds applied April 5	3,580	35·5
B. 350 pounds applied April 5	4,186	33·9
C. 150 pounds applied April 5, plus 100 pounds applied on June 1 and August 1.	4,630	46·3
D. 150 pounds applied on April 5, plus 100 pounds applied on June 1, July 1, August 1 and September 1	4,724	49·2

L.S.D. at P·05=359 pounds.

The above table emphasizes two important points in pasture production, namely, total herbage yield and seasonal distribution. A comparison of treatments A and B, both single spring applications, shows that the higher rate significantly increased pasture yields but did not improve seasonal distribution. A comparison of treatments B and C, receiving the same amount of fertilizer, shows that the split application, treatment C, significantly increased production over treatment B, and also greatly improved seasonal distribution as shown by the higher percentage of growth after June 13. Under the conditions of this test 350 pounds of fertilizer, applied in split applications, was satisfactory as the heavier treatment, D, did not significantly increase production or distribution.

Chemical Analysis

Preliminary chemical analysis indicates that irrigation of pastures results in significantly higher protein and significantly lower crude fibre content of the forage.

Significant differences were not obtained between pasture mixtures comparing orchard grass, Alta fescue, and perennial rye grass. However, it is a recognized fact that orchard grass is more palatable than either of the other grasses in a pasture mixture. Ladino clover is highly recommended as an irrigated pasture legume. Under dry conditions at Saanichton this clover will not persist. However, under irrigation it is vigorous and persistent and produces a very heavy tonnage of high quality forage.

Seed Production of Grasses and Legumes

Seed production of forage crops is a major line of research on the Saanichton Station. During the period covered by this report, different grasses and legumes have been tested for seed yields, under two projects, (1) methods of seeding grasses and legumes for seed production, and (2) the effect of date of seeding on seed yield of forage crops.

Spaced Rows versus Solid Stands

Results show that yields are increased when forages are grown in spaced rows rather than in solid stands. Based on four years' work, orchard grass in row plots yielded 513 pounds of seed per acre compared with 378 pounds from solid stands, perennial rye grass produced 465 pounds of seed per acre from rows compared with 428 pounds from solid stands, and creeping red fescue produced 592 pounds of seed per acre compared with 359 pounds when grown in solid stands. In addition to greatly increased yields from cultivated rows, pure stands are more easily maintained and seed purity increased due to ease in roguing.

Twenty varieties of perennial grasses and legumes have been grown in rows and solid-stand plots. Table 12 lists the average seed yield of a few varieties

obtained under the row system of production, and will serve as a guide to yields that might be expected under commercial production. The yield of straw is included to indicate the relatively small weight of crop that is sold off the farm. In the interest of conserving and maintaining fertility, the straw should be returned to the land in the form of manure, compost, or as a mulch.

TABLE 12.—Average Yield of Seed and Straw from Row Plots

Varieties	Yield in pounds per acre		Years tested
	Seed	Straw	
Alta fescue	809	5,080	4
Creeping red fescue	419	2,020	5
Meadow fescue	626	3,297	2
Orchard grass	476	5,340	5
Broadleaf birdsfoot trefoil	255	3,696	3

The time for which a stand may be economically maintained from an original planting varies widely with the different species. Most perennial grasses and legumes reach maximum production the second year after planting, and then the yield declines with each succeeding harvest. The rate of decline varies with the species and economic seed production for most perennial forages varies from three to five years. On the other hand, Wood meadow grass reached maximum production in the fourth harvest season and showed only a slight decline in yield in the seventh harvest.

Dates of Planting

Date of planting forage crops for seed production is an important consideration in this area. Trefoils and tall oat grass planted in the early spring will produce a light but worthwhile crop of seed the first year, while most other perennial crops do not produce seed until the second year. Perennial rye grass, planted in the fall, produces a crop of seed the following summer while orchard grass, planted at the same time, does not produce seed until the second year. Common spring vetch, Austrian winter peas, and crimson clover from fall planting produce heavier seed yields than from spring planting. With these annual crops it is essential that the soil be well drained during the winter months as they will not tolerate wet conditions.

ILLUSTRATION STATIONS

E. H. GARDNER

Illustration Stations permit studying farm problems in their local environment. Through these Stations it is possible to conduct experimental work under the varying soil and climatic conditions found within the general area served by an Experimental Farm or Station. Illustration Stations are located on privately owned farms and are operated on the basis of a co-operative agreement between the farm owner and the Experimental Farms Service.

Illustration Stations on Vancouver Island are on the following farms:

S. J. Darby and Sons, Alberni,
J. Casanave, Courtenay,
A. C. Galloway, Nanaimo,
F. R. Parr, Cobble Hill,
B. Young, Duncan,
C. Chase, Alberni.

Experimental work on the Alberni Illustration Station operated by Mr. C. Chase was discontinued in 1952. The Alberni Illustration Station operated by S. J. Darby and Sons was opened in 1953 and the Nanaimo and Cobble Hill Illustration Stations commenced operation in 1952.

Rotations

The following table gives the yields of some crops that have been grown on the various Illustration Stations. As the Cobble Hill and Nanaimo Stations did not commence operations until 1952, yield figures are not yet available for these two locations.

TABLE 13.—Yields of Crops grown on Illustration Stations

Crop	Alberni[1]		Courtenay[2]		Duncan[3]	
	Years grown	Yield/ acre	Years grown	Yield/ acre	Years grown	Yield/ acre
Potatoes.....(tons)	27	7·85	11	5·28	23	8·42
Potatoes (irrig.)..... "	—	—	—	—	2	14·72
Turnips..... "	21	25·84	—	—	—	—
Mangels..... "	17	27·73	—	—	—	—
Corn silage..... "	12	16·14	5	9·94	—	—
Spring oats.....(bu.)	23	61·33	10	58·33	16	79·27
Spring barley..... "	—	—	3	25·30	18	51·18
Spring wheat..... "	7	30·9	—	—	—	—
Fall wheat..... "	—	—	—	—	18	36·50
Clover Grass hay [4].....(tons)	24	2·57	10	2·10	—	—
Alfalfa hay..... "	—	—	—	—	14	4·14
Oat silage..... "	—	—	10	7·22	—	—
Spring peas .....(bu.)	—	—	—	—	7	32·6

(1) Five-year rotation—hoed crop, grain, seeded down with grain cover crop, hay, hay.
(2) Six-year rotation—hoed crop, grain, seeded down with grain cover crop, hay or silage, hay or silage, hay or silage.
(3) Seven year rotation—hoed crop, grain, seeded down with grain cover crop, hay, hay, hay, hay, hay.
(4) Clover grass hay yields recorded for one cut per year only.

Pasture Fertility Studies

Top yields from pastures at Alberni, Courtenay, and Duncan have been obtained from plots that have received a complete fertilizer treatment annually. Nitrogen and phosphate have given excellent responses and the response to potash has been moderate. The following table gives seven-year average yields from plots that received a complete fertilizer and from plots that received no fertilizer.

TABLE 14.—A Comparison of Fertilized and Non-Fertilized Pasture Yields

Station	Yields—Tons/acre Green Weight	
	400 6-30-15/acre	Check—No fertilizer
Alberni.....	14·03	6·65
Courtenay.....	20·47	10·53
Duncan.....	13·07	7·86

Weed growth on the non-fertilized plots was greater than on the fertilized plots. During the period of these experiments it was observed that pasture swards tended to deteriorate four or five years following seeding. This necessitated reseeding of pasture areas. Best results from fertilizers can be obtained only from pastures that are productive and that carry the recommended grasses and legumes.

Fertilizer recommendations for Vancouver Island can be obtained from the Saanichton Experimental Station or from the Provincial Department of Agriculture.

Cereals

Variety experiments with spring and fall cereals have been conducted on the Alberni, Courtenay, Duncan, and Cobble Hill Stations. These trials have indicated that only certain varieties are suited to Vancouver Island conditions. The following varieties have been outstanding in these trials: spring oats—Eagle, Abegweit; fall wheat—Sun; fall barley—Trebi; and fall oats—Winter turf.

For lighter well-drained soils which are subject to severe summer drought, fall cereals consistently outyield spring cereals. Fall cereals require good winter drainage, fall oats in particular are extremely susceptible to wet winter conditions. On heavier soils, which are more retentive of summer moisture, excellent yields of spring oats have been recorded.

Eagle oats have excellent straw strength and this variety is recommended over Abegweit where lodging conditions are prevalent. Spring wheat has given very low yields in all tests and is not recommended for Vancouver Island.

Cereal variety recommendations for Vancouver Island can be obtained from the Saanichton Experimental Station or the Provincial Department of Agriculture.

Hay Crops

Experiments with hay mixtures have been conducted at Alberni, Courtenay, and Duncan. Grass and legume species that have given good results in mixtures on the clay loam soils at Alberni and Courtenay are orchard grass, perennial rye, red clover, and alsike clover. Common brome has given good yields in the first year following seeding but yields of brome hay have fallen off badly following this initial year. Orchard grass has shown a marked ability to make growth early in the spring, and of the grass species tested, has demonstrated the top ability to make regrowth during the summer months. Alfalfa has given excellent yields on the well-drained silt soil at Duncan and has made more summer regrowth than any of the grass or legume species tested. Alfalfa has not been successful at Alberni or Courtenay due to poor drainage during the winter months and subsequent killing of the alfalfa roots. Red clover has shown comparatively high yielding ability particularly under droughty conditions.

Forage Crop recommendations for Vancouver Island can be obtained from the Saanichton Experimental Station or the Provincial Department of Agriculture.

Pasture Mixtures

Experiments with various pasture mixtures have been commenced at Nanaimo and Courtenay where mixtures are being tested under irrigated and non-irrigated conditions, respectively. Results from these experiments are not,

as yet, available. The mixtures under test include such promising species as orchard grass, perennial rye, Alta fescue, white Dutch clover and ladino clover. Ladino clover, which is a moisture-loving plant, has been restricted to the irrigated plots.

Potatoes

Potato varieties have been tested at Courtenay over a period of years. The following results have been obtained to date.

TABLE 15.—Results—Potato Variety Experiment

Variety	Marketable yield tons/acre				1951–52 averages	
	1951	1952	1953	Av.	% Dry Matter	(1) Cooking score
Keswick	4·44	6·04	8·75	6·41	23·05	G.
Katahdin	4·55	—	12·04	—	21·85	V..G..
White Rose	3·99	5·51	13·14	7·55	22·35	F.
Netted Gem	2·29	4·44	12·85	6·53	22·85	V.G.
Green Mountain	4·32	4·75	13·87	7·65	25·80	F.
Columbia Russet	3·70	4·89	12·46	7·03	24·40	G.
Burbank	2·75	4·09	11·35	6·06	23·05	V.G.

(1) Cooking score: V.G.—very good; G.—good; F.—Fair;—P.—Poor.

Poor yields were recorded during the dry years of 1951 and 1952 when the Keswick, White Rose, Green Mountain, and Columbia Russet varieties showed to advantage. In 1953 moisture conditions were good and the Green Mountain variety gave the top yield. The Burbank and Netted Gem varieties made a much better showing in 1953 than they did in the dry years of 1951 and 1952. Keswick, which was the top yielder on the basis of the 1951-52 average, was the low yielder under the more moist conditions that prevailed in 1953. The Keswick variety is a fairly recent introduction that has shown good resistance to late blight in Eastern Canada. Green Mountain gave the top percentage of dry matter in 1951 and 1952.

Cooking scores were based on a boiling test, the boiled samples being assessed by a panel of judges. Boiled tubers were scored on taste, color, dryness, mealiness, and ability to resist breaking down under boiling. Netted Gem, Burbank, and Katahdin displayed good boiling characteristics. Green Mountain and Columbia Russet, which were high in dry matter, tended to break down badly when boiled.

Irrigation

In recent years many farmers have installed irrigation systems. Nearly all systems that have been purchased by Vancouver Island farmers feature portable aluminum pipe and sprinklers. Water is derived from a variety of sources including rivers, creeks, lakes, storage dugouts, and wells. To study crop production under irrigated conditions, irrigation studies were commenced on three Illustration Stations in 1952.

The following rainfall table illustrates the annual distribution of rainfall for several Vancouver Island areas. The figures are taken from the 1951 report entitled "Climate of British Columbia" printed by the B.C. Department of Agriculture.

TABLE 16.—Vancouver Island Rainfall Figures

Area	No. years averaged	Total annual rainfall	Summer rainfall June-Sept. (incl.)	Summer rainfall as a percentage of total rainfall
		in.	in.	in.
Alberni (Beaver Creek)	56	67·84	7·76	11·5
Courtenay	19	54·36	7·48	13·8
Parksville	35	31·14	5·32	17·1
Nanaimo	50	37·23	5·46	14·7
Duncan	25	38·64	4·69	12·1
Sidney	37	30·33	4·00	13·2
Victoria	65	26·92	3·42	12·7
Sooke	40	45·42	4·67	10·3

Irrigation studies were commenced at Duncan and Nanaimo in 1952. At Duncan, water was made available for irrigation in two small dugouts constructed in a coarse gravel subsoil to a depth below the general water-table level. They measured 14 feet in depth and 25 by 50 feet at the bottom. These dugouts were fed by sub-surface water which flowed into them readily through the gravelly subsoil, and provided continuous irrigation during the summer of 1952. A total of 32·5 acres were irrigated and 71·9 acre-inches of water applied. Water was supplied by using a 10-horsepower gas engine and pump, 900 feet of 3-inch and 500 feet of 2-inch portable aluminum pipe, and 20 sprinkler heads. This arrangement permitted irrigating just over one acre at each setting of the equipment.

Crops irrigated at Duncan in 1952 were potatoes and alfalfa. Potato yields in 1952 averaged 16·70 tons per acre as compared with the 23-year average yield under no irrigation of 8·42 tons per acre. Potato fields received two irrigations totalling 5 inches of irrigation water.

Alfalfa yields do not appear to have been greatly increased through irrigation at Duncan as 1952 irrigated yields did not exceed the long-time non-irrigated alfalfa yields. Alfalfa thrives on the silt soil at Duncan as the tap roots are able to penetrate deeply and the plants benefit from the abundant subsoil moisture. Alfalfa fields received one three-inch irrigation following the first cutting.

Irrigation was of benefit at Duncan in the case of a new alfalfa seeding in 1952. Due to dry surface soil conditions, germination of the new seeding was very poor. Midsummer irrigation resulted in excellent germination and a good alfalfa stand.

Irrigation at Nanaimo was made possible by damming a small creek. The flow of water in the creek was not sufficient to supply an adequate irrigation system but through damming sufficient water was backed up to permit 24 hours of irrigation before the water level was appreciably lowered. Following irrigation, the water behind the dam regained its maximum level, in about eight hours. The irrigation system at Nanaimo consists of a 3-horsepower electric motor and 1,000 feet of 2-, 3- and 4-inch portable aluminum pipe. Nineteen sprinkler heads, capable of covering about one acre at each setting of the equipment, are used.

Irrigated pasture at Nanaimo remained productive throughout the summer and fall months. Pasture areas were fertilized with 16-20-0 at 400 pounds per acre in the spring and twice during the summer with 100 pounds of ammonium nitrate.

A storage dugout at Cobble Hill was completed in December of 1952. This dugout was constructed by damming a small ravine. Surface runoff and a tile drain supplied the water necessary to fill the dugout. This dugout has a capacity of 650,000 gallons, or 2·35 acre-feet of water. The Cobble Hill operator plans to install a sprinkler system and irrigate approximately five acres of potatoes or corn each year.

Irrigation experiments have been initiated at Duncan and Nanaimo. At Duncan the response of irrigated pasture to varying fertilizer treatments is being studied. At Nanaimo various pasture mixtures are being tested under irrigated conditions.

Further information on irrigation is given in the "Plant Nutrition" section of this report.

Farm Business Studies

Complete records of revenues and expenditures are kept at each of the Illustration Stations. The Stations at Cobble Hill, Courtenay, and Nanaimo are dairy farms and derive the major portion of their farm income from the sale of whole milk. The Alberni and Duncan Stations are mixed farms and income is derived from milk, beef, poultry, hogs, and field crops.

TABLE 17.—Average Investment—Five Stations, 1952

Av. total inventory value	Av. total acres	Av. cleared acres	Av. investment per cleared acre
$			$
22,763 88	141·9	38·9	585 19

TABLE 18.—Breakdown of Investment—Average Five Stations, 1952

Land and buildings	Livestock	Feed and supplies	Machinery and equipment	Total
$	$	$	$	$
13,125 91	2,997 80	1,337 69	5,302 48	22,763 88

The above tables indicate a comparatively high investment per cultivated acre and are indicative of the relatively small cultivated acreage per farm unit. Forest vegetation constitutes the natural cover for most of Vancouver Island and clearing costs are high. The high clearing costs are reflected in the relatively high land values. Investment in land and buildings constitutes 57·7 per cent of the average total investment for the five Stations.

TABLE 19.—Sources of Revenue and Expenditure Average Five Stations, 1952

Item	$ Revenue	$ Expenditure
Cattle and dairy produce	5,583 65	1,822 99
Field crops	1,586 75	783 01
Hogs	599 84	382 53
Poultry	765 04	444 37
Garden and orchard	8 40	1 87
Machinery and buildings	520 35	1,724 88
Miscellaneous	142 16	1,639 75
TOTAL	9,206 19	6,799 40

The major source of cash revenue in 1952 was cattle and dairy products which accounted for 60·6 per cent of the total revenue. Milk sales constituted $4,753.46 of the total shown for cattle and dairy produce, or 85·1 per cent. Revenue shown for field crops is low as a considerable proportion of the crops grown on each Station is fed to livestock and not sold for cash.

TABLE 20.—Average Labor Earnings—Five Stations, 1952

Item	Revenue	Expenses
	$	$
Cash	9,206 19	6,799 40
Increase in capital	715 27	—
Unpaid family labor	—	150 00
Interest on capital @ 5%	—	1,117 61
Farm products consumed and use of house	565 05	—
TOTALS	10,486 51	8,067 01

Average labor earnings 1952, $2,419.50.

The above table indicates that the average labor earnings per Station in 1952 were $2,419.51. Interest on investment constituted a considerable sum, and was subtracted from revenues in determining labor earnings. Average labor earnings for the five Stations for 1952 were somewhat above the average labor earnings of $2,092.47 recorded for Alberni, Courtenay, and Duncan for 1949-52, inclusive.

The Stations that operate on a mixed farming basis showed average labor earnings of $3,029.50 in 1952 as compared with average labor earnings of $2,012.84 for the dairy-type Stations.

MACHINERY AND EQUIPMENT DEVELOPMENT

H. J. KEMP

The following projects have been undertaken to assist agricultural research and in some cases as a direct help to the practical farmer or grower.

Rod-Row Plot Harvesters

To assist harvesting of small experimental plots several kinds of small hand and power-driven machines have been constructed with fairly satisfactory results. Development of more satisfactory machines is continuing.

Nursery Threshers

Three kinds of small threshers for experimental plot use have been designed and constructed. These are:—

(1) An 8-inch cylinder thresher with quick interchangeable cylinders of different types to suit various kinds of crops.

(2) A small thresher with a rubber flail-type cylinder for threshing tender or podded seeds without damage.

(3) A portable 20-inch cylinder thresher having a self-releasing concave, self-cleaning separation facilities and compressed air installation, all mounted on a rubber tired trailer chassis. Eight of these have been constructed and supplied to different Dominion Experimental Stations.

Bulb Grading Equipment

Seven experimental machines have been designed and constructed for grading bulbs on the basis of size and also on the basis of weight. These are as follows:—

(1) Modified De Vries type sizer with improved feeding and mechanical means for screening.

(2) A divergent V-belt type for faster grading.

(3) A modified commercially made apple weight type grader.

(4) A heavy drag chain conveyer with baskets and commercial-type scales for grading by weight.

(5) A light drag chain with special baskets and sensitive scales for weight grading.

(6) A rotating drag-type grade in which weighing baskets are dragged on a circular track over sensitive scales to grade by weight.

(7) A rotating grade with eight arms each carrying a self-weighing basket and automatic means for feeding ungraded bulbs or fruit and discharging the graded product into separate bins.

Miscellaneous

Many kinds of machines, equipment, and other aids have been designed and constructed in the equipment development shop for either technical or practical use. Chief among these are the following:—

FIG. 9. Portable 20-inch cylinder thresher, left side.

(1) Equipment for heating and circulating air at controlled temperatures in plant chambers, using artificial light for experimental forcing.

(2) Equipment for heating and circulating air at controlled temperatures in cabinets designed for bulb curing and seed-drying experiments.

(3) Strawberry cultivator attachment for small field tractors.

(4) Soil fumigant attachment for tractor.

(5) Sansbury poultry range feed hopper.

(6) Sansbury adjustable chick feed hopper.

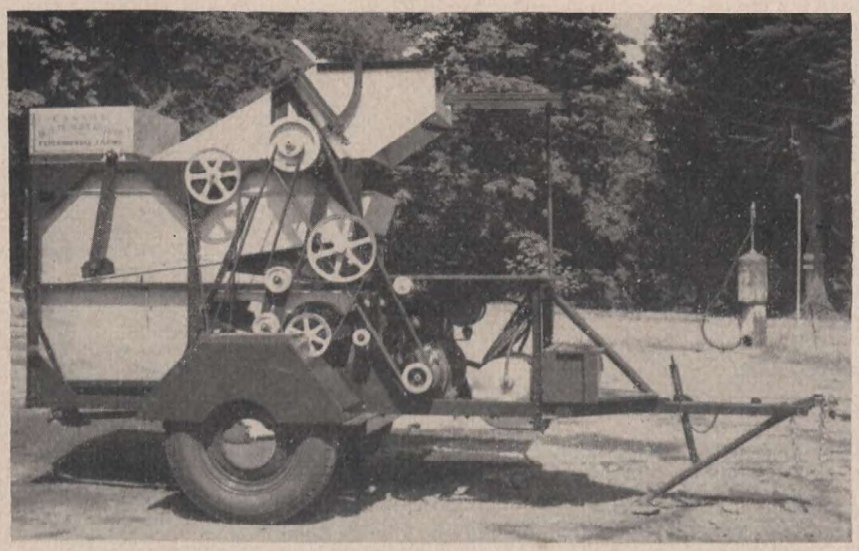

FIG. 10. Portable 20-inch cylinder thresher, right side.

POULTRY

E. R. HALL

All experimental work in poultry at the Saanichton Station since 1940 was carried out with single comb White Leghorns. Breeding and brooding received the most attention in recent years rather than problems relating to nutrition and management. The experimental work was carried out under the supervision of the late Mr. R. A. Sansbury.

Flock Production

Average production shown in the accompanying table is based on the number of pullets finishing the laying year, which begins on September 4. Flock mortality is also shown, and is based on all pullets placed in the laying houses each year.

Methods employed in breeding, feeding, and management have maintained vigor and production at a satisfactory level. A general increase in production was obtained, reaching its peak in 1952. Mortality fluctuated during this six-year period, but casualties have been due to miscellaneous ailments and not to any epidemic.

TABLE 21.—Flock Production and Mortality, 1947-52

Year ended Sept. 3	Total no. of pullets		Production per bird	Mortality
	Start	Finish		
	No.	No.	eggs	%
1947	294	263	216·0	10·5
1948	270	231	217·2	14·4
1949	296	277	227·8	6·4
1950	211	194	235·4	8·0
1951	483	417	227·9	13·6
1952	393	321	245·3	18·3

Breeding

Evaluation of Males

In 1950 a trial was concluded in which the performance of Ottawa-bred males was compared with that of R.O.P. males. Females selected and used in this five-year breeding project were the best birds from the best families in the Station flock, and were distributed as evenly as possible to males of both lines. No crossing between the two lines was permitted. The ordinary methods of selection were used. Females used in breeding pens were from dams laying 200 or more eggs, and males were from similar dams. Results obtained in this experiment show no significant differences between the two lines of males during the five-year period in (1) production, (2) egg weight, or (3) mortality. Results have fluctuated from year to year. These differences can frequently be traced to weather conditions, management, incubation brooding or rearing. Faulty incubation can frequently cause differences. For instance, in 1948, daughters of male AE1212 averaged 209·8 eggs, and in 1949, 234·9 eggs, when mating was carried out within the same line.

Relation of Eye Condition to Vigor and Production

Since 1942 a study has been made of the relationship of eye condition to vigor and production. It was noted that considerable variation occurred between individual birds with respect to fading of iris color and distortion or breaking of the pupil. Observations indicated that these variations from normal eye condition could be associated with high mortality and depressed production. Two eye grades were established and birds graded accordingly into two groups:—Grade 1—including birds in which the pupil is bright, clear, distinct, and perfectly round with the iris a solid reddish or light bay color; Grade 2—birds with eyes varying from the Grade 1 standard.

During the eight-year period, 1942-9, pullets were classified according to eye condition when placed in the laying houses. Some 2,140 pullets were studied in which mortality in pullets with Grade 1 eyes was 6·2 per cent, and in those with Grade 2 eyes, 24·2 per cent, In the same period average production was 38·1 eggs lower in birds with Grade 2 eyes during their pullet year.

In 1950 matings were made with a view to establishing two strains: a Grade 1 and a Grade 2 eye strain. Comparisons between these two strains of egg production and livability are not valid inasmuch as there were less than half as many Grade 2 pullets as there were Grade 1. The foregoing statement applies also in 1951. Comparisons within strains from year to year are however valid. The percentages of production and mortality compare well with those of previous years.

The results from the matings of 1952 and 1953 are comparable between grades within years as well as within grades from year to year. There are some surprising shifts.

Egg production for the Grade 1 group was on a par with previous years at 247.7 eggs per pullet. For the Grade 2 group however, production took a sharp rise over previous years, to 243.1 eggs per pullet, only 4.6 eggs less than the Grade 1 group. Mortality in the Grade 1 group rose to 16.1 per cent, only 1.3 per cent less than the Grade 2 group at 17.4 per cent. One hundred and eighty-six Grade 1 pullets started the test as compared to 207 Grade 2 pullets.

The 1953 results were similar to those for 1952. Production for Grade 1 pullets was 245.5 eggs per pullet compared to 236.6 for Grade 2 pullets—a difference of 8.9 eggs. Mortality for the Grade 1 pullets was 8.0 per cent and for the Grade 2 pullets, 6.5 per cent. The numbers of birds in each grade were: Grade 1—182; and Grade 2—217.

At present the whole project is under study to determine if possible, why under a program of selection for strains relatively pure breeding for Grade 1 and Grade 2 eye condition, there should result such marked changes in the Grade 2 strain.

Methods of Brooding

For many years chicks at this Station were brooded through the use of a battery brooder followed by a colony house heated with a brooder stove. In 1950 equipment for other methods of brooding was installed, making possible a comparison of the following methods of providing heat for brooding;

(1) Radiant hot water panel (built into the floor in 2 pens)
(2) Radiant electric panel (cables installed in floor in 2 pens)
(3) Rockgas brooder (1 pen)
(4) Raised brooder (1 pen)
(5) Electric brooder (1 pen)
(6) Heat lamps (in any or all pens).

The brooder house used is divided into four pens each 10 by 14 feet and separated by solid walls. A radiant heat floor panel 4 feet wide extends through all pens in which heat is provided from hot water pipes or from electric cables buried in the concrete floor. Hot water is provided from a domestic type hot water boiler heated by oil. Water circulation is guaranteed by means of a pump and adjustments provide for water at different temperatures as required. The electric heat panel is 4 by 10 feet and consists of plastic-covered heat cable laid in parallel lines $1\frac{1}{4}$ inches apart and covered with one inch of concrete. The remaining floor area in one pen is unheated, and in another pen the entire floor area is electrically heated.

In 1951 chicks were brooded by means of (1) hot water radiant heat panel, (2) rockgas brooder, (3) electric brooder and (4) electric heated radiant panel. Three broods of chicks were brooded under each of these methods. Chicks were hatched on November 27, January 18, and March 6. In 1952 chicks were brooded by means of (1) heat lamp, (2) rockgas brooder, (3) electric brooder, and (4) raised brooder. Details relating to the construction and operation of the various items of brooding equipment cannot be given here, but results obtained are briefly outlined.

In 1953 various combinations of heat lamps were compared for brooding. Two of the systems used three heat lamps in a straight line. The middle lamp in each case was white. The only difference between the two systems was the inclusion of a 4′ x 8′ hover over the lights in one.

All broods in the brooder having the hover had a greater mortality than those brooded without the hover. From this fact arises the following questions: Does the hover influence the incidence of disease? Does it influence the effect of lights? Does it influence the type of management required?

Perhaps the answer lies in all three or any combination of the three. The problem will be pursued further.

Hot Water Panel

This method has distinct advantages over electric equipment in the event of power failure. The concrete floor cools gradually and will look after chicks for five hours. The warm floor dries the droppings and no litter need be used except a sprinkling of sand before chicks are placed in the pen. If the heating is correct, there is no crowding. After the first two weeks the gradual building up of droppings reduces the heat and insulates the floor. Air drafts must be carefully avoided.

Electric Heat Panel

This has the same advantages as the hot water panel but is cheaper to operate. Mortality was highest under this method, but this condition was not related to the method of heating. There is danger from draughts when there is not a hover over the floor panels.

Rockgas

Mortality was lowest under this method of brooding, but again it could not be correlated to the method of heating. Chick body weight and feed consumption were slightly greater than in other pens. Two years' results have shown this to be true. Air temperature was higher than in other pens and more ventilation was required to keep this down to the level of other pens. There is no evidence that high brooder room temperature is an advantage.

Floor Electric Brooder

The electric floor brooder gave the lowest brooding cost per chick with mortality moderately low for a two-year period, and is easy to operate.

Heat Lamps

Infra red lamps were used alone and also under a hover with the latter method giving the best results. They have a low capital cost and the height of both lamps and hover can be adjusted readily to meet temperature requirements. Chicks are very easily viewed under this method of brooding. There is no reserve heat or protection in case of power failure.

Raised Electric Brooder

Chicks in this brooder were subject to coccidiosis as under other brooding methods. This was difficult to explain in view of the system of brooding on wire. Chicks in this brooder were much wilder than under other systems.

There seems to be little choice among the various methods used. Some of the weaknesses of each have been indicated. Each system has its advantages, and in the final analysis the method to follow is the one that has the greatest appeal to the individual.

A separate brooding trial was carried out in 1951, in which chicks were brooded to six weeks of age in a cold chamber 8 by 10 by 8 feet. The room was chilled by means of blower-type coils that created considerable draft. The room temperature was held continuously at 36° F. for the entire period while the usual brooder room temperature often rises to 60 or 65° F. At six weeks 48 chicks brooded in the cold room weighed 46·3 pounds, and 48 similar chicks, brooded under normal room temperature of 65° F., weighed 41·5 pounds. When transferred to a range shelter, the cold-room chicks adapted themselves readily without bunching and crowding. From this trial there is evidence that a cool brooder room is not harmful and may be desirable, as the chicks referred to were as good as, or better than, any chicks ever brooded at this Station.

EXPERIMENTAL PROJECTS

The experiments listed below indicate the range of work currently in progress. Some of the experiments are divided into numerous subtitles. For instance, the experiment "Organic Mulch for Horticultural Crops" includes work with several kinds of tree fruits, small fruits, and vegetables.

Fruits, Nuts and Woody Plants

Variety experiments, small fruits
Variety experiments, tree fruits and nuts
Strawberry breeding
Loganberry breeding
Tree fruits, breeding (apples, pears)
Tree fruits, rootstock trials (apples, plums, pears)
Thinning pears with chemicals
Ornamental trees and shrubs, variety experiment
Cascara cultivation.

Ornamentals

Holly culture—varieties, propagation, soil management
Flowering bulbs—variety experiment
Effect of controlled temperature on forcing bulbs
Plant houses and forcing methods for horticultural crops

Vegetables

Variety experiments
Foundation seed production of vegetables
Leek seed drying
Vernalization of hard-heading lettuce
Vegetables—different dates of seeding or planting
Chemical weed killers for vegetable crops
Cabbage breeding

Nutrition

Nutritional studies in plant growth, strawberries
Rotational experiment for maximum production
Organic mulch for horticultural crops
Effect of irrigation on horticultural crops

Field Husbandry

Farm and garden tractor operating cost
Lime experiment
Meteorological records
Date of applying commercial fertilizer to hay and pasture
Use of chemicals for weed eradication
Commercial fertilizer formula for hay, red clover
Methods of maintaining organic matter
Pasture renovation

Cereals

Variety experiments, springs oat and winter wheat; oats and barley
Breeding improved varieties of winter oats and barley

Forage Crops

Orchard grass breeding
Forage crops introduction nursery and variety experiments
Perennial and biennial grasses and legumes for hay and pasture
Pasture irrigation
Seed production—grasses, legumes, roots, etc.
Turf grass experiments

Poultry

Breeding for eye condition
Brooding with different sources of heat

Machinery Development

Small harvesters for special seed crops
Seed plot threshers
Bulb grading and other technical equipment

Illustration Stations

Five, six- and seven-year rotations
Fertilizer and lime experiments
Irrigation of pastures
Cereal and potato variety experiments
Forages, hay pasture and alfalfa experiments
Potato variety experiment
Cost of production and farm income studies

LIST OF PUBLICATIONS

The publications listed below have been written by members of the staff. They are supported by facts and data obtained from experiments that have been planned and supervised by the writers. There have also been prepared for distribution numerous mimeographed sheets on many other topics. The publication list issued by the Information Service, Canada Department of Agriculture, Ottawa, and the one issued by the Provincial Department of Agriculture, Parliament Building, Victoria, likewise catalogue useful literature on a great variety of subjects.

Fruits and Woody Plants

The Cultivation of Tree Fruits
Nut Culture
Spraying Fruit Trees
Varieties of Tree and Small Fruits Recommended
Cultivation of Small Fruits
Pollination Studies in Tree Fruits
Ornamental Trees and Shrubs for the Coastal Region of B. C.

Bulbs

Tulip Bulb Culture
Cost Analysis of an Acre of Tulips
Modified Cutting of Tulip Flowers for Market and Its Effect on Bulb Forcing.
An Experiment With Air Transported Tulip Bloom
A Shipping Experiment With Daffodil Blooms
Narcissus Culture in British Columbia
An Experiment with Precooled and Non-precooled King Alfred Daffodil Bulbs.
Effect of Fall and Spring Applications of Different Fertilizers on King Alfred Daffodils.
Promising New Methods Used in Propagation of Hyacinths
Hyacinth Bulb Production and Artificial Propagation
Easter Lily Culture in British Columbia
Gladiolus Culture in British Columbia
An Experiment with Two Dip Treatments for Gladiolus
Bulbs and Bulb Bloom
A Five-Year Forcing Experiment with B. C.—Grown King Alfred Daffodils and Four Varieties of Tulips.
Experiments on Cutting and Shipping Bulbous Flowers from Victoria to Winnipeg.
How to make a Simple Hand Gauge to Grade Bulbs
Harvesting, Curing, Storage and Forcing of B. C. Bulbs
Forcing Bulbs Under Electric Lights
Recommended Varieties of Bulbs for Various purposes
Instructions for Cutting, Dipping, Packing and Shipping Holly.

Vegetables

Standard Vegetable Varieties Recommended for Vancouver Island
Effects of Various Growing Methods in Leek Seed Production
Experimental Results in Vegetable Seed Production

Plant Nutrition

Application of Fertilizers
Composting Waste Material
Dugouts and Their Use for Irrigation on Vancouver Island
Fertilizer Recommendations for Vancouver Island
Green Manuring, Cover Cropping and Mulching
Minor Element Experiments 1943-1953
Mulches for Horticultural Crops
Report on Irrigation Experiments

Forage and Cereal Crops

Hay and Pasture Recommendations for Vancouver Island
Growing Sod for Hay and Pasture
Alfalfa, How to Obtain a Good Stand

Chemical Weed Control in Lawns
Experimental Results in Seed Production with Grasses, Legumes and Other Forage Crops
Experimental Results with Root Crop Seed Production
Cereal Varieties Recommended for Vancouver Island

Poultry

Management of Baby Chicks

Miscellaneous

Progress Report 1937-1946
Farming on Vancouver Island
List of Publications Available
A Review of Experimental Work at the Dominion Experimental Station, Saanichton, B. C.
Experimental Work for 1954 at the Dominion Experimental Station, Saanichton, B. C.

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1954

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