DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

# EXPERIMENTAL STATION

## SUMMERLAND, B.C.

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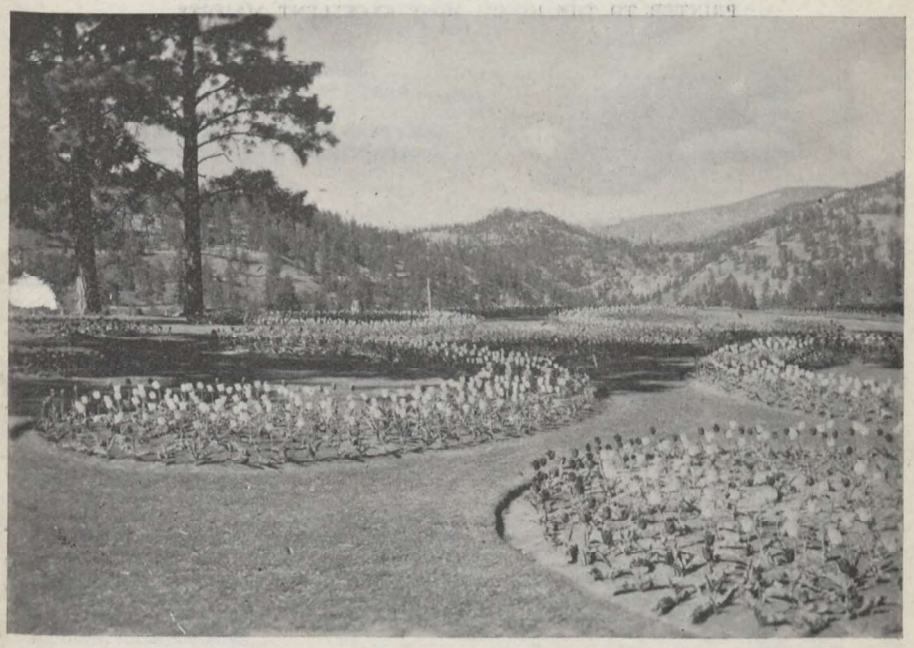
REPORT OF THE SUPERINTENDENT
W. T. HUNTER

FOR THE YEAR 1925



TULIPS IN THE FORMAL BEDS
Experimental Station, Summerland, B.C.

Printed by Authority of the Hon. W. R. Motherwell, Minister of Agriculture, Ottawa, 1926

OTTAWA
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PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1926

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# DOMINION EXPERIMENTAL STATION, SUMMERLAND, B.C.

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

### THE SEASON

The early part of the winter of 1924-5 was very severe throughout the dry belt of British Columbia. About the middle of December after a spell of mild weather, there was a sudden and severe drop in the temperature, the maxima recorded on the 14th, being 52 degrees, 15th, 12 degrees, 16th, —2 degrees, a minimum of —9 degrees being reached on the 17th. There was no snow on the ground and considerable damage to fruit trees was done throughout the whole district. Stone fruit trees suffered severely and clovers and alfalfas were, in many places killed out, where these plants had thrived without injury for many years. There were heavy snowfalls late in December and in January, but the ground was bare by the end of January and work on the land was started on February 24, ten days later than the previous year. No extreme temperatures were experienced after the new year.

The spring was early and moderately warm, and there was a fair supply of natural moisture stored in the soil. A good start was made with seeding and germination generally was quite satisfactory. Good rains occurred about the middle of April which helped the seeding along but the early part of May was hot and dry. Half an inch of rain fell on May 28 and showers occurred throughout the first two weeks of June. The remainder of the summer and autumn was extremely dry but late October, November and December gave good rains and snowfalls and soil moisture conditions for the winter were generally satisfactory. The total precipitation for the year 1925 was 8.84 inches; 1.89 above 1924, but 0.76 below the average for the ten years ending 1925. The early part of the winter 1925-6 was extremely mild. On October 28, 5 inches of snow fell, this being a most unusual occurrence so early in the year. This was all gone by the following day, greatly to the benefit of the soil which was in excellent condition to receive the moisture. Up to the end of the year no severe weather had been experienced.

The following table gives a summary of the meteorological data for the year 1925, also the average precipitation for ten years. Further meteorological data will be found in the report for this Station for the year 1924.

TABLE 1.—METEOROLOGICAL RECORDS AT SUMMERLAND, 1925

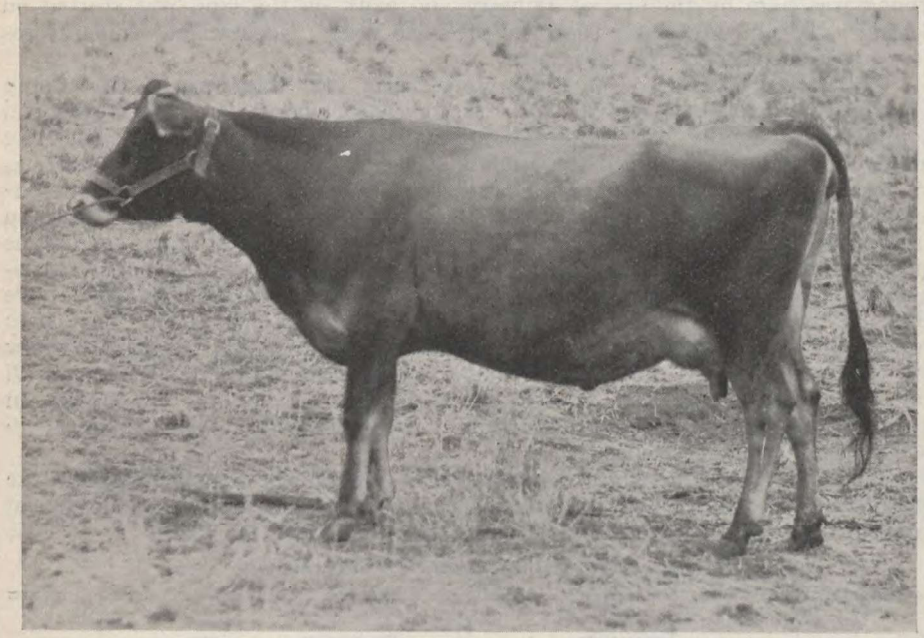
| Month | Temperature | | | | | Precipitation | | | Average precipitation for ten years | Total sunshine | Evaporation |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Highest | Date | Lowest | Date | Mean | Rain fall | Snow fall | Total precipitation | | | |
| | | | | | | inches | inches | inches | | | |
| January | 45·0 | 22nd | 8·0 | 15th | 27·58 | 0·03 | 16·6 | 1·69 | 0·97 | 31·2 | ..... |
| February | 51·0 | 24th | 21·0 | 16th | 36·80 | 0·07 | 2·7 | 0·34 | 0·54 | 77·8 | ..... |
| Mareh | 62·0 | 24th | 28·0 | 29th | 41·51 | 0·29 | 0·0 | 0·29 | 0·52 | 136·7 | ..... |
| April | 75·0 | 9th | 32·0 | 28th | 50·11 | 0·54 | 0·0 | 0·54 | 0·76 | 200·2 | 1·83 (15 days) |
| May | 82·0 | 14th | 35·0 | 3rd | 59·88 | 0·58 | 0·0 | 0·58 | 0·65 | 282·5 | 5·21 |
| June | 101·0 | 26th | 39·0 | 3rd | 66·53 | 0·93 | 0·0 | 0·93 | 1·14 | 272·2 | 5·63 |
| July | 98·0 | 16th | 52·0 | 7th | 73·87 | 0·07 | 0·0 | 0·07 | 0·66 | 322·8 | 6·88 |
| August | 93·0 | 1st | 43·0 | 27th | 67·46 | 0·15 | 0·0 | 0·15 | 0·72 | 237·9 | 5·47 |
| September | 84·0 | 3rd | 38·0 | 20th | 58·85 | 0·56 | 0·0 | 0·56 | 0·75 | 164·5 | 3·70 |
| October | 66·0 | 5th | 28·0 | 28th | 47·11 | 0·34 | 5·0 | 0·84 | 0·62 | 188·9 | 1·08 (15 days) |
| November | 51·0 | 9th | 20·0 | 4th | 37·22 | 0·55 | 5·6 | 1·11 | 0·91 | 70·0 | ..... |
| December | 47·0 | 17th | 28·0 | 31st | 36·41 | 1·12 | 6·2 | 1·74 | 1·36 | 19·6 | ..... |
| Totals | ..... | ..... | ..... | ..... | ..... | 5·23 | 36·1 | 8·84 | 9·60 | 2,004·3 | ..... |

## ANIMAL HUSBANDRY

Although this Station is primarily an institution for the study of the Horticultural problems of the district, and general farming and live stock play only a secondary part in the operations, yet there has been a tremendous increase in the work of other divisions than those engaged in horticultural investigations. This has been especially true in reference to live stock work, particularly with dairy cattle and swine. It is very evident that the fruit-growers throughout the interior are realizing more clearly as time goes on, and partial fruit failures occur from time to time. that dairy cows and hogs will help balance the revenue on the average fruit-farm to the advantage of the operator.

### DAIRY CATTLE

The Jersey herd at this Station made a very creditable showing during the year. The adult herd was augmented by the purchase of one young female,



Farleigh St. Mawes Retta—2:677

and by the exchange of one heifer for two aged breeding cows of more desirable type. Six calves were dropped during the year. Two bull calves were disposed of for breeding purposes in grade herds and one bull calf was killed at birth. Two heifer calves are being raised and one was lost at birth. The herd was fully accredited in February of this year.

To replace the herd sire lost at the end of last year, a herd sire, Rosewood Kitty's Oxford Beau —26182— was purchased in the Chilliwack district early in the year. At eighteen months of age, he gives promise of being a well-balanced individual, possessing splendid type and dairy character. He was sired by St. Mawes Oxford Beau —20278— a son of St. Mawes Lad —130501A— out of a Gold Medal cow, Edith's Oxford Belle —312639A— with a mature record of 15,440 pounds of milk and 746 pounds of fat in 365 days.

Rosewood Kitty's Oxford Beau is out of Rosewood Model Kitty—7610—a grand old show-ring winner, with a mature production record of 10,619 pounds of milk and 635.5 pounds of fat in 365 days.

Table 2 gives the records of the entire herd which was completed during the year. The average production of the six females was 9,628.5 pounds of milk, 573 pounds of butter fat.

This is an increase of 831.1 pounds milk and 45.4 pounds fat over the average of the records which were completed in 1924.

Cost of production records have been inaugurated and will be available for the report of the year 1926. All the cows in the herd are on Record of Performance and are milked three times daily. The entire herd will be bred for 305-day classes.

A senior yearling heifer in the herd, Farleigh St. Mawes Retta—21677—bred by E. W. Paitson, Duncan, B.C., and purchased from him by the Station, completed a very creditable record in the 305-day class during the year.

Under the regulations of the Dominion Record of Performance tests, Retta produced in 305 days 9,013 pounds of milk testing 5.81 per cent and yielding 524 pounds of butter fat, going on test at the age of 1 year and 345 days. She carried calf for 221 days of the test and qualified for the 305-day class by dropping a bull calf on January 24. This record exceeds that of the present holder of the World's record for that class and age, namely Golden Lad's Josephine II owned by the Sherman Nursery Company of Iowa whose record stands at 10,532 pounds of milk and 507 pounds of fat.

Farleigh St. Mawes Retta is intensely bred for production and is of St. Mawes and Rosaries Olga Lad breeding. Her sire is St. Mawes 3rd's son—14879—an Oregon-bred bull imported and used by E. W. Paitson. Her dam who was by the same sire as St. Mawes Retta 3rd's son, is St. Mawes Landseer 3rd's daughter—15228—an Oregon-bred cow also imported by Mr. Paitson, and now in the herd at the Experimental Station, Summerland. Landseer has a three-year-old record of 612 pounds of fat.

The photo was taken at the completion of her test. She is a strong rugged cow of splendid dairy temperament, gained 150 pounds in weight during the ten months, weighing 1,025 pounds when the test was finished. The total cost of her feed for the period was $106.21 so that she shows a good margin of profit for the year. A full sister is also in the herd at the Station.

TABLE 2.—LACTATION RECORDS COMPLETED DURING YEAR

| Name of cow | Reg. no. | Age at commencement of test | Date test commenced | Date calving following test | R.O.P. record no. | No. of days on test | Milk | Butter fat | Average per cent fat |
|---|---|---|---|---|---|---|---|---|---|
| | | yrs. days | | | | | lb. | lb. | |
| Leonette of Avelreagh | 11873 | 5 - | Mar. 5, 1924.. | May 14, 1925.. | 1,660 | 365 | 12,429 | 672 | 5·41 |
| St. Mawes Landseer 3rd's Daughter | 15228 | 4 256 | June 1, 1924.. | May 21, 1925.. | 476A | 365 | 7,136 | 452 | 6·33 |
| Foxhall's Viola of S.C. | 14881 | 6 - | July 3, 1924.. | ..... | 1,830 | 365 | 10,920 | 712 | 6·52 |
| Calgarth Starlight | 17479 | 3 129 | June 29, 1924.. | July 13, 1925.. | 503A | 305 | 8,152 | 495 | 6·07 |
| Violet's Melia Ann | 11599 | 5 - | Sept. 14, 1924 | Aug. 29, 1925.. | 504A | 305 | 10,121 | 583 | 5·76 |
| Farleigh St. Mawes Retta | 21677 | 1 345 | Feb. 1, 1925... | Jan. 24, 1925.. | ..... | 305 | 9,013 | 524 | 5·81 |
| Average | ..... | ..... | ..... | ..... | ..... | 325 | 9,628·5 | 573 | 5·99 |

The new dairy-barn was completed during the year and provides very comfortable accommodation for a herd of twenty animals. This building will improve the facilities for handling the herd and will render possible the keeping of accurate records both of production and cost of production.

## HORSES

No experimental breeding work is carried on with horses and only sufficient horses are carried on the Station to handle the work. The stock consists of five work teams, two light single horses, two two-year-old colts, one yearling and one foal.

## SHEEP

The flock of registered Cheviot sheep increased during the year by twenty-two lambs, from twelve ewes bred, eleven of which were ewe lambs. "Stormproof," the imported ram, had been used for two seasons and his get had many desirable qualities, chief of which was the improved quality of fleece. However, he was down behind the shoulders and this weakness he transmitted to his offspring in too great a degree. He is succeeded this year, by a shearling ram, possessing equally as good fleece but more strength in the back, bred at Macdonald College.

The flock all told at the close of the year consisted of nineteen females of breeding age, one shearling ram, eleven ewe lambs and one ram lamb. Eight three star and two star rams were sold to head range flocks in the interior and the crossing of these Cheviot rams on the Oxford cross-bred ewes of the range flocks will be watched with great interest by the breeders of the Interior of British Columbia.

## SWINE

The Berkshire herd has been further improved by severe culling, which eliminated some of the mature sows, and by the addition to the breeding herd of several very choice young gilts bred on the Station. These were with an exception, the get of "Ottawa Model 92," a Central Farm-bred boar, who is not only leaving large, strong litters that are making two hundred pound hogs in six months, but is throwing beautiful type. His get show extreme length for Berkshires, together with fine shoulders, deep smooth sides and strong heart-girths, neat trim fronts, strong well-arched loins and neat well-filled hams. A considerable number of males and females for breeding purposes were disposed of during the year.

All swine are carried in colony-type houses, and open sleeping-sheds, and liberal yard room is allowed to provide exercise. Two litters per year are raised from each sow.

VALUE OF ALFALFA VS. ROOTS FOR MARKET HOGS—PROJECT A. 463
VALUE OF ALFALFA VS. APPLES FOR MARKET HOGS—PROJECT A. 464
VALUE OF APPLES VS. ROOTS FOR MARKET HOGS—PROJECT A. 465

These projects were commenced on January 14, and concluded on April 27. Six pens, of seven hogs each, were confined in separate yards, provided with colony-houses, and meal and roots fed by hand. The pens receiving alfalfa hay were fed this in racks and this was kept before them at all times. Grain was fed three times daily and consisted of shorts, bran, oat chop and barley chop. The barley chop was gradually increased until 50 per cent of the grain mixture fed in the last three weeks consisted of ground barley. In addition 5 per cent oil meal, 7 per cent tankage and 1 per cent bone meal was added to the grain mixture.

The pens were rationed as follows:—

Pen 1. Meal, apples, alfalfa.
Pen 2. Meal, roots, alfalfa.
Pen 3. Meal, alfafa.
Pen 4. Meal, apples.
Pen 5. Meal, roots.
Pen 6. Meal only.

The hogs were marketed at an average of 175 pounds in weight and the general health and thriftiness of all pens was excellent throughout the entire period. The results were such as would indicate that alfalfa would replace the roots or apples in a feeding ration; further that apples appear equal in value to roots for hog-feeding.

As this experiment will be continued over a number of years, no definite conclusions are permissible at the end of the first year. However, it may be safely stated that due probably to the fact that all six pens had an equally large yard for exercise, very little variation in gain or feed cost per pound gain was evidenced between any of the pens. The alfalfa gives exceptional promise. Under more closely confined conditions the results would probably have been different.

## BEES

The season of 1925 was a good one for bees at this Station, although the honey yield throughout the Okanagan valley was rather lower than usual. The winter 1924-25 was long and more severe than the average but this was partially offset by a warm early spring enabling the bees to work well during the early brood-rearing. No losses occurred during the winter and all colonies came through with sufficient stores for spring needs.

The principal sources of nectar were the same as in preceding years, viz., alfalfa, Dutch, alsike, and sweet clovers and vetch. Of these alfalfa probably gave the best yields.

After sending three colonies to Illustration Stations in northern British Columbia, the season's work was carried out with seven hives, which were divided for an increase of five, making a total of twelve put into winter quarters at the end of October.

The total crop produced from the seven hives (spring count) was 1,505 pounds, an average per hive of 215 pounds. The greatest yield from one hive was 309 pounds, which includes increases taken from the parent colony. Almost a sufficiency of honey was retained in the hives for winter needs, as only 100 pounds of sugar was purchased for feed syrup and all colonies received the same weight of stores as in former winters.

### METHOD FOR DETECTING PREPARATIONS FOR SWARMING—PROJECT AP. 5

The object of this experiment is to ascertain whether preparations for swarming can be detected by use of a double brood chamber.

Supers, without excluders, were added to all colonies as soon as necessary in the spring. During the swarming season these were tipped from the rear to see if queen-cells were being built, it being thought that cells would be constructed in the super before the brood chamber proper. There was only one case of any tendency to swarm during the entire season and in this the swarm issued, the queen-cell having passed unnoticed at the previous examination.

Notes on the various colonies follow:—

Colony No. 1. No cells built during season.
" 4. Supersedure cells found June 19 in the super as well as brood-chamber proper.
" 5. No cells built during season.
" 6. Cells unnoticed. Swarm issued June 19.
" 12. No cells built during season.
" 13. The only cells built were those to replace lost queen.
" 14. No cells built during season.

### WINTERING BEES IN FOUR-COLONY CASE—PROJECT AP. 8

No deaths occurred under this method of wintering. The average number of combs covered by bees on April 6, the date of first thorough spring examination, was six. The average weight of stores was 11.25 pounds.

23475—2½

### WINTERING BEES IN SINGLE-COLONY CASE—PROJECT AP. 10

All colonies, to the number of seven, came through the winter in good shape, except for the loss of one queen which necessitated the union of that colony with another. The average number of combs covered by bees on April 6 was 7.3. The average weight of stores at the same date was 15.5 pounds. Kootenay cases were used for protection in this experiment.

### RETURNS FROM APIARY—PROJECT AP. 20

The total amount of extracted honey from seven colonies, spring count, was 1,505 pounds or 215 pounds per colony. The value of this at 20 cents per pound was $301. Adding to this the value of colony increase during the season at $7 per colony the total return was $336. Deducting the cost of sugar for fall feeding, viz., $7, the profit is shown to be $329.

### COMPARISON OF DIFFERENT SIZES OF HIVES—PROJECT AP. 21

Two sizes for hives were used this season, the "Langstroth," 10-frame hive, and the "Jumbo," 10-frame hive. Production records under each system follow:—

TABLE 3.—TYPE OF HIVE

| Size of hive | No. of hives | Total honey yield | Average per colony |
|---|---|---|---|
| | | pounds | pounds |
| Jumbo | 2 | 312·0 | 156·0 |
| Langstroth | 4 | 788·75 | 197·2 |

While the Langstroth hives gave the better results, these returns should not be taken as conclusive, as figures must be averaged over a period of years.

### PROTECTED VERSUS UNPROTECTED HIVES DURING SUMMER—PROJECT AP. 42

This experiment is being conducted to determine whether protecting cases for colonies influence the honey yield or not.

Two colonies were placed in Kootenay cases and lifts built up during the summer to correspond to the number of supers. Two received only brood-chamber protection from Kootenay cases the entire summer. One colony was all that could be spared as a check and this received no protection whatever.

TABLE 4.—PROTECTING HIVES IN SUMMER

| Method followed | Yield from parent colonies | Yield from increases if any | Total yield | Average per colony |
|---|---|---|---|---|
| | pounds | pounds | pounds | pounds |
| Full protection | 224·75<br>147·0 | ..... | 317·75 | 185·87 |
| Brood-chamber protection | 229·5<br>225·0 | ..... | 454·5 | 227·25 |
| No protection | 86·0 | 223·0 | 309·0 | 309·0 |

This experiment will have to be carried on for several years before any definite conclusions can be drawn.

## CEREALS*

A large part of the southern interior of British Columbia served by this Station raises some cereal crops for either grain, hay or ensilage. The acreage, although not extensive, is important in the scheme of mixed farming in general practice. In view of the fact that the cereal investigations conducted at this Station are under irrigation only and also that the territory served includes irrigated and non-irrigated districts and with very variable soil and climatic conditions, it will readily be observed that definite recommendations as to varieties to sow are apt to be misleading, nor do the results to date of our cereal experiments justify making such recommendations. The work with cereals that is being conducted year by year do, however, justify this statement—that inquiries from farmers for assistance with their cereal problems are always welcome and with a knowledge of their individual problem, the results of our cereal investigations may prove of service.

### SPRING WHEATS, OATS, BARLEYS

(Test of varieties of strains—Projects Ce. 1, 5, 6)

Previous to 1924 these cereal projects were conducted in duplicate one-sixtieth-acre plots. The average results in detail of these experiments for a period of seven and eight years are published in this Station's reports for the years 1922 and 1923. Starting in 1924 the cereal work has been conducted on the rod-row system of plots, replicated four times. The two years' results do not permit of these results being presented at this time.

Fifteen varieties or strains each of spring wheats, oats and barleys were tested in 1925. All the grains under test made excellent growth and reached maturity, thus making it possible to record much valuable data.

### WINTER WHEAT

(Test of Varieties or Strains—Project Ce. 4)

Sixteen varieties and strains of winter wheats were seeded in the autumn of 1924 in rod-row plots replicated four times. Inadequate soil-moisture conditions delayed germination and retarded growth. Consequently, these winter wheats made very little top by the time winter set in. Of the sixteen varieties seeded only four survived the winter. Sixteen varieties were again seeded this year and they give promise of wintering in excellent condition.

### FIELD BEANS, TEST OF VARIETIES—PROJECT CE-8

Sixteen varieties of field beans were tested and results recorded. A five-year average yield of twelve varieties of field beans is given in this Station's report for the year 1924.

## FIELD HUSBANDRY

Alfalfas, clovers and grasses on the Station came through the winter in excellent condition. Throughout the dry belt of British Columbia, however, considerable acreage of alfalfa was winter-killed. (See meteorological record at the front of this report.) This outstanding failure of alfalfa to survive the

* The work in the divisions of cereals, field husbandry, forage crops, chemistry, tobacco and economic fibre production is under the charge of Mr. A. J. Mann, B.S.A., Assistant to the Superintendent, who has been entirely responsible under the Superintendent for that work at this Station, and has prepared the sections of the report which deal with those particular divisional operations.

winter shows the importance of farmers using good quality seed of a hardy variety or strain from a known dependable source. Irrigation water was plentiful for the season. Good crops of very excellent quality alfalfa hay were harvested to feed the stock on the Station.

ALFALFA—YIELD OF HAY, NINE-YEAR AVERAGE

The various alfalfa fields from which these yields are taken include types of soils from gravelly loam to silt loam. The topography of the land is high, slightly rolling and with all aspects. The average results for nine years, 1917-25, are given in the following table.

TABLE 5.—ALFALFA—AVERAGE YIELD OF HAY—1917-25

| Year | Average yield per acre | Precipitation | | | Irrigation | |
|---|---|---|---|---|---|---|
| | | Rainfall | Snowfall | Total | Rate of application in acre-ins. | Acre-ins. of water per ton of hay |
| | tons lb. | inches | inches | inches | acre-inches | acre-inches |
| 1917 | 3 1,115 | 5·97 | 42·15 | 10·18 | 36·36 | 10·22 |
| 1918 | 4 1,830 | 5·74 | 22·20 | 7·96 | 41·80 | 8·50 |
| 1919 | 2 1,507 | 4·81 | 44·56 | 9·27 | 21·65 | 7·86 |
| 1920 | 2 1,616 | 8·34 | 18·90 | 10·23 | 21·49 | 7·65 |
| 1921 | 4 264 | 8·51 | 27·70 | 11·28 | 11·22 | 2·71 |
| 1922 | 2 412 | 6·12 | 33·20 | 9·44 | 2·43 | 1·10 |
| 1923 | 3 282 | 11·37 | 19·90 | 13·36 | 31·0 | 9·86 |
| 1924 | 2 1,082 | 4·42 | 25·30 | 6·95 | 34·50 | 13·57 |
| 1925 | 3 792 | 5·43 | 36·10 | 8·85 | 32·0 | 9·78 |
| Average 9 years | 3 544 | 6·74 | 30·00 | 9·72 | 25·82 | 7·92 |

On soil where alfalfa or sweet clover have not been grown before, inoculation of the seed is necessary in order to obtain the best results in the establishing of a stand of alfalfa. Farmers requiring nitro-culture may obtain enough for 60 pounds of legume seed free of charge with full directions for using from the Dominion Bacteriologist, Central Experimental Farm, Ottawa. Applications from British Columbia should be sent at least three weeks in advance of the time expected to seed. The number of pounds of seed to be inoculated and the approximate time of seeding should be sent with the application.

Inoculation may also be accomplished by taking soil, when the sun is not shining, from a well-established field of either alfalfa or sweet clover and scattering it on the field that is to be seeded at the rate of approximately 500 pounds per acre and immediately incorporating it into the soil by disking or harrowing.

Land preparation should be very thorough for a long-term crop such as alfalfa. Where irrigation is a factor to be considered, it is particularly important that the land be thoroughly and suitably levelled so as to provide for the economical distribution of water. It is also very important that the land be reasonably clean of weed seeds because the alfalfa plant in its early stages of development is poorly adapted to compete with weeds. If irrigated lands to be seeded are known to be dirty with weed seeds, it is well to delay seeding until the weed seeds are germinated and eradicated by an occasional harrowing when the young weed plants are about half an inch high. This method of cleaning the land of weeds before seeding to alfalfa is quite practical under irrigation, but not where alfalfa is being established where a deficiency of irrigation water is likely to occur in early summer, or on non-irrigated light dry soils. The seed-bed should be firm, particularly so on light dry soils, so as to bring the small seeds and small particles of soil in close contact and thus assist to ensure good germination and early development—neglect of this one important factor, a

firm seed-bed, invariably results in failure of the seed to germinate. The best time to seed will vary with the variable soils and climatic conditions existing throughout the interior of British Columbia. Each farmer should endeavour to study his own particular opportune time to seed—such time to be guided by suitable moisture conditions rather than temperature. In other words, if the soil in the spring has adequate moisture for good germination and is in a workable condition, it should be an opportune time to seed and no delay should be occasioned by anticipating probable frosts, for the young alfalfa plant can withstand any reasonable amount of frost that might be expected at that time of year. At this Station, excellent results are being obtained by seeding in late autumn—late enough so that germination does not take place until early the following spring. This method of seeding is especially worthy of consideration in districts where light dry soils, little snow for winter protection, and inadequate moisture conditions exist. Rate of seeding should be approximately from 10-12 pounds per acre of good quality seed of a hardy strain from a known source, and preferably Canadian-grown. If possible, seed with a grain-drill and through the tubes to a depth that will ensure the seed from drying out—or in other words, to a depth where there is moisture; this may be from one to almost three inches in depth and especially applies to light dry soils, even under irrigation. During the first year of establishing alfalfa under irrigation, deep root development is encouraged and a stronger stand secured by delaying and restricting irrigation after the young seedlings have appeared. The young plants should not be clipped unless in danger of smothering from weeds or producing too much growth. If clipping is necessary it should be delayed as long as possible and then clipped high with a mower and the clippings allowed to remain on the ground. A new stand of alfalfa during the first year should not be pastured and it should go into winter with about a foot of growth. Old established alfalfa fields, particularly fields that are more economical to be left to permanent alfalfa, that are in need of thickening or rejuvenating or eradicating of weeds, may be disked lightly and reseeded in the early spring at the rate of approximately 5 pounds of seed per acre. This practice will also apply to alfalfa fields that failed to produce a satisfactory stand in the second year.

## FORAGE CROPS

With the exception of Shoobut alfalfa and Ladino clover which were winter-killed, the alfalfas, clovers and grasses under test came through the winter in excellent condition. Irrigation was adequate for forage crop work throughout the season.

In the following tables of results in forage crop work, yields in green, dry and air-dried matter per acre are recorded. The method of determining the green and dry matter per acre was as follows: each plot was weighed immediately after cutting, which gave the yield in green matter. From each plot a representative sample weighing approximately 50 pounds was taken and passed through an ensilage cutter and thoroughly mixed. Duplicate samples weighing 2 pounds each were then taken for the determination of the absolute dry matter. These samples were air-dried in the sun and the drying process continued in a heated room until no further shrinkage was observed. The samples were then placed in an electric oven and dried to constant weight. The air-dried yields represent the yields of field-cured hay.

## ENSILAGE CROPS

Twenty-three varieties of Indian Corn were tested in duplicate seventy-fifth acre plots on silt loam soil which had grown alfalfa the previous five years. The land was ploughed in the early spring and worked down. Manure was applied at the rate of fifteen tons per acre and the land reploughed, disked, irrigated and prepared for planting. The soil was in excellent condition. All varieties were seeded May 22nd in rows three feet apart and on June 23 the plants were thinned to eight inches apart in the rows. Irrigation was adequate for the season. The rate of application in acre-inches, June-15; July-9; August-8, total of 32 acre-inches for the season. All varieties made excellent growth and were harvested on September 11. The results obtained were as follows:

### INDIAN CORN—PROJECT AG-1

Of the twenty-three varieties under test the following seven varieties were earliest in order of maturity—Quebec 28, Todd: North Western Dent, Brandon: Twitchells Pride, Fredericton; North Western Dent, North Dakota grown; North West Dent, Dakota; North West Dent, Summerland grown and Golden Glow, Kelowna grown. The stage of maturity was very promising for all varieties. Crompton's Early again has given highest yields over a number of years. This variety recorded highest yield green and dry weight in the three year average of 12 varieties—1923-25; second highest yield in green weight and fourth highest yield in dry matter per acre of twenty-three varieties under test in 1925 and highest average yield in green weight of six varieties for five years, 1921-25. A comparison of results for the years 1923-25 show considerable variations in yields of corn sold under the same variety name but obtained from different sources. In fact, with some varieties the variations in yields are so marked as to indicate that source of seed is a very important factor for growers to consider when purchasing seed corn—source of seed frequently is of more economic importance than variety. The results of North Western Dent from Summerland grown seed and of Golden Glow from Kelowna grown seed indicate promise for locally-grown seed corn, especially in view of the fact that practically all varieties of corn mature in the southern Okanagan valley. Under field conditions at this Station the following varieties have matured for ensilage and seed purposes: North Western Dent, Leaming; Golden Glow, Wisconsin No. 7 and Longfellow. In districts with higher altitude than 1,500 feet and in the northern districts of the southern interior of British Columbia districts where the season is shorter than at this Station and where frosts occasionally occur during the growing season for corn early maturing varieties should be considered and planting should be done immediately after danger of spring frosts. The object of each farmer producing corn for ensilage should be to grow the highest-yielding variety or strain that will mature under his particular soil and climatic conditions—and throughout the districts of the southern interior of British Columbia considerable variable soil and climatic conditions exist. The problem of obtaining seed corn of a known suitable variety or strain for a district might be overcome by some dependable farmer making a specialty of growing seed corn for the farmers of his district.

Twelve varieties of corn have been grown for three years, 1923-1925. The average yields, green and dry weights per acre are given in tables 6 and 7.

TABLE 6.—INDIAN CORN—TEST OF VARIETIES 1925

| Name | Source | Average yield per acre-green | Per-centage dry matter | Dry matter per acre 1925 |
|---|---|---|---|---|
| | | tons lb. | per cent | tons lb. |
| North Western Dent | Nebraska grown | 15 825 | 28·20 | 4 683 |
| North Western Dent | Summerland grown | 11 650 | 35·69 | 4 84 |
| North Western Dent | Brandon | 9 825 | 42·82 | 4 61 |
| Crompton's Early | Duke | 15 300 | 26·02 | 3 1,884 |
| North Western Dent | Dakota | 9 1,200 | 38·82 | 3 1,453 |
| White Cap Yellow Dent | Steele Briggs | 10 1,375 | 34·71 | 3 1,419 |
| Yellow Dent | Wimple | 10 1,450 | 34·52 | 3 1,404 |
| Golden Glow | Kelowna grown | 11 800 | 32·37 | 3 1,380 |
| Burr Leaming | Carter | 12 975 | 28,82 | 3 1,198 |
| Wisconsin No. 7 | Duke | 11 1,025 | 31·17 | 3 1,177 |
| Hybrid | Wimple | 10 1,000 | 33·01 | 3 932 |
| Longfellow | Dakota Imp. Seed Co. | 12 300 | 27·80 | 3 755 |
| Wisconsin No. 7 | Parks | 10 925 | 31·91 | 3 677 |
| Golden Glow | Duke | 10 925 | 31·81 | 3 656 |
| Leaming | Parks | 12 600 | 26·93 | 3 625 |
| Leaming | Duke | 10 850 | 31·09 | 3 482 |
| Disco 90 Day White Dent | Dakota Imp. Seed Co. | 10 550 | 31·45 | 3 463 |
| North Western Dent | North Dakota grown | 8 575 | 37·24 | 3 172 |
| Amber Flint | Wimple | 8 50 | 38·04 | 3 105 |
| North Dakota | Steele Briggs | 11 275 | 27·28 | 3 77 |
| Quebec 28 | Todd | 6 1,800 | 39·89 | 2 1,505 |
| Longfellow | Duke | 9 450 | 29·0 | 2 1,350 |
| Titchell's Pride | Fredrecton | 8 875 | 30·17 | 2 1,091 |
| Average of 23 varieties | | 10 1,417 | 32·55 | 3 850 |

TABLE 7.—INDIAN CORN, TEST OF VARIETIES, THREE-YEAR AVERAGE—1923-1925

| Variety | Source | Average yield per acre green weight | | Percentage dry matter | | Dry matter per acre | |
|---|---|---|---|---|---|---|---|
| | | 1925 | 1923-25 | 1925 | 1923-25 | 1925 | 1923-25 |
| | | tons lbs. | tons lb. | % | % | tons lb. | tons lb. |
| Cromptons Early | J. O. Duke | 15 300 | 14 1,138 | 26·02 | 28·13 | 3 1,884 | 3 1,596 |
| North Western Dent | Dakota | 9 1,200 | 11 1,707 | 38·82 | 30·94 | 3 1,453 | 3 1,086 |
| Longfellow | Dakota Imp. Seed Co | 12 300 | 12 414 | 27·80 | 27·41 | 3 755 | 3 805 |
| Wisconsin No. 7 | John Parks | 10 925 | 11 1,076 | 31·91 | 27·86 | 3 677 | 3 714 |
| Golden Glow | J. O. Duke | 10 925 | 12 3 | 31·81 | 27·24 | 3 656 | 3 533 |
| Leaming | John Parks | 12 600 | 12 1,180 | 26·93 | 25·53 | 3 625 | 3 460 |
| Disco 90 Day White Dent | Dakota Imp. Seed Co | 10 550 | 12 174 | 31·45 | 27·40 | 3 463 | 3 369 |
| Leaming | J. O. Duke | 10 850 | 11 82 | 31·09 | 28·24 | 3 482 | 3 156 |
| Wisconsin No. 7 | J. O. Duke | 11 1,025 | 10 1,537 | 31·17 | 28·02 | 3 1,177 | 3 64 |
| North Dakota | Steele Briggs | 11 275 | 11 335 | 27·28 | 26·23 | 3 77 | 2 1,993 |
| Longfellow | J. O. Duke | 9 450 | 9 1,428 | 29·00 | 27·09 | 2 1,305 | 2 1,293 |
| Titchell's Pride | Fredericton | 8 875 | 10 147 | 30·17 | 25,63 | 2 1,091 | 2 1,010 |
| Average of 12 varieties | | 10 1,856 | 11 1,271 | 30·29 | 27·48 | 3 558 | 3 340 |

## SUNFLOWERS, VARIETY TESTS FOR YIELD AND PURITY—PROJECT AG-76

Ten varieties of sunflowers were tested under the same cultural conditions as the variety tests with corn. All varieties were havested September 12. Results are as follows:

TABLE 8.—SUNFLOWERS, TEST OF VARIETIES, 1925

| Name | Source | Ave. height of plants | Yield per acre green weight | | Per cent dry matter | Dry matter per acre | |
|---|---|---|---|---|---|---|---|
| | | inches | tons | lb. | % | tons | lb. |
| Russian Giant | Dakota Imp. Seed Co | 108 | 8 | 1,550 | 35·16 | 3 | 170 |
| Russian Mammoth | K. McDonald | 108 | 8 | 275 | 36·67 | 2 | 1,968 |
| Manteca | C.P.R. | 72 | 5 | 275 | 39·99 | 2 | 109 |
| Ottawa 7o | C.E.F. | 72 | 4 | 700 | 38·28 | 1 | 1,330 |
| Manchurian | McKenzie | 72 | 4 | 500 | 38·62 | 1 | 1,302 |
| Mixed | C.P.R. | 63 | 5 | 50 | 29·10 | 1 | 924 |
| Black | C.P.R. | 66 | 4 | 250 | 32·03 | 1 | 642 |
| Manchurian | C.P.R. | 72 | 3 | 975 | 37·25 | 1 | 598 |
| Mammoth Russian | C.P.R. | 84 | 3 | 0 | 42·04 | 1 | 522 |
| Mixed Menonite | Rosthern | 54 | 3 | 600 | 30·51 | 1 | 14 |
| Average of 10 Varieties | | 59 | 4 | 1,922 | 35·96 | 1 | 1,558 |

Ten varieties of sunflowers have been grown for two years—1924 and 1925. The average yields in green and dry matter per acre are given in table 9.

TABLE 9—SUNFLOWERS—TEST OF VARIETIES—AVERAGE OF TWO YEARS, 1924-25—YIELDS, IN GREEN AND DAY WEIGHTS PER ACRE

| Name | Source of seed | Height in inches | Yield per acre green weight | | Per centage dry matter | Dry matter per acre | |
|---|---|---|---|---|---|---|---|
| | | inches | tons | lb. | % | tons | lb. |
| Russian Mammoth | K. McDonald | 86 | 10 | 1,409 | 30·24 | 3 | 11 |
| Russian Giant | Dakota Imp. Seed Co | 88 | 10 | 855 | 29·62 | 2 | 549 |
| Manchurian | McKenzie | 67 | 6 | 1,538 | 31·85 | 1 | 1,974 |
| Early Ottawa 76 | C.E.F. | 68 | 6 | 1,559 | 31·66 | 1 | 1,971 |
| Manchurian | C.P.R. | 68 | 6 | 480 | 31·29 | 1 | 1,567 |
| Mixed | C.P.R. | 63 | 7 | 288 | 25·45 | 1 | 1,481 |
| Mixed Mennonite | Rosthern | 54 | 4 | 934 | 27·00 | 1 | 1,330 |
| Manteca | C.P.R. | 64 | 5 | 446 | 31·83 | 1 | 1,311 |
| Mammoth Russian | C.P.R. | 72 | 6 | 696 | 30·65 | 1 | 1,130 |
| Black | C.P.R. | 64 | 6 | 359 | 26·61 | 1 | 1,066 |
| Average of 10 varieties | | 69 | 7 | 56 | 29·62 | 1 | 1,839 |

A comparison of the preceding tables of yields of corn and sunflowers show that corn yields considerably more than sunflowers in both green and dry matter per acre. In comparing sunflowers with corn for ensilage, sunflowers are more frost resistant and therefore may be seeded earlier than corn, an important factor in districts where the season is short and where corn is not likely to thrive nor mature. Where corn can be economically grown, it is without a peer as an ensilage crop. As compared with sunflowers, corn is more palatable, more nutritious, more drought resistant, more economical to harvest and invariably yields more dry matter per acre, and dry matter constitutes the true feeding value of a crop. However, the sunflower crop for ensilage has a place in Canadian agriculture and that place is in those districts where corn or other more desirable ensilage crops cannot be economically grown.

# ANNUAL HAY CROPS

## MILLETS—VARIETY TESTS—PROJECT AG-251

Seven varieties of millets were tested in triplicate 1/100-acre plots on gravelly silt loam soil which had grown roots the previous year. The land was fall-ploughed in 1924 and in the following spring prepared for seeding. From this time until seeding, June 22, many weed seeds were germinated and eradicated by an occasional harrowing. All varieties were sown broadcast June 22 at the rate of 30 pounds of seed per acre. Irrigation was adequate and the rate of application in acre-inches was as follows, June 7, July 11, total for the season 18 acres-inches. Table 10 gives the varieties tested and the yields per acre.

TABLE 10—MILLETS—TEST OF VARIETIES, 1925

| Variety | Per cent dry matter | 1925 | | Two-year average, 1924–1925 | |
|---|---|---|---|---|---|
| | | Yield per acre | | Yield per acre | |
| | | Green weight | Dry matter | Green weight | Dry matter |
| | % | tons lb. | tons lb. | tons lb. | tons lb. |
| Hog | 23·68 | 6 1,000 | 1 1,078 | 5 425 | 2 1,036 |
| Golden | 30·22 | 4 1,800 | 1 961 | 6 1,375 | 1 1,396 |
| Early Fortune | 22·57 | 4 1,000 | 1 31 | 5 1,875 | 1 1,031 |
| Common | 28·16 | 5 400 | 1 929 | 5 1,075 | 1 1,180 |
| Siberian | 38·07 | 4 300 | 1 1,160 | 5 1,050 | 1 1,455 |
| Hungarian | 39·36 | 3 1,700 | 1 1,031 | 5 175 | 1 993 |
| Japanese | 31·23 | 5 100 | 1 1,154 | 4 400 | 1 553 |
| Average of 7 varieties | 30·47 | 4 1,757 | 1 906 | 5 911 | 1 1,379 |

For an early-maturing variety, Early Fortune is especially suitable when the crop is required to mature in from 40-45 days. Golden millet has been consistently the best of the millets under test. It is very leafy and of excellent quality and requires from 67-70 days to mature for hay purposes.

## LEGUMES AND GRASSES AND MIXTURES FOR ANNUAL HAY, TEST FOR YIELD AND SUITABILITY—PROJECTS AG. 247, 248, 249

A number of legumes, grasses and mixtures for annual hay were tested under the same cultural conditions as the variety test of millets. The legumes, grasses and mixtures sown, rate of seeding, and yields per acre are given in tables 11 and 12.

TABLE 11—MISCELLANEOUS ANNUAL HAYS, 1925

| Corn sown | Rate of seeding per acre | Percentage dry matter | 1925 | | Two-year average, 1924-25 | |
|---|---|---|---|---|---|---|
| | | | Yield per acre | | Yield per acre | |
| | | | Green weight | Dry matter | Green weight | Dry matter |
| | pounds | % | tons lb. | tons lb. | tons lb. | tons lb. |
| Spring Rye | 90 | 30·11 | 1 300 | 0 692 | 2 1,300 | 1 87 |
| Barley | 100 | 44·39 | 1 1,500 | 0 1,554 | 2 366 | .. 1,777 |
| Sudan grass | 25 | 34·50 | 2 300 | 0 1,483 | 2 350 | .. 1,354 |
| Hubam clover | 20 | 24·12 | 1 1,600 | 0 868 | 1 1,700 | .. 1,108 |
| White sweet clover | 20 | 24·36 | 1 1,100 | 0 755 | 1 1,325 | .. 938 |
| Sorghum | 40 | 25·54 | 5 1,900 | 1 1,039 | ..... | ..... |
| Alaska Oat | 100 | 46·49 | 1 1,000 | 0 1,395 | ..... | ..... |
| Gold Rain Oat | 100 | 32·08 | 1 1,400 | 0 1,091 | ..... | ..... |
| Teft Grass | 7 | 41·01 | 1 500 | 0 1,025 | ..... | ..... |
| Leader A Oat | 100 | 34·91 | 1 400 | 0 838 | ..... | ..... |
| Cow Peas | 90 | 18·16 | 2 100 | 0 744 | ..... | ..... |
| Soy Beans | 90 | 29·60 | 1 200 | 0 651 | ..... | ..... |

TABL 12—MIXTURES FOR ANNUAL HAY, 1925

| Varieties and mixtures sown | Rate of seeding per acre | 1925 | | | Two-year average 1924-25 | |
|---|---|---|---|---|---|---|
| | | Percentage dry matter | Yield per acre | | Yield per acre | |
| | | | Green weight | Dry matter | Green weight | Dry matter |
| | pounds | % | tons lb. | tons lb. | tons lb. | tons lb. |
| Sorghum | 50 | 20·68 | 7 1,400 | 1 1,185 | 5 1,775 | 1 303 |
| Cow Peas | 25 | | | | | |
| Sudan Grass | 17 | 25·32 | 6 500 | 1 1,165 | 6 700 | 1 826 |
| Sorghum | 20 | | | | | |
| Sudan Grass | 10 | | | | | |
| Sorghum | 10 | 28·79 | 5 200 | 1 936 | ..... | ..... |
| Cow Peas | 22 | | | | | |
| Soy Beans | 22 | | | | | |
| Sorghum | 50 | 23·01 | 5 1,400 | 1 623 | ..... | ..... |
| Soy Beans | 25 | | | | | |
| Sweet Clover | 15 | 37·26 | 2 1,700 | 1 124 | ..... | ..... |
| Golden Millet | 20 | | | | | |
| Sudan Grass | 40 | 31·08 | 3 400 | .. 1,989 | ..... | ..... |
| Soy Beans | 25 | | | | | |
| Sudan Grass | 40 | 28·86 | 2 800 | .. 1,385 | ..... | ..... |
| Cow Peas | 25 | | | | | |
| Sweet Clover | 15 | 34·69 | 1 1,800 | .. 1,318 | ..... | ..... |
| Gold Rain Oat | 80 | | | | | |
| Peas | 45 | | | | | |
| Oats | 80 | 29·05 | 1 1,800 | .. 1,104 | ..... | ..... |
| Spring Vetches | 45 | | | | | |

Some desirable characteristics of an annual hay crop are: wide range or adaptability to soil and climatic conditions; ability to grow fast and compete with weeds, especially in the early stages of growth; easy to harvest and cure and the production of economical yields of palatable and nutritious fodder. Of the annual hays under test in 1924 and 1925, sorghum and sudan grass show much promise either in mixtures or pure. Peas were not worth harvesting and are not suitable to grow under hot dry climatic conditions even under irrigation. Teff grass gives promise of being a suitable grass for annual hay under somewhat limited moisture conditions. Hubam clover gave an earlier and stronger stand than white sweet clover, but not as good in quality. Cow peas and soybeans in mixture show considerable promise.

## ALFALFAS, CLOVERS, GRASSES AND HAY MIXTURES OTHER THAN ANNUALS

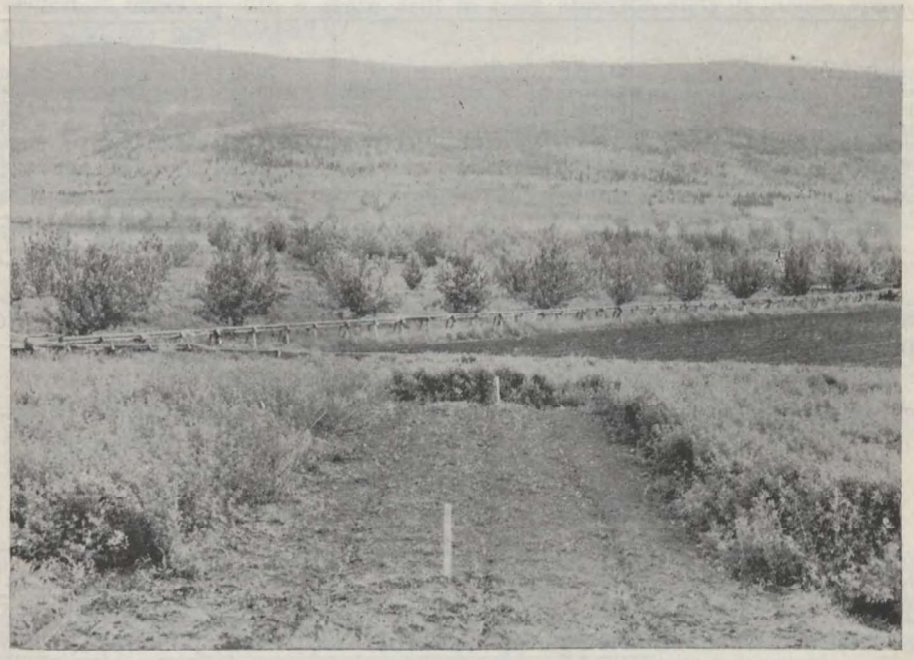
### ALFALFA, VARIETY TESTS FOR HARDINESS, YIELD AND SUITABILITY, PROJECT AG 126

Twelve varieties of alfalfa from different sources were sown in the spring of 1923 in duplicate 1/100-acre plots on gravelly loam soil which had grown sunflowers the previous year. All varieties were seeded broadcast at the rate of 12 pounds of seed per acre and without a nurse-crop. During the year of establishment all varieties produced a ton and a half of field-cured hay with the exception of the Siberian varieties which produced between six and seven hundred pounds. The varieties tested and the results obtained in yields of green and dry matter per acre for the years 1924 and 1925 are shown in table 13.

TABLE 13.—ALFALFA—TEST OF VARIETIES

| Name | Source of seed | Average yield per acre green weight 1925 | | | | | 1925 | | | Two-year average 1924-25 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Total of all cuttings | | | | |
| | | First cut June 17th | Second cut July 16th | Third cut Aug. 29th | Total | | Per cent dry matter | Dry matter per acre | | Yield per acre green weight | | Per cent dry matter | Dry matter per acre | |
| | | pounds | pounds | pounds | tons | lb. | % | ton | lb. | ton | lb. | % | ton | lb. |
| Grimm | Cap Rouge | 14,650 | 16,300 | 15,550 | 23 | 500 | 24·67 | 5 | 1,471 | 21 | 975 | 23·35 | 5 | 81 |
| Grimm | Brooks | 15,500 | 13,400 | 17,150 | 23 | 100 | 22·95 | 5 | 580 | 18 | 1,425 | 23·34 | 4 | 1,880 |
| Turkestan | Steele Briggs | 20,200 | 8,000 | 12,600 | 20 | 800 | 26·24 | 5 | 706 | 20 | 125 | 24·52 | 4 | 1,850 |
| Variegated | Steele Briggs | 15,550 | 10,200 | 12,350 | 19 | 100 | 26·64 | 5 | 150 | 18 | 650 | 25·64 | 4 | 1,411 |
| Cossack | Hansenstock | 18,400 | 11,700 | 10,800 | 20 | 900 | 26·95 | 5 | 1,022 | 17 | 950 | 26·24 | 4 | 1,214 |
| Cossack | Dakota Improved Seed Co | 13,500 | 10,000 | 11,750 | 17 | 750 | 27·21 | 4 | 1,455 | 16 | 725 | 26·68 | 4 | 743 |
| Sample | McCannus, Ida, Ont | 13,500 | 13,400 | 12,250 | 19 | 650 | 30·04 | 5 | 1,610 | 15 | 840 | 27·25 | 4 | 621 |
| Grimm | Lyman | 15,400 | 12,200 | 12,700 | 20 | 300 | 26·35 | 5 | 619 | 15 | 1,750 | 17·18 | 4 | 560 |
| Siberian | Boyd, Alberta | 21,500 | 11,000 | ..... | 16 | 500 | 28·41 | 4 | 1,233 | 15 | 1,075 | 26·17 | 4 | 165 |
| Siberian | Nelson, B.C | 16,000 | 14,000 | 13,000 | 21 | 500 | 25·18 | 5 | 701 | 15 | 250 | 26·92 | 3 | 1,901 |
| Medicago falcata | Paramount alfalfa Farm | 22,200 | 12,000 | ..... | 17 | 200 | 27·50 | 4 | 1,350 | 12 | 925 | 27·31 | 3 | 805 |
| Average of 11 Varieties | | 16,945 | 12,018 | 10,741 | 20 | 27 | 26·56 | 5 | 445 | 16 | 1,972 | 25·87 | 4 | 839 |

The outstanding result of the two years' test of these twelve varieties of alfalfas is the importance of using good quality hardy seed from a known dependable source—a fact that was very obvious last spring when the variety Shoobut from the Southern Argentine failed entirely to survive the winter. One of the Shoobut alfalfa plots which winter killed is shown in the accompanying picture. The Siberian varieties give much promise, especially for pasture purposes in districts where soil moisture is somewhat inadequate. Although only



Shoobut alfalfa from seed grown in Southern Argentine completely winter-killed. Hardy strains and seed grown in northern climates (Canadian-grown is best) should be used.

two cuttings per season were possible to harvest from these hardy Siberian varieties as compared with three cuttings of the other varieties under test, yet the yields are very good, although at the bottom of the list.

Twelve varieties of alfalfas from different sources were sown in the spring of 1923 in duplicate plots on gravelly loam soil. Of these varieties Shoobut from seed obtained in the Southern Argentine failed entirely to survive the winter of 1924-25. Heretofore, all varieties and strains of alfalfas under test at this Station have been quite hardy. The winter-killed plot of Shoobut alfalfa as shown in the foreground of the picture shows the importance of using good quality seed of a hardy strain from a known source and preferably Canadian-grown.

Eight varieties of alfalfas were sown in the spring of 1924 in duplicate 1/100 acre plots on gravelly loam soil which had grown roots the previous year. These alfalfas were established under extremely unfavourable cultural conditions.

In 1925 the rate of application of irrigation water in acre-inches was as follows: April-20, May-9, total, 29 inches.

Of the eight varieties under test, Cossack, D.I.S.C. was outstandingly the heaviest yielding variety in green and dry matter per acre. This variety and Siberian were more resistant to unfavourable soil moisture conditions caused by untimely irrigation than were the other six varieties. Siberian was not as early in maturing for hay purposes as were the other varieties in this test.

The following results represent one cutting only:—

TABLE 14.—ALFALFA TEST OF VARIETIES—1925

| Name | Source of seed | Per cent dry matter | Yield per acre 1925 | | | |
|---|---|---|---|---|---|---|
| | | | Green weight | | Dry matter | |
| | | % | tons | lb. | tons | lb. |
| Cossack | D.I.S.C. | 30·68 | 11 | 1,800 | 3 | 1,302 |
| Grimm | Lyman | 43·18 | 6 | 600 | 2 | 1,441 |
| Siberian | Boyd, Alta. | 37·78 | 6 | 1,850 | 2 | 1,232 |
| Variegated | Steele Briggs | 43·71 | 5 | 1,300 | 2 | 939 |
| Sample | Ida, Ont. | 49·23 | 4 | 650 | 2 | 258 |
| Cossack | Boyd, Alta. | 48·46 | 4 | 550 | 2 | 143 |
| Grimm | Brooks | 47·26 | 3 | 1,450 | 1 | 1,521 |
| Turkestan | C.E.F. | 45·07 | 3 | 1,450 | 1 | 1,358 |
| Average of 8 Varieties | | 43·17 | 5 | 1,706 | 2 | 774 |

Three varieties of alfalfa were sown in the spring of 1922 in single one-fourteenth-acre plots on drifting sandy soil which had grown hemp the two previous years. The yields for three years are given in the following table:—

TABLE 15.—ALFALFA, TEST OF VARIETIES, 1925

| Variety | Source | First cut June 10 | Second cut July 16 | Third cut Sept. 4 | Field—Cured | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Total yield per acre 1925 | | Average yield per acre 1923–25 | |
| | | lb. | lb. | lb. | tons | lb. | ton | lb. |
| Grimm | Lyman | 4,732 | 3,168 | 4,864 | 6 | 764 | 6 | 76 |
| Grimm | S.D. | 4,158 | 2,528 | 3,904 | 5 | 590 | 5 | 861 |
| Turkestan | Commercial | 4,325 | 3,008 | 3,488 | 5 | 821 | 4 | 1,286 |
| Average of 3 Varieties | 3 years | 4,405 | 2,901 | 4,085 | 5 | 1,391 | 5 | 741 |

BROADCAST VERSUS ROWS FOR HAY PRODUCTION PROJECT AG. 129

Turkestan alfalfa was sown in the spring of 1921 in sextuplicate plots on gravelly loam soil. The plots were sown broadcast and in rows at different distances apart. The following table gives the average yield per acre of field-cured hay.

TABLE 16.—ALFALFA—YIELD OF HAY—FIELD CURED—1925

| Plot | Average of six plots | | | Total yield per acre field cured 1925 | Average yield per acre field cured 1924-25 |
|---|---|---|---|---|---|
| | First cut June 11th | Second cut July 16th | Third cut Sept. 4th | | |
| | lb. | lb. | lb. | tons lb. | tons lb. |
| Broadcast | 5,550 | 4,450 | 4,900 | 7 900 | 7 133 |
| Rows 6" apart | 6,200 | 5,900 | 5,300 | 8 1,400 | 7 625 |
| Rows 12" apart | 6,150 | 4,750 | 5,150 | 8 50 | 6 1,742 |
| Rows 18" apart | 5,750 | 5,800 | 5,800 | 8 1,350 | 7 546 |
| Rows 24" apart | 5,950 | 4,900 | 4,950 | 7 1,800 | 6 1,479 |
| Rows 36" apart | 5,500 | 5,250 | 5,050 | 7 1,800 | 6 1,215 |
| Average | 5,850 | 5,175 | 5,192 | 8 217 | 6 1,857 |

The farther apart the rows were the greater tendency for the alfalfa crop to lodge, the greater difficulty in cutting the crop, and the greater loss of crop through not being thoroughly cut by the mower. In districts where alfalfa is being established under limited moisture conditions, the row system of seeding may give the better results, but even in such cases it is doubtful as to whether it is an economical practice to seed alfalfa in rows at a greater distance apart than 12-18 inches. Where conditions are favourable for obtaining a good stand of alfalfa, seeding with a grain drill in rows approximately 6 inches apart is probably the best method.

ALFALFA, SPRING VERSUS AUTUMN SEEDING, PROJECT AG-136

Three year's tests at this Station have given excellent results with autumn seeding. The method is to seed late enough in the autumn so that germination will not take place until early the following spring. This method of autumn seeding is worthy of consideration in districts where soil moisture conditions are inadequate, especially on light soils.

WHITE DUTCH CLOVERS, VARIETY TESTS FOR YIELD AND SUITABILITY, PROJECT AG-231

Six varieties of White Dutch Clovers were sown in duplicate 1/100-acre plots on gravelly loam soil in the spring of 1924. Very unfavourable cultural conditions during the year of establishment resulted in these clovers failing to produce sufficient crop to harvest in 1925. The variety Ladino was outstanding owing to the fact that it entirely winter-killed.

GRASSES, TEST OF VARIETIES, PROJECT AG-255

In the spring of 1924 a number of grasses were sown in duplicate 1/100-acre plots on gravelly loam soil which had grown roots the previous year. The plots were established under very unfavourable conditions and the following grasses, Canadian blue, Kentucky blue, sheep fescue, red fescue, western rye, Italian rye, English rye, native bunch grass (Agropyron spicatum) orchard,

and the legume sainfoin failed to produce stands sufficient to harvest. The five grasses that did survive out of the fourteen seeded were harvested and gave the following yields in green and dry matter per acre.

TABLE 17.—GRASSES—TEST OF VARIETIES—1925

| Name | Rate of seeding per acre | 1925 | | | Two-year average — 1925-25 | | |
|---|---|---|---|---|---|---|---|
| | | Percentage dry matter | Yield per acre | | Percentage dry matter | Yield per acre | |
| | | | Green weight | Dry matter | | Green weight | Dry matter |
| | pounds | % | tons lb. | tons lb. | % | tons lb. | tons lb. |
| Red Top | 14 | 39·22 | 2 1,200 | 1 39 | 40·82 | 6 250 | 2 1,113 |
| Meadow Fescue | 14 | 41·65 | 3 700 | 1 790 | 36·97 | 3 800 | 1 509 |
| Tall Oat Grass | 35 | 43·96 | 1 300 | .. 1,011 | 42·10 | 1 1,875 | .. 1,602 |
| Brome Grass | 15 | 52·59 | 2 1,100 | 1 682 | ..... | ..... | ..... |
| Timothy | 15 | 48·81 | 1 1,100 | .. 1,513 | ..... | ..... | ..... |

HAY AND PASTURE MIXTURES, PROJECT AG-258

Three hay and pasture mixtures were sown in duplicate 1/100-acre plots under the same cultural conditions as the grasses. The results are as follows:

TABLE 18.—HAY AND PASTURE MIXTURES—1925

| Mixture | Rate of seeding per acre | Per cent dry matter | Average yield per acre | |
|---|---|---|---|---|
| | | | Green weight | Dry matter |
| | pounds | % | tons lb. | tons lb. |
| Alfalfa | 1 | ..... | ..... | ..... |
| Red clover | 6 | ..... | ..... | ..... |
| Alsike clover | 4 | ..... | ..... | ..... |
| Timothy | 6 | ..... | ..... | ..... |
| Orchard grass | 3 | 38·31 | 4 600 | 1 1,295 |
| Alfalfa | 8 | ..... | ..... | ..... |
| Red clover | 2 | ..... | ..... | ..... |
| Alsike clover | 4 | ..... | ..... | ..... |
| Timothy | 6 | 52·71 | 2 1,400 | 1 846 |
| Alfalfa | 1 | ..... | ..... | ..... |
| Red clover | 4 | ..... | ..... | ..... |
| Alsike clover | 4 | ..... | ..... | ..... |
| Timothy | 8 | ..... | ..... | ..... |
| Orchard grass | 2 | 47·55 | 2 250 | 1 21 |

HAY AND PASTURE MIXTURES WITH ALFALFA, SWEET CLOVER AND RED CLOVER AS THE BASES —PROJECT AG. 258 (B), 258 (C), 258 (D)

Hay and pasture mixtures were started in 1922 to determine what grasses can be economically grown in a mixture with alfalfa as the base. In 1924 the experiment was enlarged and included hay and pasture mixtures with alfalfa, white sweet clover and red clover as the bases.

These hay and pasture mixtures were established under extremely unfavourable cultural conditions. In the first cutting, the white sweet clover mixtures gave larger yields of green and dry matter per acre than the alfalfa mixtures. After the first cutting, the sweet clover made practically no growth whereas the alfalfa made excellent growth. This indicates that the second cutting of the alfalfa mixtures would considerably out-yield the second cutting of the white sweet clover mixtures. It was very unfortunate that the land had to be ploughed and that no second crop was recorded.

The nine hay and pasture mixtures with red clover as the base and in the same varying combinations and proportions as the mixtures of alfalfa failed to produce sufficient stand of clover to harvest. The one year's test with these various mixtures indicates that favourable cultural, soil and moisture conditions are more necessary for red clover than either white sweet clover or alfalfa.

All mixtures received the same amount of irrigation. The rate of application in acre-inches was as follows: April 20; May 9; total for season 29 acre-inches.

Five hay mixtures with alfalfa as the base were seeded in the spring of 1922 on drifting sandy soil in one-fourteenth-acre plots. The yields of field-cured hay per acre for three years, 1923-25, are given in table 19.

TABLE 19.—HAY MIXTURES—WITH ALFALFA AS THE BASE—1925

| Mixture | Rate of seeding | First cut June 10 | Second cut July 16 | Third cut Sept. 4 | Field—Cured | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Average yield per acre | | Average yield per acre 1923-1925 | |
| | lb. | lb. | lb. | lb. | ton | lb. | tons | lb. |
| Alfalfa Meadow fescue | 6<br>15 | 3,766 | 3,648 | 4,096 | 5 | 1,510 | 5 | 459 |
| Alfalfa Timothy | 6<br>8 | 2,590 | 3,872 | 4,032 | 5 | 494 | 5 | 336 |
| Alfalfa Orchard grass | 6<br>16 | 4,592 | 3,552 | 4,352 | 6 | 496 | 5 | 59 |
| Alfalfa Western rye | 6<br>8 | 2,926 | 3,520 | 3,840 | 5 | 286 | 4 | 1,696 |
| Alfalfa Tall oat | 6<br>15 | 3,262 | 3,232 | 4,480 | 5 | 974 | 4 | 1,101 |
| Average of 5 mixtures | | 3,427 | 3,565 | 4,160 | 5 | 1,152 | 4 | 1,930 |

Nine hay and pasture mixtures in varying combinations and proportions with alfalfa and white sweet clover as the bases were established in 1924 under the same cultural conditions as the grasses and harvested in 1925, and gave the results shown in tables 20 and 21.

Of the mixtures sown with alfalfa as the base, alfalfa and brome grass gave the highest yields in green and dry matter per acre. Of the mixtures sown with white sweet clover as the base, the mixture containing two legumes and eight grasses gave the highest yields in green and dry matter per acre.

TABLE 20.—HAY AND PASTURE MIXTURES, 1925—ALFALFA AS THE BASE

| Mixture | Rate of seeding per acre | Per cent dry matter | Average yield per acre | | | |
|---|---|---|---|---|---|---|
| | | | Green weight | | Dry matter | |
| | lb. | % | tons | lb. | tons | lb. |
| Alfalfa | 6 | 36·47 | 6 | 1,900 | 2 | 969 |
| Brome grass | 8 | | | | | |
| Alfalfa | 6 | 48·26 | 3 | 900 | 1 | 1,330 |
| Brome grass | 5 | | | | | |
| Western rye grass | 5 | | | | | |
| Alfalfa | 6 | 50·47 | 2 | 600 | 1 | 232 |
| Brome grass | 4 | | | | | |
| Western rye grass | 4 | | | | | |
| *Bunch grass (Native) | 7 | | | | | |
| Alfalfa | 6 | 47·69 | 2 | 900 | 1 | 337 |
| Brome grass | 3 | | | | | |
| Western rye grass | 3 | | | | | |
| Bunch grass (native) | 5 | | | | | |
| Orchard grass | 4 | | | | | |
| Alfalfa | 6 | 40·30 | 3 | 500 | 1 | 619 |
| Brome grass | 3 | | | | | |
| Western rye grass | 3 | | | | | |
| Bunch grass (Native) | 5 | | | | | |
| Orchard grass | 3 | | | | | |
| Tall oat grass | 6 | | | | | |
| Alfalfa | 6 | 47·60 | 2 | 1,700 | 2 | 617 |
| Brome grass | 2 | | | | | |
| Western rye grass | 2 | | | | | |
| Bunch grass (Native) | 4 | | | | | |
| Orchard grass | 3 | | | | | |
| Tall oat grass | 5 | | | | | |
| Italian rye grass | 4 | | | | | |

TABLE 20.—HAY AND PASTURE MIXTURES—1925—ALFALFA AS THE BASE—*Concluded*

| Mixture | Rate of seeding per acre | Percentage dry matter | Average yield per acre | | | |
|---|---|---|---|---|---|---|
| | | | Green weight | | Dry matter | |
| | lb. | % | tons | lb. | tons | lb. |
| Alfalfa | 6 | | | | | |
| Brome grass | 4 | | | | | |
| Western rye grass | 4 | | | | | |
| Bunch grass (Native) | 3 | | | | | |
| Orchard grass | 2 | 54·71 | 2 | 1,500 | 1 | 1,009 |
| Tall oat grass | 4 | | | | | |
| Italian rye grass | 3 | | | | | |
| Timothy | 4 | | | | | |
| Alfalfa | 6 | | | | | |
| Brome grass | 2 | | | | | |
| Western rye grass | 2 | | | | | |
| Bunch grass (Native) | 3 | | | | | |
| Orchard grass | 2 | 50·91 | 3 | 100 | 1 | 1,605 |
| Tall oat grass | 4 | | | | | |
| Italian rye grass | 3 | | | | | |
| Timothy | 3 | | | | | |
| Meadow fescue | 2 | | | | | |
| Alfalfa | 6 | | | | | |
| Brome grass | 2 | | | | | |
| Western rye grass | 2 | | | | | |
| Bunch grass (Native) | 3 | | | | | |
| Orchard grass | 2 | 44·21 | 2 | 1,300 | 1 | 343 |
| Tall oat grass | 4 | | | | | |
| Italian rye grass | 3 | | | | | |
| Timothy | 2 | | | | | |
| Meadow fescue | 1 | | | | | |
| Red clover | 1 | | | | | |
| Average of 9 mixtures | | 46·74 | 3 | 600 | 1 | 1,239 |

*Bunch grass (Native)—*Agropyron spicatum*

TABLE 21—HAY AND PASTURE MIXTURES, 1925—WHITE SWEET CLOVER AS THE BASE

| Mixture | Rate of seeding per acre | Percentage dry matter | Average yield per acre | |
|---|---|---|---|---|
| | | | Green weight | Dry matter |
| | lb. | % | tons lb. | tons lb. |
| Brome grass | 8 | 36·59 | 4 1,250 | 1 1,384 |
| White weet clover | | | | |
| White sweet clover | | | | |
| Brome grass | 5 | 36·07 | 5 1,600 | 2 184 |
| Western rye grass | | | | |
| White sweet clover | 6 | | | |
| Brome grass | 4 | 35·42 | 7 250 | 2 1,047 |
| Western rye grass | 4 | | | |
| Bunch grass (Native) | 7 | | | |
| White sweet clover | 6 | | | |
| Brome grass | 3 | | | |
| Western rye grass | 3 | 35·37 | 5 1,900 | 2 209 |
| Bunch grass (Native) | 5 | | | |
| Orchard grass | 4 | | | |
| White sweet clover | 6 | | | |
| Brome grass | 3 | | | |
| Western rye grass | 3 | 36·94 | 5 150 | 1 1,749 |
| Bunch grass (Native) | 5 | | | |
| Orchard grass | 3 | | | |
| Tall oat grass | 6 | | | |
| White sweet clover | | | | |
| White sweet clover | 6 | | | |
| Brome grass | 2 | | | |
| Western rye grass | 2 | | | |
| Bunch grass (Native) | 4 | 35·43 | 5 600 | 1 1,755 |
| Orchard grass | 3 | | | |
| Tall oat grass | 5 | | | |
| Italian rye grass | 4 | | | |
| White sweet clover | 6 | | | |
| Brome grass | 4 | | | |
| Western rye grass | 4 | | | |
| Bunch grass (Native) | 3 | 38·31 | 4 1,350 | 1 1,582 |
| Orchard grass | 2 | | | |
| Tall oat grass | 4 | | | |
| Italian rye grass | 3 | | | |
| Timothy | 4 | | | |
| White sweet clover | 6 | | | |
| Brome grass | 2 | | | |
| Western rye grass | 2 | | | |
| Bunch grass (Native) | 3 | | | |
| Orchard grass | 2 | 38·40 | 4 1,650 | 1 1,706 |
| Tall oat grass | 4 | | | |
| Italian rye grass | 3 | | | |
| Timothy | 3 | | | |
| Meadow fescue | 2 | | | |
| White sweet clover | 6 | | | |
| Brome grass | 2 | | | |
| Western rye grass | 2 | | | |
| Bunch grass (Native) | 3 | | | |
| Orchard grass | 2 | 31·28 | 9 700 | 2 1,849 |
| Tall oat grass | 4 | | | |
| Italian rye grass | 3 | | | |
| Timothy | 2 | | | |
| Meadow fescue | 1 | | | |
| Red clover | 1 | | | |
| Average of 9 mixtures | ..... | 35·98 | 5 1,605 | 2 163 |

## FIELD ROOTS

### MANGELS, VARIETY TESTS FOR YIELD AND PURITY—PROJECT AG-21

Thirty-three varieties of mangels were tested this year and particular attention given to trueness of type and dry matter content of root.

Several years tests with mangels indicate the importance of seeding with the best quality seed obtainable—seed that is true to type and suitable for the particular soil and climatic conditions of the district.

23475—4½

The following tables give the average yields of a number of varieties that have been tested for several years.

TABLE 22—MANGELS—TEST OF VARIETIES—THREE-YEAR AVERAGE, 1923-1925

| Variety | Source of Seed | Percentage dry matter | Yield per Acre | | | |
|---|---|---|---|---|---|---|
| | | | Green weight | | Dry matter | |
| | | % | tons | lb. | tons | lb. |
| Giant White Sugar | Steele Briggs | 14·45 | 29 | 941 | 4 | 347 |
| Yellow Intermediate | C.E.F., Ottawa | 15·50 | 25 | 1,862 | 4 | 378 |
| Giant Rose Inter. Sugar | Wm. Ewing | 15·98 | 24 | 645 | 3 | 1,638 |
| Royal Giant Sugar | Steele Briggs | 15·40 | 24 | 471 | 3 | 1,630 |
| Green Top White Sugar | Wm. Ewing | 23·62 | 16 | 878 | 3 | 1,582 |
| Long Red | Steele Briggs | 15·57 | 24 | 678 | 3 | 1,420 |
| Giant Yellow Oval | Steele Briggs | 15·61 | 23 | 1,901 | 3 | 1,229 |
| Long Red | Wm. Ewing | 15·07 | 24 | 828 | 3 | 1,220 |
| New Ideal | Steele Briggs | 13·66 | 24 | 960 | 3 | 619 |
| Danish Studstrop | K. McDonald | 13·00 | 21 | 1,522 | 2 | 1,404 |
| Giant Yellow Globe | Wm. Ewing | 11·11 | 23 | 922 | 2 | 1,209 |
| Yellow Globe | Steele Briggs | 12·17 | 21 | 703 | 2 | 1,119 |
| Giant Yellow Intermediate | Wm. Ewing | 11·89 | 20 | 1,492 | 2 | 902 |
| Golden Tankard | Dupuy & Ferguson | 12·94 | 18 | 1,224 | 2 | 789 |
| Average of 14 varieties for three years, 1923-1925 | | 14·71 | 23 | 216 | 3 | 678 |

TABLE 23—MANGELS—TEST OF VARIETIES—TWO-YEAR AVERAGE, 1924-1925

| Variety | Source of seed | Percentage dry matter | Yield per acre | | | |
|---|---|---|---|---|---|---|
| | | | Green weight | | Dry matter | |
| | | % | tons | lb. | tons | lb. |
| Elvetham Mammoth | Hartman | 15·23 | 24 | 1,893 | 3 | 1,668 |
| Barres Half Long | General Swedish | 14·65 | 23 | 177 | 3 | 790 |
| White Red Top Half Sugar | Hartman | 15·22 | 21 | 1,556 | 3 | 662 |
| Stryno Barres | Hartman | 13·00 | 25 | 777 | 3 | 551 |
| Fjerrilsley Barres | Hartman | 12·72 | 24 | 1,824 | 3 | 411 |
| Svalof Alfa | General Swedish | 14·91 | 21 | 848 | 3 | 269 |
| Red Eckendorfer | General Swedish | 12·23 | 24 | 1,511 | 3 | 148 |
| Rosted Barres | Hartman | 13·60 | 23 | 380 | 3 | 190 |
| Barres Oval | General Swedish | 13·27 | 22 | 588 | 2 | 1,914 |
| Eckonderfer Yellow | Hartman | 12·67 | 22 | 1,678 | 2 | 1,822 |
| White Green Top Half Sugar | Hartman | 13·88 | 20 | 1,985 | 2 | 1,813 |
| Faaroje Barres | Hartman | 12·89 | 21 | 1,838 | 2 | 1,737 |
| Eckondorfer Red | Hartman | 12·80 | 21 | 1,996 | 2 | 1,618 |
| Yellow Eckondorfer | General Swedish | 12·98 | 19 | 57 | 2 | 982 |
| Yellow Intermediate | Summerland Exp. Station | 15·32 | 15 | 965 | 2 | 227 |
| Average of 15 varieties for 2 years, 1924-1925 | | 13·69 | 22 | 538 | 3 | 53 |

SUGAR BEETS, VARIETY TESTS FOR YIELD AND PURITY—PROJECT AG-66

Eight varieties of sugar beets for sugar-content analysis were grown this year for the Dominion Chemist, who reports as follows:—

"The results indicate high quality, both as to sugar content and purity. The weight per root is above the average for beets with such an excellent percentage of sugar and the yields are decidedly high."

CARROTS, VARIETY TESTS FOR YIELD AND PURITY—PROJECT AG-36

Nineteen varieties of carrots were tested this year for purity and yield of green and dry matter per acre. A number of varieties have been tested for several years and the average yields are given in the following table:—

TABLE 24—FIELD CARROTS—TEST OF VARIETIES—THREE-YEAR AVERAGE, 1923-25

Yields in green weight and dry matter per acre

| Variety | Source of seed | Percentage dry matter | Average yield per acre | | | |
|---|---|---|---|---|---|---|
| | | | Green weight | | Dry matter | |
| | | % | tons | lb. | tons | lb. |
| White Belgian | Wm. Ewing | 14·75 | 18 | 1,397 | 2 | 1,322 |
| White Intermediate | Wm. Ewing | 13·93 | 20 | 489 | 2 | 1,119 |
| Long Orange Belgian | J. A. Bruce | 15·06 | 17 | 1,968 | 2 | 1,093 |
| White Belgian | Halifax Seed Company | 14·28 | 18 | 956 | 2 | 1,030 |
| Long Red Surrey | Steele Briggs | 17·70 | 14 | 779 | 2 | 848 |
| Imp. Short White | Steele Briggs | 13·61 | 18 | 433 | 2 | 746 |
| White Intermediate | Summerland Exp. Station. | 14·78 | 16 | 1,479 | 2 | 715 |
| Danish Champion | C.E.F., Ottawa | 16·41 | 14 | 641 | 2 | 620 |
| Yellow Belgian | Wm. Ewing | 15·00 | 13 | 1,886 | 2 | 459 |
| White Belgian | J. A. Bruce | 15·01 | 14 | 885 | 2 | 219 |
| Long Orange | J. A. Bruce | 18·81 | 11 | 775 | 2 | 6 |
| New Yellow Intermediate | Wm. Ewing | 14·04 | 14 | 1,015 | 1 | 1,795 |
| Imp. Intermediate White | Dupuy & Ferguson | 12·27 | 16 | 1,434 | 1 | 1,714 |
| New Yellow Intermediate | Halifax Seed Co | 16·31 | 11 | 1,313 | 1 | 1,630 |
| Intermediate Smooth White | J. A. Bruce | 13·48 | 13 | 1,439 | 1 | 1,447 |
| Average of 15 varieties, 1923-1925 | | 15·03 | 15 | 1,393 | 2 | 451 |

## OTHER FORAGE—CROP PROJECTS

*Project Ag. 17.*—Mangels, breeding of pure strains. Selected roots of Yellow Intermediate were grown for seed. Roots were also grown of this variety and selections made for seed raising in 1926.

*Project Ag. 37.*—Field carrots, breeding of desirable types. Selected roots of White Intermediate were grown for seed. Roots were also grown of this variety and selections made for seed raising in 1926.

*Project Ag. 92.*—Agropyron spicatum, breeding improved strains. This experiment was continued and an excellent block of plants will be ready for further work in 1926.

*Project Ag. 111.*—Alfalfa, breeding improved strains. Selected plants were isolated in 1925 and seed obtained for further work in 1926. A block of plants were set out for observation and further selection.

*Project Ag. 117.*—Soybean, breeding improved strains. This experiment is being continued.

*Project Ag. 181.*—Soy Beans, variety tests for forage. One hundred and two varieties were tested this year and seed harvested for a continuance of this experiment in 1926.

*Project Ag. 256.*—Miscellaneous Legumes: Eleven kinds of vetches were seeded in duplicate 1/100-acre plots to determine their suitability for orchard cover-crops and forage crops. This work is being continued.

Wood's Clover. (Dalea alopecuroides). An annual legume used for soil building purposes on lands where the more important legumes do not thrive. This legume has been tested for two years and has produced excellent growth and matured an abundance of seed.

Japan Clover: (Korean lespedeza). This legume is used on poor lands for permanent pasture purposes. It has been tested for one season and produced excellent growth but no seed.

*Project Ag. 257.*—Miscellaneous forage crops other than grasses and legumes.

Australian Salt Bush (Atriplex semibaccata). A plant that is resistant to alkali and drought conditions is being tested at the Station and on alkali lands throughout the district. During the season of 1925 the plants under test at the Station made excellent growth and without irrigation. This work is being continued.

## HORTICULTURE

The study of horticultural problems, and experimentation in various directions to determine the solution for these problems, constitutes the major work of this Station. Until the year 1925 the supply of irrigation water was inadequate on the Station. In the year just closed the water supply all season was ample at all times and as the supply for the future appears now to be on a permanent basis, more experimental work will be possible.

This year the work in Horticulture at this Station was divided, Mr. R. C. Palmer, M.S.A., Assistant to the Superintendent, who was formerly in charge of all the work in horticulture, being given those divisions which have to do with tree fruit and small-fruit problems and investigations, and Mr. W. M. Fleming, M.S.A., formerly District Agriculturist at Duncan, was added to the staff as Assistant to the Superintendent and given charge of the work in vegetable gardening, truck crops, floriculture and landscape gardening. These officials have been responsible under the Superintendent for the work in their respective divisions and for the preparation of the report for this year in so far as it embraces the work of those divisions.

### Tree Fruits

Since a large area of the irrigated land in the British Columbia dry belt is planted to tree fruits, it is fitting that this Station devote considerable attention to investigation of problems associated with the culture of apples, pears and stone fruits. While a relatively small portion of the territory served by this Station is particularly suited to the production of small fruits a considerable quantity of berries is grown throughout the district for home use and local consumption. With these facts in mind a large number of experiments are being carried on in order to secure reliable information concerning the means whereby the largest possible yield of high grade fruit may be produced at the lowest possible cost.

While special attention is being directed towards the solution of production problems, some consideration is also being given to questions connected with the handling of the crop after it has been grown. As the quantity of tree fruits

produced in British Columbia has increased it has become increasingly important to devise ways and means of prolonging the life of the product to the end that fruits may be delivered to the consumer in prime condition over a fairly long period. It is with a view to throwing light on this problem that harvesting and storage investigations are being carried on at this Station.

It is impossible to present in detail, in a report of this nature, the complete annual results of the various fruit projects under way at this Station. Accordingly, only a brief outline of a number of experiments which have been carried on for several years is given in the following pages. The reasons for undertaking each experiment are set forth, the general plan of procedure is outlined and where significant results have been secured these are briefly stated. It is hoped that these general statements concerning the scope and progress of the work will prove of interest to a wide circle of readers. It is proposed to publish the detailed results of the various projects in the form of bulletins so as to make them readily available to those especially interested in any particular problem. Pending the time when the results of any specific project are available in bulletin form detailed information will gladly be furnished by letter.

## BREEDING OF TREE FRUITS

All but a very few of the varieties of tree fruits grown commercially are the result of chance seedlings. During the past few years, however, great progress has been made in the development of scientific methods of plant breeding. The application of breeding principles to the improvement of fruits is already bringing results and it is certain that plant breeding will have a very marked influence on the future trend of fruit growing. Our present commercial varieties have been selected as the best of countless chance seedlings but not one of them is perfect—all are susceptible to improvement. Eventually they will be replaced by other varieties possessing characters which will make them more profitable to grow. These replacements will necessarily be brought about slowly with tree fruits which are relatively long lived, but the process can be hastened by carrying on breeding operations. The expense, length of time, and area of land involved, make it very difficult for the grower to do breeding work with tree fruits. It is for this reason that the following projects are being carried on at this Station.

### APPLE BREEDING, PROJECT H 22

This project was started in 1924, the primary object being to produce a high-quality, attractive, long-keeping winter apple adapted to British Columbia dry belt conditions. Controlled crosses are being made, using such varieties as McIntosh, Delicious, Newtown and Winesap as parents. Several hundred seedlings have been secured from the crosses made in 1924 and a considerable quantity of seed from the 1925 crosses has been planted. It is proposed to continue making crosses each year and to grow the resulting trees to fruiting age, when the most promising seedlings can be selected for more extensive propagation and trial before being introduced to commerce.

### PEAR BREEDING, PROJECT H 43

The pear would undoubtedly be grown to a much larger extent in the British Columbia dry belt were it not for the fact that the bacterial disease known as Fire Blight has, at times, caused very serious losses. The foremost authorities on Fire Blight control are of the opinion that the losses caused by this disease will eventually be entirely prevented by the development of com-

mercial varieties of pears which are immune or highly resistant to the attacks of the bacteria which cause the injury. Certain Chinese varieties of pears have been found to be immune to Fire Blight but they are inferior in size and quality to the European sorts, the best of which are all extremely susceptible to Blight. It is hoped that by crossing these Chinese pears with the best commercial sorts, new varieties may be developed which will prove to be immune to Blight and at

Bridge-grafting on a tree that has been partially girdled by collar-rot.

the same time possess the necessary size and quality to make them of commercial value. With this object in mind propagating material of a number of immune and highly resistant varieties was secured in 1924 from Dr. F. C. Reimer of the Southern Oregon Experiment Station. It is proposed to propagate trees of these Chinese varieties and when they reach blooming age cross them with high-quality commercial varieties such as the Bosc, Bartlett and Anjou.

## CULTURAL METHODS FOR TREE FRUITS

Of the many operations connected with the production of fruit probably none is more worthy of investigation than soil management. Methods of soil management which bring success in one district are often quite unsuited to conditions encountered in another district where similar crops are grown. Even within the same district the cultural requirements of various kinds of tree fruits differ, and orchard practice must be adapted to suit differences in the character of the soil and the topography of the land. In order to determine the most profitable method of orchard soil management for any particular set of conditions numerous experiments must be carried out. Such experiments may be carried on to a limited extent by the individual grower, but a comprehensive investigation of the problem is possible only where facilities are available for conducting extensive experiments over a series of years.

It is to fill this need that this Station is devoting considerable attention to a study of various methods of orchard soil management. Information is being secured with regard to the influence of cultural methods on such factors as:—

1. Yield and quality of fruit produced.
2. Growth and vigour of trees.
3. Texture and fertility of the soil.
4. Water requirement.
5. Cost of operation.
6. Prevalence of orchard pests.

The projects under way involve a detailed investigation of a number of methods of orchard soil management, each of which gives promise of proving satisfactory in some section of the territory served by this Station. Over 35 acres of orchard are included in the various experiments which are briefly outlined in the following paragraphs.

### ALFALFA COVER-CROP, PROJECT H 404

At the time when this Station was started alfalfa was being grown in a few orchards in the Okanagan valley and had already been used to good advantage as a cover-crop in the irrigated sections of Washington. These facts made it seem advisable to undertake experiments with a view to determining the adaptability of alfalfa to British Columbia dry belt conditions. Accordingly a two-acre block of apple orchard was set out in 1916 and seeded to alfalfa. Since that date this block has been carried on under various systems of alfalfa cover cropping. In the spring of 1921 two more acres of apple orchard and three acres of stone fruits, which had been planted in 1916, were sown to alfalfa. In 1924 a third apple orchard, three acres in area, was set out in a two-year-old alfalfa field. These plantings have made it possible to observe the results following the use of alfalfa as a cover-crop on various types of soil and with trees of various kinds and ages. They have also facilitated the testing out of various methods of handling alfalfa in the orchard.

In brief it may be stated that the results to date indicate that, under British Columbia dry belt conditions, alfalfa cover-cropping can only be recommended in particularly favourable locations. Probably the two most important requirements for the successful use of alfalfa as a cover-crop are an adequate supply of water and a deep soil. An abundant supply of irrigation water is essential owing to the high water requirement of alfalfa. The irrigation water applied to each of the orchards on this Station during the past ten years has been carefully measured and the results suggest a water requirement of at least two and a half acre-feet per season in orchards where alfalfa is grown as a cover-crop.

The necessity of a deep soil is also due, in large measure, to the large amount of water required by alfalfa. Only in relatively deep soils can the necessary supply of water be stored up to supply both the trees and the cover-crop during the hot dry months of July and August when irrigation water is usually limited. The use of alfalfa as a cover-crop on shallow soils frequently results in keen competition between the trees and the alfalfa for water and in the event of such competition the trees are always the first to suffer.

Where conditions are favourable, however, cover-cropping with alfalfa has been found to give excellent results. The physical condition of the soil can be improved and the supply of humus and nitrogen greatly increased at very low cost. This improvement in soil conditions can be expected to result eventually in increased vigour of tree and greater yield of fruit, though it sometimes happens that the trees receive a severe check during the first year or two while the alfalfa is becoming established.

With regard to methods of handling alfalfa in the orchard it has been found that the water requirement is least where the crop is permitted to grow uncut and undisked until the latter part of August. After the last irrigation the crop may well be flattened down with a disk or float. This procedure facilitates the operation of picking and also reduces the danger of fire and encourages the rotting down of the cover-crop during the winter months. Under most conditions it seems desirable to give the alfalfa cover-crop a thorough disking in the spring of the year. A tractor disk is the most satisfactory implement with which to perform this operation but good work can be done with a horse-disk weighed down with bags of sand. This spring disking helps to control grass and weeds, tends to thicken up the stand of alfalfa and assists in incorporating humus with the soil. Under very favourable conditions one or even two crops of alfalfa can sometimes be cut for hay without causing any apparent injury to the trees. The practice of taking alfalfa off for hay is however, a very dangerous one since it increases the amount of irrigation water required and reduces the fertility of the soil.

Where an alfalfa cover-crop is grown special attention should be paid to the marking out of irrigation furrows. These should be relatively large and deep in order to ensure uniform distribution of irrigation water. Special precautions are also necessary to guard against injury from rodents. A space about four feet in diameter at the base of the trees should be kept clear of alfalfa and rubbish to minimize the danger of girdling by mice. Should moles and gophers become abundant it is advisable to practice trapping and poisoning, and in severe cases it is sometimes necessary to plough up the cover-crop.

To summarize, it may be stated that the growing of alfalfa as a cover-crop has its disadvantages as well as its advantages, and any grower contemplating seeding his orchard to this crop would be well advised to write to this Station for detailed information concerning the circumstances under which satisfactory results may be expected from such a procedure.

### ANNUAL COVER-CROPS—H. 580

There are a good many sections in the territory served by this Station where there is insufficient water to make it possible to grow permanent cover-crops. Under such conditions some form of annual cover-cropping, involving the cultivation of the soil during a portion of the growing season, is usually adopted. A number of annual and biennial crops are adapted for use in this type of orchard culture. It is in order to find out which of these crops will best meet the conditions encountered in various sections of the British Columbia dry belt that this project is being carried on. Three acres of apple orchard have been set aside for the comparative testing of such crops as hairy

vetch, spring vetch, buckwheat, fall wheat, fall rye, barley and rape. Seedings of each of these crops are made on August 1 and September 1, and a record is kept of the amount of growth made before winter sets in. All the crops are turned under in the spring and the land is kept clean cultivated in the summer. An additional four acres of apple orchard are being cover-cropped with hairy vetch in a similar manner with a view to determining the cost of operation and water requirement of an orchard so treated as compared with one in which permanent cover-crops are being grown.

The results of these experiments to date indicate that annual cover-cropping cannot be expected to give as good satisfaction as is achieved where there is sufficient moisture to permit the growing of continuous cover-crops. Nevertheless annual cover-crops have been found to be of considerable value in that they assist in maintaining the fertility and humus content of the soil and afford protection to tree roots during the winter. Hairy vetch is probably the most serviceable of the crops tested and has given good results when sown about August 1 and disked in the following May or early June. A good cover has been secured with the fall grains when these were sown as late as September 1. While considerable expense is involved the use of annual cover-crops is advised where there is insufficient water available to make the growing of permanent cover-crops possible.

### CLEAN CULTIVATION—PROJECT H. 403

At the time when this Station was started clean cultivation was in vogue in a good many of the British Columbia fruit sections. Accordingly, it seemed advisable to make a test of this method of culture. With this in mind a two-acre apple orchard was set out in 1916. During the succeeding ten years this orchard has been clean-cultivated. The soil has been worked after every irrigation and after any heavy showers which fell during the summer months. Weeds have been kept down. No form of cover-cropping has been practised nor has any barnyard manure nor chemical fertilizer been applied.

The results of this procedure have been far from satisfactory. During the first few years the trees made good growth and produced a fair tonnage of fruit. After six years, however, the depletion of soil fertility was evidenced by reduced growth and devitalized appearance of the foliage. The fact that it was found very difficult to secure a uniform distribution of irrigation water indicated that the physical condition of the soil had been injured. The cost of operation of this orchard was high, due to the labour involved in cultivation. Many of the trees were in a weakened condition by the fall of 1924 and the severe freeze experienced in December of that year further injured their roots to such an extent that there were a large number of deaths during the following summer. The losses were so serious that it was decided to remove all the trees from this orchard in the fall of 1925. The redeeming features of this method of culture are that it ensures freedom from rodent-injury and entails the use of the smallest amount of irrigation water of any system which has been tried out at this Station.

These results suggest that clean cultivation is a very dangerous method of orchard culture under Okanagan conditions and should only be resorted to under exceptional circumstances, such as a severe infestation of rodents or an acute water shortage.

### FARM ROTATION—PROJECT H-408

The practice of supplementing fruit-growing by dairying seems to be on the increase. This fact makes it imperative that information be obtained regarding the possibility of producing dairy feeds in the orchard. To secure data in this connection a two-acre apple orchard, set out in 1916, was carried

on under a farm rotation for five years. Mangels, grain and hay were grown, and the soil was heavily manured preparatory to the mangel crop. From time to time mangels and soiling crops have been grown on other orchards at the Station. Records have been kept of the crops harvested and the labour involved in their production.

The data provided by these experiments indicated that such crops can be grown to good advantage while the trees are small, but that intercropping of this nature should not be attempted after the trees have reached bearing age. The growing of clover hay in an orchard, even when the trees are small has not been attended by very satisfactory results, and where hay is required ar annual crop such as oats and vetch is recommended in preference.

### HAIRY VETCH COVER-CROP, PROJECT H 405

The fact that hairy vetch had been used to good advantage in other fruit sections suggested that this crop might well be tested under Okanagan conditions. Unfortunately none of the Station orchards were planted permanently to hairy vetch until 1920 although vetch had been used with oats as a soiling crop in a two-acre orchard for four years previous to that date. In the fall of 1920 this orchard was seeded down to vetch and has been carried on under a system of continuous cover-cropping with this legume since that time. In the fall of 1921, a three-acre stone-fruit orchard, which was planted in 1916 and had been intercropped with vegetables, was sown to hairy vetch which has been used as a permanent cover-crop from that time onward. An additionad acre of stone fruits, set out in the spring of 1924, is also being carried on under a system of continuous cover-cropping with hairy vetch.

These plantings have provided an excellent opportunity for studying the adaptability of hairy vetch to a system of permanent cover-cropping under irrigated orchard conditions. It has been found that hairy vetch is particularly well adapted for use as a cover-crop in the orchards of the British Columbia dry belt. Excellent results have been secured by sowing the vetch with a drill about the first of August. By blocking every other hole with a piece of cardboard and closing down the drill as far as possible without crushing the seed, good stands of vetch have been secured with the use of only 25 pounds of seed to the acre. When vetch is used as a continuous cover-crop, reseeding may be effected by disking early in August or when a fair proportion of the seed is ripe. Where the trees are so loaded down with fruit that fall disking is not practicable, good results have followed the application of the disk the first thing in the spring. Provided this spring disking is done early enough the vetch usually flowers in time to set seed the same year. In case of a serious water shortage a vetch cover-crop can be destroyed and the land reduced to a state of clean cultivation by thorough disking. This practice can also be made use of in the control of rodent-pests.

The use of hairy vetch as a cover-crop has been attended with most satisfactory resuts. The trees have been encouraged to make a strong vigorous growth and to bear excellent crops of fruit. The texture of the soil has been greatly improved and an adequate supply of humus and nitrogen has been provided. The cost of operation has been reduced to a very low figure and slightly less water has been required than is the case with alfalfa.

All things considered hairy vetch appears to be particularly well adapted for use as a cover-crop in the irrigated orchard sections of this province.

### RED CLOVER COVER-CROP, PROJECT H 406

For many years red clover has been recognized as a valuable crop for soil-building purposes, particularly as a means of increasing the humus and nitrogen content of the soil. It was logical therefore to infer that this legume might

prove of value as an orchard cover-crop. Acting on this assumption clover was used in seven acres of apple orchard during the first five years after the original orchards were set out at this Station. In a three-acre block the clover was planted with timothy and was cut for hay. In a two-acre block the clover was used in connection with the farm rotation already mentioned in this report. In the remaining two acres the clover was sown and ploughed up each year.

In none of these orchards did the clover give very encouraging results. The fact that clover has such small seeds necessitates the preparation of a very fine, firm seed-bed. The slow growth made by the young clover seedlings leaves this firmly packed ground exposed to the action of sun and wind over a fairly long period and is thus conducive to soil baking. The roots of the clover plant feed mainly at the same depth as the roots of fruit trees so that the clover plant competes with the trees for moisture and plant food. During the time that a clover cover-crop is growing in the orchard the trees frequently suffer a severe set back. However, the clover does increase the supply of nitrogen and humus in the soil, and after it is ploughed up the trees frequently show beneficial effects. Briefly, the experience with clover at this Station and elsewhere in the Okanagan valley suggests that it is not as desirable for cover-crop purposes as hairy vetch.

### SWEET CLOVER COVER-CROP, PROJECT H 578

Within recent years sweet clover has attracted considerable attention as a soil-improver. It is being used to good advantage as a cover-crop in the pear orchards of the Rogue river valley. The soil in this section of Oregon is very heavy clay similar to that encountered in several of the fruit districts of British Columbia. It is possible that in such sections sweet clover may be found to have value as a cover-crop. With a view to securing first-hand information as to the adaptablity of sweet clover to British Columbia orchard conditions, and in order to obtain reliable data as to how this cover-crop can best be handled in the orchard, it is planned to seed down two acres of pear orchard in the spring of 1926. From the knowledge of sweet clover gained from other experiments in progress at this Station it is anticipated that this crop will not prove as adaptable to use in orchards as hairy vetch or alfalfa. Nevertheless, it is considered that it may prove of value in locations where the soil is particularly heavy or where it is difficult to secure a good stand of other legumes.

### VEGETABLE INTERCROPS, PROJECT H 407

During the years which must necessarily elapse before an orchard comes into profitable bearing, the production of vegetable intercrops is frequently undertaken. The influence of such a procedure on the subsequent growth and productivity of the trees merits investigation. With a view to securing reliable data in this connection the original apple orchards planted on this Station in 1916 included a two-acre block which was intercropped with vegetables for the first seven years of its life. Vegetable intercrops have also been grown from time to time in the stone fruit orchards at this Station.

In general the results obtained indicate that vegetable intercropping should be accompanied by special measures for maintaining the fertility and physical condition of the soil. Continued intercropping without heavy applications of barnyard manure or the periodic turning in of a cover-crop can be expected to result in depletion of soil fertility and consequent injury to the trees. Chemical fertilizers cannot be relied upon to take the place of manure or cover-crops as they do not supply the organic matter which is so essential to the maintenance

of fertility and good physical condition in the soils of semi-arid regions. Good results have followed the culture of vegetable intercrops where cover-cropping with vetch has been practised every other year. The best results from vegetable intercropping cannot be expected unless at least one year out of every three is devoted to cover-cropping, or manure is applied in heavy annual applications.

## FERTILIZERS FOR TREE FRUITS

The researches of soil chemists and plant physiologists have brought to light the fact that many soils are deficient in certain elements which are essential to plant growth. Chief among these are the elements nitrogen, potash and phosphorus. The fact that application of these chemicals to the soil, resulted in increased yields of many farm crops suggested that similar results might be expected in the case of tree fruits. During the past thirty years many experiments have been carried on in Great Britain, Eastern Canada and the United States in order to find out whether it is profitable to apply chemical fertilizers to orchards. The results of these experiments have been somewhat contradictory, tending to indicate, in the main, that nitrogen is the only element which can be expected to give sufficient returns to justify the cost of application. Even with this element the returns vary greatly under different soil conditions, and the conditions existing within the tree itself appear to have an important bearing on the problem. It is with a view to ascertaining the results which may be expected from the use of chemical fertilizers to orchards in the British Columbia dry belt that the following experiments are being carried on.

### MAINTAINING FERTILITY IN STONE FRUIT ORCHARDS, PROJECT H 579

The number of enquiries received at this Station relative to the possibility of maintaining fertility in stone-fruit orchards by the use of chemical fertilizers indicated the necessity of securing reliable information in this connection. Accordingly, a three-acre orchard of peaches and apricots was set out in the spring of 1924. To one acre of this block chemical fertilizers are being applied, another acre receives an annual application of barnyard manure, while the third acre is being cover cropped with hairy vetch. Intercrops are being grown in the blocks receiving chemical fertilizers and manure. It is planned to continue this experiment on this plan for at least five years.

### PROMOTION OF ANNUAL BEARING IN APPLES, PROJECT H 531

It is the aim of every orchardist to encourage his trees to bear annual crops. Recent experiments in Eastern Canada and the United States have suggested that, at least in some cases, trees which have developed the biennial bearing habit may be induced to bear a full crop every year by applying nitrogen in the spring of the "off" year. It is in order to ascertain whether this practice can be relied upon to produce the desired results under Okanagan conditions that this project has been undertaken.

In the spring of 1924, thirty-six trees of the Wagener variety which had been planted in 1916 and which had all developed the biennial bearing habit were selected. Just before growth started nitrate of soda was placed around nine of these trees at the rate of 5 pounds to the tree. Another nine trees were given nitrate of soda at the rate of 10 pounds to the tree. A "heading in" type of pruning was practised on nine additional trees, while nine trees were left untreated. The results of this procedure should be manifested in the 1926 crop.

### SECURING SIZE IN WINESAPS, PROJECT H 412

There is urgent need for the production of a greater quantity of high-quality winter apples in British Columbia orchards. The Winesap meets this requirement admirably in those districts where it thrives to good advantage. Unfortunately, the fruit of this variety does not size up well in districts north of Penticton except under very favourable conditions. This project is designed to find out whether the Winesap can be successfully grown farther north by maintaining the soil in a high state of fertility. In the original planting of Winesaps which was made at this Station in 1916, eighteen trees were set. These were planted 30 feet apart one way and 15 feet the other. During the winter of 1923 the fillers were removed leaving ten trees 30 feet apart each way. Some of these trees have received heavy annual applications of chemical fertilizer. To others large quantities of manure have been applied, while some have been left as check trees without the use of chemical fertilizers or manure. All these trees are growing in an exposed location. To date they have made good growth but the crops have been disappointing both as to total tonnage and as to size of the individual fruits. Two other Winesap trees planted in a sheltered location have given much more satisfactory results even though they have received no manure nor chemicals.

These trees are not yet old enough nor are there a sufficient number of them in the experiment to justify definite statements, but, taken in conjunction with general observations in commercial orchards, these results suggest that factors other than soil fertility have a good deal to do with the productivity and the size of the Winesap. The variety seems to thrive in certain favoured locations as far north as Summerland but can be recommended for general planting in the Oliver, Osoyoos and Keremeos districts only.

## FILLERS FOR TREE FRUIT ORCHARDS

The question of just how far apart trees should be planted to give maximum returns over a series of years is one of vital interest to every fruit-grower. The practice of planting filler trees in orchards has some champions but many growers who have tried it have been disappointed in the results secured. Accurate records as to cost of operation and yields secured are necessary before definite conclusions can be arrived at in problems of this nature. It is to supply such information that the projects outlined in the succeeding paragraphs are being carried on.

### APPLE FILLERS—PROJECT H 530

There is fairly general agreement among western apple-growers that permanent trees of the standard varieties should be set not less than 30 feet apart each way. There is some difference of opinion, however, as to whether it is worth while to plant fillers. With a view to throwing light on this problem, the permanent trees in the twelve-acre cultural apple orchard set out in 1916 were planted 30 feet apart each way. These permanent trees were filled one way with such varieties as Jonathan, Wagener and Duchess.

By the summer of 1923 the fillers were beginning to crowd the standards and it was decided to remove most of them the following winter. The yield of fruit produced between 1916 and 1923 was not sufficient to pay the cost of planting, caring for, and removing the filler trees. Both fillers and standards have been left in a two-acre block in order to determine the influence of the fillers on the growth of the standards and on the total yield of fruit produced in the five years subsequent to 1923.

The results to date suggest that the growing of vegetable intercrops in young orchards is more likely to prove profitable than the planting of filler trees.

PEACH AND APRICOT FILLERS—PROJECTS H 533 & 534

During the past ten years the practice of "long" pruning apricots has become popular. It seems quite possible that the adoption of this type of pruning may necessitate planting the trees farther apart than was found advisable when the trees were headed back each year. With the purpose of determining the relation between distance of planting and methods of pruning, a three-acre orchard of apricots and peaches was set out in the spring of 1924. In this orchard half the trees were planted 20 feet apart each way, the other half being set 30 feet apart with a filler in the centre.

## HARVESTING OF TREE FRUITS

One of the most difficult problems in orcharding is that of determining when fruit is ready to pick. Under our present system of marketing, fruits are shipped for thousands of miles and are held for consumption months after they are picked. Under such conditions great care is necessary as to the time and method of harvesting. Fruit must be picked at such a time and in such a way that it can be delivered to the consumer in first-class condition. So long as each individual grower marketed his own fruit it was possible for him to find out whether or not he was harvesting it in such a way as to give the maximum of satisfaction to the consumer and so bring the greatest possible return to himself. At the present time, however, the bulk of our fruit goes through central packing-houses and it is impossible for each grower to trace his fruit to its destination and so determine whether his harvesting methods are satisfactory. This condition of affairs has suggested the necessity for maturity tests which might be used by packing-house officials and by the grower to ensure that the fruit is picked at the proper stage of maturity. Such tests must necessarily be carried on over a series of years and over a fairly wide territory. Investigations of this nature involve an immense amount of detailed record work which can be effectively undertaken by a government institution but which can hardly be attempted by a private individual. It is for this reason that an investigation of problems associated with the harvesting of tree fruits is being carried on at this Station.

MATURITY TESTS FOR APPLES—PROJECT H 414

Few growers seem to realize the importance of harvesting their apples at the proper stage of maturity. The fact that, during the past ten years, many car-loads of apples from the British Columbia dry belt have reached the consumer in an immature or overripe condition is ample evidence of the need for reliable maturity tests which will enable the grower to harvest his apples at the proper stage of ripeness.

A study of this problem was begun at this Station in 1920 and the work has been continued and extended each year. In 1925 the fruit from four trees of each of the varieties, Yellow Transparent, Duchess, McIntosh, Jonathan, Grimes Golden, Delicious, Wagener, Rome Beauty, and Yellow Newtown was used in the experiment. A peach box of apples was picked from each tree each week for a period extending well over the customary picking season for the variety. The " ground colour " or colour of the skin on the unblushed side of the apple was recorded at picking time as was also the seed colour, the hardness of the apples, the ease with which they could be removed from the tree,

and the development of watercore. The increase in red colour as the season advanced was recorded by estimating the percentage of red colour on each of ten marked apples on each tree each week. Similarly the increase in volume of the crop was calculated by caliper measurements made on each of ten marked apples on each tree each week. The loss from windfalls was arrived at by noting the number of marked apples blown off each week. The fruit was stored unwrapped in a ventilated common storage cellar. During the storage season of each variety the apples were examined at monthly intervals and observations made with regard to quality, condition, and the development of storage diseases. This procedure has made it possible to secure information as to the influence of maturity at picking time on the grade and volume of the crop harvested as well as on the keeping quality of the fruit.

In brief, the results have indicated that the changes in colour of the skin on the unblushed side of the fruit are a most useful guide to maturity. When the skin on the unblushed side is distinctly green at the time the apple is picked the fruit usually develops poor quality for the variety, softens quickly and is susceptible to storage troubles such as scald and shrivelling. In apples which are left on the tree until the skin on the unblushed side is clear yellow the storage life is frequently shortened by the development of breakdown. Between these two extremes there is a time when the ground colour is a light green-yellow. It has been found that apples picked at this stage usually develop good quality for the variety and keep well in storage. The optimum shade of ground colour is not identically the same for all varieties but a simple colour chart has been devised which shows the stage at which our most important varieties should be picked. It is hoped that, through the courtesy of the Bureau of Plant Industry, a number of these charts may be available for distribution to growers in time for use in harvesting the 1926 crop.

The ease with which the fruit parts from the spur is another very useful indication of maturity. In varieties such as McIntosh and Grimes Golden, which tend to drop freely after they have reached a certain stage of ripeness, it is probably the most important factor in determining when the fruit should be picked. Our results indicate, however, that a box or two of apples on the ground beneath a tree does not always indicate a reduction in yield, as the increase in size of the fruit remaining on the tree is frequently sufficiently great to compensate for a considerable loss in windfalls. The results of experiments conducted during the past five years suggest that apples should not be picked in an immature condition for fear of loss from wind, but that it is good practice to remove them from the trees as soon as they come off so easily that there is danger of serious loss from dropping.

By the use of a pressure tester of the type devised by J. R. Magness of the Bureau of Plant Industry it has been ascertained that most varieties of apples do soften appreciably as they ripen on the tree. However, the differences in hardness as the fruit approaches maturity have been found to be relatively small and complications have been encountered with the red varieties which frequently become harder with the deeping in intensity of the red colour. Furthermore it has been found that there is considerable variation in the hardness of apples of the same variety at the same stage of maturity when these apples have received different cultural treatment. Apples grown on heavy soil are usually softer at picking time than those grown on light soils. Similarly the large fruits grown under conditions of ample moisture supply are commonly softer than the smaller specimens resulting where the supply of moisture is not so plentiful. From the above remarks it may be inferred that the pressure tester has been found of doubtful value as a means of determining the proper time to pick apples.

Seed colour has also been found to be unreliable as a maturity test, since it varies greatly with the variety and with the seasonal weather conditions. The taking on of red colour is an excellent indicator of quality but is not always reliable as a maturity test since it is influenced by such factors as density of foliage. Size has likewise proved to be deceptive as an indication of maturity, for it has been found that, given an adequate supply of moisture in the soil, most apples continue to increase in size for some considerable time after their optimum picking season.

To summarize, it may be stated that the results of this investigation indicate that, in the ground colour test and in the ease with which the fruit leaves the tree, we have have two simple, practical methods of determining when apples should be picked. While these tests cannot be considered infallible their general adoption would undoubtedly result in a marked improvement in the quality of the apples shipped out from the British Columbia dry belt.

## IRRIGATION OF ORCHARDS

The fact that most of the orchards in the territory served by this Station are irrigated is ample justification for an investigation of problems associated with the irrigation of tree fruits. The privilege of being able to apply water to the land by artificial means is a very valuable one, but it brings with it new problems which are not encountered by the orchardist who relies on natural precipitation for his supply of soil moisture. The cost of delivering the water and of distributing it over the soil constitutes a heavy annual tax on the land. This tax can only be offset by the production of large yields of high grade produce. In order that high yields may be secured at least expense it is essential that water be applied to the land in the most economical manner possible. This can only be accomplished when reliable information is available concerning the best methods of applying the water, the most advantageous time to apply it, and the most desirable amount to apply. To secure such information it is necessary to carry out carefully planned experiments over a series of years. It is with this object in view that the following projects are being conducted.

### IRRIGATION OF APPLE ORCHARDS—PROJECT H-411A

At the time this Station was started there was very little information available concerning the irrigation requirements of apple orchards under British Columbia dry belt conditions. There was a considerable difference of opinion among growers regarding such questions as the influence of cultural methods on the amount of water required, the desirability of irrigating during the blooming period, and the benefits to be derived from fall irrigation. It was to clear up the uncertainty on such questions that this project was undertaken.

Since the time when the cultural apple orchards were set out in 1916 the water applied to each block has been carefully measured. Only sufficient water has been applied to keep the trees in good growing condition, and care has been taken to reduce to a minimum the losses due to percolation and run-off. Since the furrow method of irrigation is in almost universal use in the irrigated orchard sections of this province all the water has been applied by this method. A record has been kept of the dates of irrigation, the amount of water applied and the length of time required to apply it. Water has been applied before, during and after the blooming period and the results noted. Some orchards have been irrigated in the fall while other comparable blocks have been allowed to go into the winter without fall irrigation. Questions which must be answered by the grower first thing in the spring are: "What implements shall

I use to mark out my furrows"? "How deep should the furrows be and how far apart?" "What is the most economical length of run?" Such problems have received careful study during the past ten years and while stereotyped answers are not possible a great deal of useful information has been accumulated.

After trying out a number of marking devices it has been found that a small 6-inch plough and a single horse give as good satisfaction as any under a wide range of conditions. The plough can be rendered even more serviceable by reducing the size of the share and mould board. Where a tractor is available more elaborate machinery is probably justified. Under most conditions relatively deep furrows seem to be advisable, particularly where cover crops are being grown. The distance apart which furrows should be placed to give most economical results depends somewhat on the character of the soil. The one safe rule to follow seems to be that the furrows should be sufficiently close so that after a normal irrigation all the soil between the furrows at a depth of a foot or so below the surface is moistened. It has been found by repeated tests that after a 36-hour irrigation it is only in exceptional cases that the moisture has spread more than 18 inches sideways from the furrow. In this condition it might be well to point out that water travels faster in a downward direction that it does sideways. Where furrows are placed a long way apart and water is run a long time in the hope of moistening all the soil between them there is usually considerable loss from seepage. The most desirable length of run depends also to some extent upon the nature of the soil. On porous soil of sandy or gravelly nature best results have been secured with a comparatively short length to run, whereas with soils of a more impervious character, such as the clays and silts, longer furrows have been used to good advantage. Even under such conditions however, a furrow much more than 100 yards in length is likely to result in considerable loss through percolation at the upper end and in poor distribution of moisture in the area farthest from the source of supply.

With his furrows made the next question with which the grower is confronted is: "When shall I apply my first irrigation?" Many growers have the opinion that the application of water during the blooming season is likely to reduce the set of fruit. The observations made at this Station do not support this contention. During the past ten years no ill effects have been noted following the application of irrigation water while the trees were in bloom. The results secured suggest that an ample supply of moisture in the soil is essential during the spring months in order to ensure a good set of fruit. Accordingly, if the soil shows signs of drying out it seems advisable to apply water regardless of the stage of bloom.

When the grower has his water running, the next question which is likely to occur to him is: "How much water shall I apply?" Experimental results indicate that no hard and fast rule can be laid down. The nature and condition of the soil determines, in large measure, the amount of water which it is desirable to apply at each irrigation. It has been found that good orchard soil will hold, on an average, 2 inches of water for each foot in depth, so that where there is only a foot or two of good soil underlayed with sand or gravel the moisture holding capacity of the soil is relatively limited. On the other hand deep fertile soils provide a reservoir in which relatively large amounts of water may be stored. Even under the best of conditions application of more than 5 inches of water at a time is likely to result in considerable wastage. Unfortunately, few growers are equipped with the measuring devices necessary to determine how much water they are applying. Under such conditions they must judge the amount of water applied by the length of time required to apply it and by examination of the soil. The length of time required to apply irrigation water is by no means an accurate indicator of the amount of water applied, for it has been found that a much longer time is required to apply

a given amount of water to heavy soils and to soils of which the physical condition is poor than is the case with lighter soils and soils having a high humus content. On deep silt soils water can often be run in the same furrows for several days to good advantage, whereas a similar procedure on shallow soils underlayed with gravel would be most wasteful. The ideal amount of water to apply is that which will ensure a thorough moistening of the soil to the depth occupied by the tree roots. There is only one way to determine when this amount of water has been applied and that is by examining the soil at different depths. A small, strongly made spade is useful in making such examinations.

With regard to frequency of application it is impossible to arrive at any specific recommendation from the results secured. Apparently the most important point to keep in mind is that the soil should not be allowed to become very dry between irrigations, for when this occurs the trees are likely to be injured. Furthermore, it is very difficult to get water to spread uniformly in soil which has become badly dried out. In deep soils which are retentive of moisture irrigation at monthly intervals is often found sufficient, but on lighter, shallow soils applications at weekly intervals are sometimes found necessary during the heat of summer. Water should be applied before the trees show signs of suffering from lack of moisture. Where a vetch cover-crop is used the effect of a deficient water supply is usually evident in this crop before the trees have begun to suffer. A simple test of whether irrigation is required is to squeeze a ball of earth together in the hand. If the ball of earth falls apart when the hand is opened water should be applied.

The amount of water required and the frequency with which is should be applied have been found to be influenced considerably by cultural methods. Of the systems of orchard culture under test at this Station the alfalfa sod mulch has necessitated the use of the greatest, and clean cultivation the least, amount of irrigation water. A continuous cover-crop of hairy vetch entails the use of almost as much water as does cover cropping with alfalfa, but the vetch system may be modified to accommodate a shortage of irrigation water. While the use of cover-crops has been found to require the application of more water than where clean cultivation is practised it should not be inferred that the most advantageous use of water is made where continuous clean cultivation is the method of orchard culture adopted. Only where the soil is maintained in good physical condition and in a high state of fertility can the most economical use of irrigation water be made, for only under such conditions are large yields possible. Under British Columbia dry belt conditions the use of cover-crops appears to be one of the most valuable means of increasing production at relatively low cost. In short, the results of our experiments indicate that the growing of cover-crops can usually be expected to result in sufficiently greater yields to justify the application of the additional water required.

The question as to when the last irrigation should be given is one which necessitates a qualified answer since it depends upon such factors as climate, character of soil, seasonal weather conditions and cultural methods. In the more northerly districts the final irrigation may well be given about the end of July since subsequent applications have been found to encourage a late growth which makes the trees susceptible to winter injury. On the lighter soils, particularly in the sourthern end of the valley, it is often found necessary to irrigate as late as the first week in September in order to swell the fruit and prevent the trees from becoming prematurely defoliated. With regard to the possible benefits to be derived from an application of irrigation after the crop has been harvested it has been found that such a procedure is of considerable value where the soil is badly dried out. Root injury and collar rot have been found to be far more serious where trees have been allowed to go into the

winter with the soil in a dry condition than where good moisture conditions have been provided by fall irrigation. On the other hand where good conditions of soil moisture already exist there appears to be little gained by applying additional water.

### IRRIGATION OF STONE-FRUIT ORCHARDS—PROJECT H. 411C

Since stone fruits are grown to a considerable extent in the southern sections of the British Columbia dry belt, and since their irrigation requirements are considered to be somewhat different from those of apples and pears, it has been considered worth while to carry out experiments with a view to determining the most satisfactory irrigation practices to adopt with apricots, peaches, cherries, plums, etc.

The water applied to the variety stone-fruit orchards set out in 1916 has been carefully measured each year. A record has been kept of the dates or irrigation, the amount of water applied and the time required to apply it. Similar records are being kept of the water applied to the peach and apricot orchard set out in the spring of 1924.

The results have been similar in most respects to those presented in this report under irrigation of apple orchards, Project H. 411A, with the exception that it is possible to discontinue irrigation a little earlier with stone fruits. It should be emphasized, however, that it is advisable to continue irrigating stone fruits after the crop has been harvested. The practice of discontinuing irrigation as soon as the crop is picked often results in injury to the trees, particularly to the fruiting buds which should produce the following year's crop.

## JONATHAN BREAKDOWN

The development of a condition of decay known locally as "Jonathan Breakdown" in apples grown in British Columbia has resulted in an annual loss totalling many thousands of dollars. The disease is not confined to the Jonathan, but this variety is usually the one most seriously affected. The losses with the 1922 crop were unusually extensive. At that time fruit growers and shippers were divided in their opinions as to the cause and possible remedies for the trouble. Some were confident that Breakdown was due to the conditions under which the fruit was grown, others considered that the condition of the fruit itself at picking time was the key to the situation, while still others believed that the treatment of the fruit after it was picked played the major role in the development of the disease. It was to secure accurate data as to the cause of the trouble, and more particularly to determine ways and means of preventing its occurrence, that the following projects were started. In 1923 the work was conducted as a co-operative experiment by officials of the Central Experimental Farm, the Fruit Branch, and the Experimental Station at Summerland. For the past two years, the investigation has been continued and extended by the staff of this Station. So far the work has been confined to a study of the development of Breakdown in the Jonathan variety.

### INFLUENCE OF GROWING CONDITIONS ON BREAKDOWN—PROJECT H. 416A

There is a strong feeling, particularly among shippers, that the development of Breakdown, while it does not take place until after the fruit is picked, is, in reality, due to such factors as the condition of the trees, the nature of the soil on which they are growing, the amount of thinning practised, the methods of culture adopted, and the amount of irrigation water applied. It is to determine the truth in this regard that this experiment is being conducted.

During the past three years, apples have been harvested from some 150 individual trees located in various commercial orchards from Salmon Arm to Penticton. These trees have been selected so as to provide as wide a range as possible of age, type and vigour of tree, kind of pruning, degree of thinning, methods of culture, type of soil, and irrigation practise. The fruit from these trees has been wrapped, packed in standard apple boxes and placed in common storage, and the amount of Breakdown which has developed in the fruit from each individual tree has been determined at various stages of the storage period.

It has been found that Breakdown is apparently associated with seasonal weather conditions in that it is much more serious some years than others. Unusually hot dry weather during the summer months is apparently conducive to Breakdown. A certain amount of Breakdown has developed in the fruit from each of the districts where apples have been secured, but the disease has been found to be more serious in the districts where the soil is relatively heavy. Ample moisture conditions during August and September seem to be favourable to the development of Breakdown, while a deficiency in the moisture supply at that season of the year results in the production of small, firm textured apples which are seldom affected. Heavy pruning and thinning, light crops, and top-grafting on a vigorous stock seem to be conducive to Breakdown. In fact, any orchard practice or group of orchard practices which induces over-vigorous growth in the fruit seems to give the apples a tendency to develop Breakdown. These results suggest that overstimulation of the trees is not desirable. It seems possible to overfertilize, to prune and thin more severely than is necessary and to apply more irrigation water than is required. Nevertheless it should be borne in mind that high yields can only be produced by strong vigorous trees, that a certain amount of pruning and thinning is necessary, and that a good moisture supply is essential to the production of high-quality fruit in paying quantities. Apparently, the aim should be to produce the highest possible tonnage per acre of first grade, moderate sized fruit at the least possible cost.

### INFLUENCE OF CONDITION OF FRUIT AT PICKING TIME ON BREAKDOWN—PROJECT H. 416B

It was the contention of many close observers that the maturity of the apples at the time they were picked determined to a large extent whether or not Breakdown would develop. There were also a number who believed that large size, high colour and watercore were factors predisposing apples to Breakdown. This project was planned to test out the validity of these contentions. Each year for the past three years 20 or more trees have been selected in various commercial orchards. From each of these trees fruit has been harvested every week for a period extending well over the customary picking season. At each picking careful observations have been made of the maturity of the apples from each tree, notes being taken of the stage of "ground colour," the hardness, the seed colour, and the development of watercore in the fruit. The apples were wrapped, packed in standard apple boxes and placed in common storage. After being stored for several months they were examined and a record kept of the percentage of Breakdown in the fruit from each picking from each tree. Notes were also made with regard to the quality and the condition of the various samples. In order to determine the relation between size and Breakdown caliper measurements were made of each apple. Similarly the relation between red colour and Breakdown was ascertained by recording the percentage of red colour on each individual apple.

The results indicate that the maturity of the fruit at picking time has a great deal to do with the development of Breakdown. In 1923 practically no

Breakdown occurred in apples which were picked before October 15, no matter from what district, kind of soil nor tree they were picked. Fruit picked from the same trees at a later date broke down very badly and the later the date of picking the higher the percentage of apples which developed Breakdown. It was observed, however, that there were a few trees the fruit from which did not break down even though picked as late as October 27. In 1924 and 1925 similar results were recorded, with the exception that in 1924 an appreciable amount of Breakdown occurred in fruit picked as early as October 6, and in 1925 a small percentage of Breakdown developed in fruit harvested as early as September 29. No Breakdown occurred in fruit picked on September 15 in any of the years mentioned. These facts suggest that the development of Breakdown is influenced by the date at which the fruit is harvested. They also indicate however, that the safe date varies from year to year with season conditions. Furthermore, the date varies to some extent with individual trees, being influenced by cultural methods etc. Accordingly it is very difficult to set any calendar date before which Jonathan apples should be picked in order to prevent Breakdown, but it has been observed that the important factor in the prevention of Breakdown is not so much the calendar date on which the fruit is picked as the stage of maturity of the apples at the time harvested. Of the various maturity tests devised with a view to determining when apples are ready to pick, the "ground colour" test has been found to be one of the most reliable. As an apple ripens the ground colour, or colour of the skin on the unblushed side, changes from green to yellow. It has been found that practically no Breakdown occurs in Jonathans which are harvested when the skin on the unblushed side shows a tinge of green. A simple colour chart has been devised which shows the stage of ground colour at which Jonathans should be harvested and also the stages at wihch the fruit is too green or too ripe for best results. It is hoped that, through the courtesy of the Bureau of Plant Industry, a number of these charts may be available for distribution to growers in time to be of assistance in harvesting the 1926 crop.

The development of watercore is another indication of maturity which is of use in determining when the Jonathan should be picked. In this variety watercore first shows up as small water-soaked spots arranged in a circle about the core area. As soon as these spots appear the fruit should be harvested without delay, for a small percentage of such fruit has been found to develop Breakdown. When the fruit is left on the tree until these spots have commenced to join together in a continuous band of water-soaked flesh, the storage life of the fruit is usually comparatively short. In fact it has been observed that, under common storage conditions, a very high percentage of such apples develop Breakdown within a month of the time they are picked. A chart showing these stages of watercore has been prepared.

With regard to the relation of size and red colour to Breakdown it was found that most of the Breakdown occurred in large highly coloured apples. Nevertheless only a relatively small proportion of the large of highly coloured fruits developed the trouble, for so long as the large apples were picked soon enough they did not break down, and the small sizes were seldom affected no matter how highly coloured they were when picked.

To sum up the apparent influence of the condition of the fruit at harvest time on the subsequent development of Breakdown it may be said that the results of this experiment suggest that large size, high colour and watercore are frequently the forerunners of Breakdown, but that so long as the apples are picked before they reach an advanced stage of maturity they seldom develop the trouble. It is quite possible to pick the fruit too soon. Apples picked when the skin on the unblushed side is distinctly green in colour are usually poor in quality ond soften and shrivel rapidly in storage.

### INFLUENCE OF STORAGE CONDITIONS ON BREAKDOWN—PROJECT H 416C

It was the contention of many growers that Breakdown was due to the treatment of the fruit after it was picked. Accordingly it seemed desirable to find out whether the disease was influenced by such factors as temperature, humidity and ventilation. The question as to whether the use of apple-wraps and the packing of the fruit in commercial containers had any bearing on the Breakdown problem also seemed worthy of investigation. It was to throw light on such questions that this project was undertaken.

Comparable lots of apples were wrapped in oiled paper, sulphite paper, and stored loose. Similarly apples of the same size and grade picked from the same trees on the same date were placed in cold storage, ventilated common storage and unventilated common storage. These apples were examined at monthly intervals during the storage period and the amount of Breakdown under the various conditions was recorded.

The wrapping apparently exerted no significant influence on the development of the disease, for Breakdown occurred about the same time and to about the same extent in fruit which was wrapped in oiled paper, sulphite paper or stored loose. Temperature was found to have a considerable influence on the rate of development of the disease, for Breakdown developed much more slowly in cold storage than in common storage. It was observed, however, that after the fruit had been held for four months at a temperature of 32 degrees just as much Breakdown had developed as under common storage conditions. The results suggest that humidity may have some influence on the development of Breakdown, but further investigations are necessary before positive statements can be made regarding this point. With regard to the influence of ventilation, it was found that Breakdown developed more rapidly and to a slightly greater extent in an unventilated cellar than was the case where good ventilation was provided. It may be remarked that both the temperature and the humidity were slightly higher in the unventilated cellar.

Briefly it may be stated that while storage conditions have been found to influence the rate of development of Breakdown, there is little evidence to suggest that they are the primary cause of the trouble.

## PRUNING OF FRUIT TREES

Pruning has perhaps received more attention from scientific experimenters during the past fifty years than has any other orchard practice. A great wealth of accurate data has been accumulated from which it is possible to draw certain fairly definite conclusions as to the results which may be expected to follow the adoption of various methods of pruning. Nevertheless there still remain a number of practical pruning problems concerning which opinions are far from unanimous. With regard to form, the central leader, modified leader, and open centre tree each have their advocates. The most desirable height of head is also a matter of contention. Concerning severity of pruning there are those who consider that a certain amount of heading in, particularly with stone fruits and young trees, is good practice. There are others who deem it a crime to shorten back a branch at any time. Some claim that best results are secured by starting trees with a comparatively large number of branches, while others are strongly in favour of having relatively few main branches from the beginning. It is with a view to securing first-hand information on the above questions that the following experiments are being carried on.

### APPLE TYPE OF PRUNING—PROJECT H-32A

This project was designed to provide data as to the influence of various methods of pruning on the size and strength of the trees, and on the yield and grade of fruit produced.

Of the permanent trees set out in the cultural apple orchards one-third have been pruned to the central leader type, one-third modified leader and one-third open centre. The pruning on all the trees has been a moderate heading and thinning out during the first few years, followed by an annual thinning out. It has been found possible to produce a strong frame-work in each type of tree. The central leader trees are, however, tending to get out of reach even at this early date, while the open centre trees are not developing as large an area of bearing surface as are the other types. The modified leader type appears to be desirable for most varieties of apples. In this type of tree a good distribution of branches can be secured and a large bearing surface developed within reach of ladders of moderate height. In the modified leader tree the treatment during the first five or six years is similar to that used in developing a tree of the central leader type, but after that time the dominance of the leader is suppressed. Many varieties such as the Grimes Golden and Rome Beauty tend to assume the modified leader form without much training. With such varieties as Delicious and McIntosh it is usually necessary to check the leader after it has reached the desired height.

The matter of height of head is largely one of personal preference, but is also influenced to a certain extent by climatic conditions, methods of culture, etc. In districts where winter injury to the trunks is prevalent it is undoubtedly of advantage to have a relatively low headed tree. Picking, thinning and spraying costs are also somewhat reduced by keeping the trees low. However, low branches interfere seriously with cultural operations so that many growers prefer to have the first main branch come off from the trunk about two feet from the ground. Many of the trees on this Station were started with branches a foot from the ground, but in most cases it has been found desirable to remove these lower branches.

### APPLE, DEGREE OF PRUNING—PROJECT H-32B

The purpose of this project is to secure information concerning the influence of severity of pruning on the size of trees, the age when they come into bearing, and the yield and grade of fruit produced.

The filler trees in the cultural apple orchards received various degrees of pruning from the time they were set out. Similarly the trees in the Winesap and Rainier orchard, set out in the spring of 1924, are being pruned with varying degrees of severity.

The results secured indicate that severe heading while the trees are small tends to dwarf the tree and to delay bearing. On the other hand a severe thinning out, leaving few main branches appears to encourage a strong spreading growth and early fruiting. It is now evident that many of the trees at the Station were started with too many main branches. This has necessitated the removal of large limbs which reduces the bearing surface of the tree and results in large pruning wounds, besides being an expensive operation. These observations suggest that while some heading of young apple trees may be necessary the tendency in the past has been towards more heading and less thinning out than is desirable.

### APRICOT PRUNING—PROJECT H-533

During the past few years the practice of "long" pruning apricots, as opposed to annual heading back, has come into prominence. This method of pruning has apparently produced excellent results in the apricot sections of California. There is some doubt, however, as to whether it will prove so successful in British Columbia, for the climatic conditions here are quite different.

Accordingly, there is need for a carefully planned experiment to determine the reaction of apricot trees to various pruning practices under British Columbia dry belt conditions, and it is to fill this need that this project has been started.

Pruning tests have been carried out in a small way with the apricot trees set out in 1916 in the variety stone fruit orchard. The results of these preliminary experiments showed the necessity for a more comprehensive investigation of the relation between pruning, variety, soil fertility, and distance of planting. Accordingly, a block of apricots, an acre and a half in area, was set out in the spring of 1924. Three varieties, the Moorpark, Blenheim and Tilton were used. The trees were set at two planting distances, 30 feet apart each way with a filler in the centre, and 20 feet each way without a filler. One-third of the area is being continuously cover cropped with hairy vetch, another is being manured each year and intercropped with mangels, potatoes, etc., while the third is being similarly intercropped but treated with chemical fertilizers instead of manure. Three types of pruning are being practised, the "long", the "short" and an intermediate system. From this project it is hoped to secure reliable information concerning the influence of such factors as variety, distance of planting and methods of culture on the pruning problem.

The results secured to date suggest that the pruning of the apricot may well be less severe than has been advocated in the past, but that a certain amount of heading back may be found advisable at intervals of every 2 or 3 years. The essential feature seems to be that pruning be sufficiently severe so that in conjunction with other orchard practices it will result in moderately strong new growth.

### PEACH PRUNING—PROJECT H-534

The fact that "long" pruning has been conducive to such good results with the apricot has suggested that the peach might possibly respond well to similar treatment. Accordingly, a similar experiment to that outlined under Apricot Pruning, Project H-533, is being carried out with peaches, the varieties used being Elberta, J. H. Hale, and Tuscan Cling.

The results secured to date suggest that more severe pruning is advisable with the peach than is necessary with the apricot.

### PRUNE PRUNING—PROJECT H 577

The fact that prune and plum trees, when grown under British Columbia dry belt conditions, frequently stunt themselves by over-bearing at an early age has suggested that their vigour might be maintained by the adoption of some system of pruning. It is with the hope of finding some means of prolonging the bearing life of prune trees that this project has been begun.

The trees included in the variety orchard set out in 1916 and those used in an additional variety test started in the spring of 1925 are being used in this project. Some of the trees are being cut back every year, others every other year, while some are being left without any heading back.

The results to date indicate that pruning is of some assistance in maintaining the vigour of prune and plum trees but that it should be accompanied by good conditions of soil fertility and an ample supply of soil moisture if best results are to be secured.

### PEAR PRUNING—PROJECT H. 355

Difficulty is frequently experienced with young pear trees, in that the branches tend to assume an upright position, resulting in a compact tree which is slow in coming into bearing. Recent experiments conducted in California suggest that this condition may be overcome by adopting what is called the

"Caldwell" system of training. This system involves the spreading of the branches by tieing them down in a position approaching the horizontal. It is claimed that this method of procedure encourages early fruiting and produces a spreading type of tree.

In order to determine whether such a practice might be followed to advantage under local conditions, a number of trees of the Bartlett variety, planted in 1916, were tied at various angles in the spring of 1924. In addition it is planned to carry on a pruning and training experiment with 100 Bartlett trees planted as fillers in the pear orchard set out in 1925. Some of these trees will be left unpruned, some will be tied down, while an attempt will be made to spread the remainder by a thinning-out type of pruning.

The results secured from the few trees treated in 1924 indicate that the Caldwell system has several points in its favour. The tieing down of the branches has opened out the trees and encouraged fruit bud formation.

## SPRAYING OF TREE FRUITS

The testing of various spray materials for combating tree fruit pests and diseases is being carried out to good purpose by the Dominion and Provincial Entomologists and Plant Pathologists. Accordingly, it has not been considered necessary to carry on extensive spraying experiments at this Station. The work in this connection has been confined to the application of standard sprays for such insects and diseases as have made their appearance in the orchard, and to the installation and testing out of a stationary spray plant.

### STATIONARY SPRAY-PLANT

A comparatively recent development in orchard spraying is the use of a stationary tank and power outfit from which the spray is distributed throughout the orchard in pipes. The pipes are equipped with faucets at regular intervals and enough hose is used to spray fifteen to twenty trees from each faucet. Such plants have been in successful operation in the orchard sections of Wenatchee and Yakima for several years and their number is increasing rapidly. These facts made it seem worth while to ascertain the adaptability of the stationary sprayer to British Columbia dry belt conditions.

Through the courtesy of the Provincial Department of Agriculture an out-of-date model portable spray-pump and engine was secured free of cost. This outfit was renovated and the necessary permanent concrete tank constructed in time to test out the efficiency of the equipment in the summer of 1925.

The results secured suggest that, in the near future, a number of British Columbia fruit-growers are likely to find it economical to install stationary spray plants. The saving of time and labour effected is a considerable item, and the elimination of the jolting and rocking of machinery will doubtless add materially to the life of the outfit. The stationary plant seems to be particularly well adapted for use in orchards about ten acres in area where the topography of the land renders the use of a portable outfit difficult. The fact that the stationary plant does away with the necessity for a team facilitates the application of the spray at the time when weather conditions are most favourable, and also eliminates the interference with irrigation furrows commonly experienced when a portable machine is used. Probably the most serious argument against the stationary spray plant is the high initial cost, the piping alone approximating $50 an acre. However, growers who have had stationary outfits in operation for several years maintain that where three or more sprays are applied annually the expense is fully justified.

Growers contemplating the installation of a stationary spray outfit are cordially invited to visit this Station and inspect the plant. Considerable detailed information concerning the best procedure to follow in putting in a stationary sprayer is available.

## STOCKS FOR TREE FRUITS

It is well known that seedlings of tree fruits are highly variable both in regard to the type of the tree and the character of the fruit produced. In order to propagate fruit trees true to type man has, for centuries, resorted to the practice of grafting. The most common procedure has been to grow seedling trees to the age of one or two years and then to bud or graft these to the desired variety at the ground level. Until recent years little attention was paid to the fact that, in addition to the portion of the tree above ground, the root systems of seedlings vary greatly. It is now known, however, that the type of root-stock on which fruit trees are worked has a very marked influence on the vigour, productivity, and hardiness of the resulting trees.

During the past few years the practice of double working has gained many advocates. The usual procedure in double working is to graft some hardy stock on a seedling root system, and when a strong frame-work has been developed to re-bud or graft the stock to some more desirable variety. The chief advantage claimed for double working is that it makes it possible to grow tender varieties of fruit under more adverse conditions. Double working is also being advocated as a means of reducing the losses caused by fire blight. The following projects have been undertaken with a view to determining the value of hardy root stocks and double working under British Columbia dry belt conditions.

### STOCKS FOR APPLES, PROJECT H 360

British Columbia fruit-growers are only too familiar with the losses caused by various forms of winter-injury in the trunks and roots of apple trees. In the more northerly sections trunk-injury is a serious factor, while in the southern districts collar rot and root-killing take their toll. Some means of checking the losses due to these causes is urgently needed and it is with the hope of finding a solution that this project has been undertaken.

In 1916 a four-acre apple orchard was set out. Half of this block was planted to commercial varieties secured from various nurseries. The other half was planted to a number of new varieties originated at the Central Experimental Farm, Ottawa. These Ottawa varieties were worked on hardy root-systems obtained by sowing the seeds of apples secured from orchards where hardy varieties only were grown. The entire block was carried on under a system of clean cultivation for ten years after date of planting. In the spring of 1925 a large number of trees of the commercial varieties failed to leaf out properly, and on examination it was found that, while the portion of the tree above ground was quite healthy, many of the roots were dead. The injury was so severe that in a number of cases the trees died outright during the following summer. In the two-acre block of Ottawa varieties which had received similar cultural treatment only one tree was seriously damaged.

The killing of the roots was undoubtedly brought about by the sudden drop in temperature in December 1924. The fact that the orchard was clean cultivated evidently permitted the frost to penetrate the soil rapidly with the result that only the hardy root-stocks were able to withstand the shock. It is encouraging to be able to report that severe root-killing is seldom experienced where the soil is protected by a cover-crop. Nevertheless in districts where there is insufficient moisture available to permit the growing of cover-crops, it is evidently well worth while to make sure that trees are worked on hardy root-systems.

It is proposed to extend the root-stock investigations to include a study of the growing of trees on their own roots, and an attempt is being made to determine the commercial possibilities of propagating root-systems by layerage.

The climatic conditions at this Station are not favourable to investigation of the efficiency of double working as a means of preventing trunk-injury, for

injury of this nature is seldom experienced in the Summerland district. However, observations in commercial orchards suggest that it may be found advisable to use such stocks as the Canada Baldwin, Mammoth Black Twig, Winter St. Lawrence and McIntosh for the trunk and main frame-work of the more tender varieties in districts where trunk-injury is prevalent.

## STORAGE OF TREE FRUITS

Storage has come to be recognized as an essential step in the marketing of tree fruits. This is particularly true of the apple crop. The holding of fruit in storage brings with it new problems, many of which are difficult if not impossible for the grower or shipper to solve for himself. A detailed knowledge of the many factors which influence the storage life of fruit is essential if serious loss from storage diseases is to be avoided. Answers must be found to such questions as: "To what extent is the storage life of fruit affected by the conditions under which it is grown?" "At what temperature should various fruits be stored for best results?" "How much longer can fruit be kept in cold storage than in common storage?" "What atmospheric humidity should be maintained in storage rooms?" "What is the function of ventilation in fruit storage?" "Is the storage life of fruits prolonged by the use of wrappers?" In order that the answers to such questions might be made available to British Columbia fruit-growers and shippers storage investigations were begun at this Station in 1922. The work so far has been restricted to a study of the storage life of apples, and the various projects under way are outlined in the following paragraphs.

### INFLUENCE OF CULTURAL CONDITIONS ON THE STORAGE LIFE OF APPLES, PROJECT H. 29A

The correspondence received by this Station contains such queries as: "Which apples keep best, those grown where clean cultivation is practised or those from orchards where cover-crops are used?" "Does the application of chemical fertilizers influence the keeping quality of apples?" "Is it true that heavy thinning and severe pruning result in the production of apples that do not keep well?" "Are the best apples produced on light or on heavy soils?" This project has been planned with a view to throwing light on such questions.

Each year detailed storage records have been kept of the keeping quality of the fruit harvested from a large number of individual trees. These trees have been selected to provide a wide range of cultural methods, soil fertility and soil type, severity of pruning and thinning, etc.

A great deal of interesting data has been secured which seems to indicate that any orchard practice or group of practices which tends to produce fruit which is over-large for the variety tends to produce fruit having a relatively short storage life. These results suggest that the grower should endeavour to produce moderate sized rather than over-large fruit. It is no doubt possible to over-fertilize, to thin more heavily than necessary and to apply more irrigation water than is required, but a certain amount of pruning and thinning and an abundant supply of irrigation water appear to be highly desirable, for with out these it is impossible to produce a high yield of marketable fruit at a low cost per box. Even under the best planned system of orchard management there will undoubtedly be a certain proportion of over-large fruits produced. The results of this experiment suggest that such fruit should be disposed of relatively quickly as it has been found to have a comparatively short storage life.

INFLUENCE OF TEMPERATURE ON THE STORAGE LIFE OF APPLES—PROJECT H-29B

Most fruit growers and shippers are well acquainted with the fact that the ripening processes in apples are greatly retarded by holding the fruit at a temperature slightly above freezing. The exact temperature at which various varieties should be held, and the comparative efficiency of cold and common storages are, however, questions on which further experimental evidence is desirable. There is at present no cold storage equipment available at this Station, but through the courtesy of the Associated Growers of British Columbia it has been possible to make a comparative test of the storage life of apples kept under cold storage and under three types of common storage conditions.

This project was started in the fall of 1925. The necessary apples and storage space were provided by the Associated Growers of British Columbia. Over a hundred boxes of apples were used, representing various commercial grades and sizes of the six varieties: McIntosh, Jonathan, Grimes Golden, Rome Beauty, Delicious and Newton. The temperature in the various storage houses was recorded by means of thermographs supplied by the Fruit Branch, and the humidity was determined by daily readings of wet- and dry-bulb thermometers. With the co-operation of Mr. B. H. Hoy of the Provincial Department of Agriculture and Mr. T. H. Jones of the Fruit Branch the apples were examined at monthly intervals during the storage period. Detailed observations were made regarding the development of various storage diseases, and the condition of the fruit at each inspection was accurately determined by means of a pressure tester of the type devised by Mr. J. R. Magness of the Bureau of Plant Industry.

In brief, the results to date indicate that a number of our important commercial varieties of apples can be held in marketable condition for two or three months longer in cold storage than where only common storage facilties are available. It was noted that while such storage diseases as Jonathan spot, scald and Jonathan breakdown were not prevented by cold storage conditions their development was considerably retarded by a temperature of 32 degrees. Two storage diseases not encountered under common storage conditions appeared in the fruit stored at a temperature of 32 degrees. Soft scald developed in apples of the Jonathan variety which had been picked in an immature condition and placed in cold storage, and the Grimes Golden developed a type of internal breakdown when held at a temperature of 32 degrees. These results suggest that while cold storage cannot be expected to prevent the developement of such diseases as scald and Jonathan breakdown, and with certain varieties may even result in the development of diseases not encountered in common stored fruit, yet it has a definite value since the life of varieties such as McIntosh, Delicious, Rome Beauty, and Yellow Newtown may be extended for as much as two or three months by holding them at a temperature of 32 degrees.

INFLUENCE OF VENTILATION ON THE STORAGE LIFE OF APPLES—PROJECT H-29C

Most growers and shippers are agreed that a certain amount of ventilation is necessary in apple storage houses, but there is a wide difference of opinion concerning the means through which ventilation increases the storage life of fruit. There is need for experiments to answer such questions as: "Are the beneficial effects from ventilation due to the removal of injurious products given off by the fruit?" "Can the increased storage life of fruit held in ventilated common storage be explained on the ground that ventilation influences the temperature of the storage?" "To what extent does ventilation influence the amount of moisture in the air of storage houses, and what effect has humidity on the storage life of the fruit?" "How much ventilation is necessary?" "Is it wise to leave apples out in the orchard under conditions of free ventilation for a time before placing them in storage?" This project has been undertaken to provide answers to such questions.

Every year for the past three years comparable samples of such commercial varieties as McIntosh, Jonathan, Grimes Golden, Rome Beauty and Newtown have been kept in a common storage cellar where ventilation was given every night, and in a similar cellar where no ventilation was afforded. In addition, duplicate samples have been left out in the orchard for various lengths of time before being removed to storage. These apples have been examined at intervals during the storage period and observations made with regard to condition of the fruit and the prevalence of storage diseases.

A large amount of accurate data has been accumulated which may be briefly summarized as follows. The apples in the unventilated storage matured appreciably faster than those provided with ventilation. Scald developed earlier and to a greater extent in the unventilated fruit. There was also more loss from rots and moulds where no ventilation was given. The average temperature during the autumn months was several degrees higher in the unventilated storage, and the amount of moisture in the air also remained relatively high.

In the ventilated cellar the ripening processes apparently progressed slightly more rapidly than was the case with the fruit left out in the orchard. Scald developed earlier and to a greater extent than with apples which were left out in the orchard for a time. The average temperature during September and October was usually slightly above that recorded in the orchard. With regard to humidity, it was found necessary to sprinkle water on the floor in order to keep enough moisture in the air to prevent the fruit from shrivelling.

The fruit left out in the orchard for a time kept surprisingly well, except that a certain amount of shrivelling developed, particularly in fruit which had been picked in an immature condition. Humidity readings taken in the orchard showed the air to be relatively dry.

These results indicate that the storage life of apples is prolonged to an appreciable extent by ventilation, and suggest that the beneficial effects are due partly to the fact that injurious gasses are carried away and partly to the influence of ventilation on temperature and humidity. They suggest that no serious injury to the fruit need be expected from leaving it out in the orchard for a period of several weeks. In the event of conjestion in packing sheds it is probable that satisfactory results will be secured if the apples are stacked loose in orchard boxes on the north side of the trees and protected from the sun by the use of empty boxes placed over the top. It should be stated that the above remarks refer to districts where common storage only is available. Where cold storage facilities are at hand best results will undoubtedly be secured by removing the fruit from the orchard as soon as picked, and reducing it to a temperature of 32 degrees as quickly as possible.

### INFLUENCE OF WRAPPERS ON THE STORAGE LIFE OF FRUIT, PROJECT H 29D

The use of a paper wrap as a protective covering for the higher grades of apples has now become a general practice in the boxed apples sections of the Pacific Northwest. The chief advantages claimed for the paper wrap are that it facilitates packing, reduces bruising and checks the spread of rots. About five years ago Messrs. Brooks, Cooley & Fisher conceived the idea of extending the usefulness of the apple wrap by impregnating it with a colourless, odourless, mineral oil. Preliminary experiments suggested that wraps so treated might prove to be a commercial preventative of apple scald. This project was started in 1921 to ascertain the commercial possibilities of the oiled wrap and also to secure information regarding the storage life of wrapped apples as compared with those stored loose.

Each year a considerable number of boxes of the most important commercial varieties of apples grown in the British Columbia dry belt have been packed in various kinds of wrappers. Comparable samples have been stored loose. During the storage season the fruit has been examined and observations made regarding conditions and the prevalence of storage diseases.

The results secured indicate that the oiled wrapper is a commercial proposition which has come to stay. In fact the advantages of this wrapper are so readily apparent that it is already being used extensively in commerce. For best results in scald control it has been found that the wrappers should contain not less than 20 per cent of oil, though fairly satisfactory commercial control has been secured with wrappers containing 15 per cent of oil. Oiled wrappers have not in all cases entirely prevented the development of scald but the disease has usually been reduced to a negligible factor. In addition to controlling scald it has been found that the oiled wrap retards the ripening processes to a slight extent and reduces the tendency of the fruit to shrivel. In order for the oiled wrap to be effective in scald control it has been found that the fruit should be wrapped shortly after it has been picked. The question as to whether all apples should be wrapped soon after picking or whether it is desirable to store them loose for a time and pack shortly before sale is one which requires a qualified answer. With varieties which are particularly susceptible to scald it undoubtedly pays to wrap the fruit in oiled paper within a month of the time it is picked. Another argument in favour of wrapping apples soon after they are harvested is that experiments have shown the injury from bruising and stem punctures to be less serious when fruit is handled at that time. On the other hand wrapped fruit has been found to shrink somewhat when held in storage for a long time, resulting in a slack pack. Furthermore, the development of storage diseases such as bitter pit and breakdown in wrapped apples is sometimes sufficiently serious to necessitate re-packing, which is a most expensive operation. Where apples are stored loose it seems particularly important to maintain a fairly high atmospheric humidity in order to reduce the tendency of the fruit to shrivel.

## THINNING OF TREE FRUITS

Thinning, or the removal of a portion of the crop in order to improve the grade and size of the fruit left on the tree, has now become an established orchard practice. There is need, however, for reliable experimental evidence concerning the proportion of the fruit which it is most economical to remove, and regarding the time when the operation of thinning can be most advantageously performed. The following projects have been undertaken for the purpose of supply such information.

### APPLE, DEGREE OF THINNING, PROJECT H 413A

The object of this experiment is to secure accurate data concerning the effect of various degrees of thinning on the yield and grade of fruit produced, and on the bearing habits of the tree.

All the trees in the cultural apple orchard, almost 600 in number, are included in this experiment. An equal number of trees of each variety are thinned heavily, moderately and lightly, while some are left unthinned. In severe thinning the apples are spaced one to every 10 inches of bearing surface. On the moderately thinned trees one apple is left to approximatly every 6 inches of bearing wood, while the spacing of the fruit on the lightly thinned trees is one to about 4 inches of fruiting wood. The thinning has, in most cases, been done after the June drop, but before the fruit has reached the size of a walnut.

Up till the present time the lightly thinned trees of most varieties have given the largest yield of marketable fruit. On early bearing varieties such as Duchess and Yellow Transparent, however, light thinning was not sufficient in 1925 to prevent the production of a large percentage of small sized fruit. No marked influence of degree of thinning on the bearing habit of the tree has yet been noted.

The results secured suggest that it is impossible to state any definite distance as the most desirable to which to thin apples. The severity to which the fruit should be thinned appears to depend largely on the age and vigour of the tree, the fertility of the soil and the moisture supply. On young vigourous trees heavy thinning does not seem to be justified, but as the trees become older the removal of a larger portion of the crop is doubtless necessary in order to secure the requisite size and grade in the remainder of the crop. Thinning appears to be more necessary on some varieties than on others. With such varieties as Delicious, Jonathan, Winter Banana and Northern Spy it is seldom necessary nor desirable to do much thinning, but varieties such as Duchess, Yellow Transparent, Wagener and Wealthy frequently fail to attain good size unless a considerable proportion of the crop is removed.

### APPLE, TIME OF THINNING, PROJECT H 413B

This experiment was started in 1924 for the purpose of securing information regarding the most economical time to thin apples.

In 1925 two trees of each of the varieties, Delicious, Rome Beauty, McIntosh, Duchess, Grimes Golden, Jonathan, Wagener, Yellow Transparent and Wealthy were used in the investigation. Every fortnight, from blossom time to the end of July, ten spurs on each tree were thinned to a single apple on each spur. Each spur was numbered with a tinfoil tag. Diameter measurements were made of each apple at thinning time and at the time harvested.

The results secured indicate that thinning at the blossom and calyx stages is impractical. With varieties such as Duchess, Yellow Transparent and Wealthy, which tend to set several fruits to a spur, thinning may well be started soon after the calyx stage. With varieties such as McIntosh, Grames Golden and Delicious, which frequently thin themselves to one fruit to a spur, thinning may well be left till after the June drop. The labour of thinning is greatly increased if the operation is deferred till the fruit is larger than a walnut, but the size of the fruit is influenced even when thinning is done quite late in the season.

### THINNING OF STONE FRUITS, PROJECT H 410

The purpose of this project is to secure reliable information regarding the economy of thinning peaches, plums, prunes and apricots. A large number of trees in the cultural and variety orchards are being used in the investigation.

The 1925 crop of stone fruits was so greatly reduced by winter injury that no thinning experiments were possible in that year. However, the results of experiments carried out in previous years indicate that, with certain varieties which tend to set an excessive amount of fruit, thinning is highly desirable. Unthinned trees of the Rochester peach, Pond Seedling plum, Sugar prune and Blenheim apricot have frequently produced fruit of very inferior quality, and have, in many cases, suffered serious breakage from overloading. On the other hand the Crawford peach, Wickson plum, Tennant prune, and Moorpark apricot have seldom required thinning.

## VARIETY TESTS OF TREE AND BUSH FRUITS

Each year sees a few more varieties added to the long list of cultivated fruits. In addition to chance seedlings there is a growing number of introductions from plant breeding stations. Along with this ever increasing multiplicity of novelties has come a call for a reduction in the number of varieties grown commercially. It is important that no new fruit of promise should be discarded before it has been thoroughly tested against existing commercial varieties. A

trial ground is necessary where these new introductions can serve a term of probation and where their characteristics may be faithfully and impartially recorded. It is to fill this need that the following projects are being carried on.

### APPLE, VARIETY TEST—PROJECT H-33

The cultural apple orchards were laid out so as to serve as a comparative test of ten of the most important commercial varieties of apples grown in the Dry Belt of British Columbia. In addition, two trees each of a large number of varieties of lesser commercial promise and two trees each of a number of seedling and cross-bred varieties originated at Ottawa, were planted in 1916. These plantings already exceed 19 acres and are being added to as new varieties are developed. Accurate records are being kept of the yielding ability, quality, hardiness and disease resistance exhibited by each variety.

None of the new introductions which have reached fruiting age seems likely to displace such standard commercial varieties as Delicious, Rome Beauty and McIntosh, but one variety, the Melba, appears to have commercial possibilities. This variety, originated at the Central Experimental Farm, Ottawa, is a seedling of the McIntosh. With regard to tree characteristics, the Melba seems to inherit the good qualities of its parent in that it develops a strong frame work and carried its fruit well distributed over a large bearing surface. The fruit matures at the same season as the Duchess and is of high dessert quality.

### APRICOT, VARIETY TEST—PROJECT H-334

The original orchard plantings made in 1916 included twelve trees of each of the more popular varieties of apricot and two trees each of a number of varieties less used in commerce. The 1925 apricot crop was a failure due to frost injury during the previous winter, but the results secured in previous years suggest that commercial plantings may well be restricted to the Blenheim, Moorpark and Tilton until further information is secured regarding the newer introductions.

### CHERRY, VARIETY TEST—PROJECT H 35

Trees of the standard commercial varieties of cherries have now been in bearing for several years. The Bing and Lambert leave little to be desired from the commercial standpoint, in their own season. Several new introductions which are said to extend the season of the Bing type cherry have recently been added to the Station's plantings, but these will require to be tested over a series of years before definite statements can be made regarding their commercial possibilities. New plantings should undoubtedly consist largely of the Bing and Lambert with about 10 per cent of the Black Tartarian or Black Republican varieties as pollinizers.

### FILBERT, VARIETY TEST—PROJECT H 338

The Barcelona and Du Chilly are giving good satisfaction at this Station and the Pearson is reported to be cropping well elsewhere in the southern Okanagan. Further tests will be necessary before the commercial possibilities of the filbert in the British Columbia dry belt can be determined, but there seems no reason why fruit growers in the stone fruit districts should not grow at least enough to supply their own needs.

### PEACH, VARIETY TEST—PROJECT H 332

The sudden drop in temperature in 1924 destroyed the fruit buds of all the varieties of peaches grown on this Station so that there was no crop in

1925. The results for the previous nine years, however, suggest the Elberta, J. H. Hale and Rochester varieties as being suitable for commercial plantings in the sourthern Okanagan.

PEAR, VARIETY TEST—PROJECT H 44

Twelve trees of each of the Bartlett, Bosc, Anjou and Seckel, and two trees each of a large number of less popular varieties were planted in 1916. The three-acre pear orchard planted in the spring of 1925 has also been laid out to serve as a test of promising commercial varieties. Several new introductions are under trial, but until these have been tested over a longer period of time, growers are advised to continue planting such varieties as the Flemish Beauty and the Anjou.

PLUM AND PRUNE VARIETY TEST—PROJECT H 48

Over sixty varieties of plums and prunes are under observation. The more recent additions include such widely advertised varieties as the Date and Yakima prunes and the Gold Plum. Several of the new introductions show commercial promise but further testing is necessary before it can be determined whether they are better suited to British Columbia dry belt conditions than such well-known varieties as the Italian prune and the Bradshaw, Green Gage and Damson plums.

WALNUT, VARIETY TEST—PROJECT H 351

This project has not been in operation for sufficient length of time to justify definite recommendations, but the results secured in sections of Oregon where the climate is somewhat similar, suggest that the grafted Franquette variety of walnut is likely to prove the most satisfactory. While walnut growing may never assume commercial importance in this valley there seems good reason to hope that it will be found possible for many fruit-growers to produce sufficient nuts for their own use.

## Small Fruits

While the production of small fruits in the British Columbia Dry Belt is not sufficiently great to warrant carrying on extensive cultural experiments with berry crops the number of enquiries received by this Station has shown the need for experiments to determine the varieties most likely to prove satisfactory under the climatic conditions encountered in the interior valley of this province. Accordingly, the work with small fruits at this Station has been confined to the variety tests mentioned in the following paragraphs.

BLACKBERRY, VARIETY TEST—PROJECT H 2

The Loganberry, Leucretia drewberry and Thornless blackberry are included in this test. These have all been found to require winter protection, but this should not deter berry-lovers from growing enough to supply the home table.

CURRANT, VARIETY TEST—PROJECT H 4

A large number of varieties of currants have been tested over a period of ten years. The Wilder (red), Boskoop Giant (black) and White Grape are recommended for home use.

GOOSEBERRY, VARIETY TEST—PROJECT H 6

Of the several varieties of gooseberries tested, the Oregon Champion seems to be best suited to southern Okanagan conditions. The fruits of this variety are relatively small but are comparatively resistant to mildew which is difficult to control on the larger-fruited varieties.

GRAPE, VARIETY TEST—PROJECT H 40

The European varieties of grapes have been found too tender for outside planting except in very favourable situations, but a number of the American varieties such as the Campbell Early (black), the Niagara (white) and the Vergennes (red) have proved relatively hardy. While it is doubtful whether commercial plantings on a large scale are justified, it is probable that growers in the southern Okanagan could, with a little care, produce sufficient grapes to supply the local market.

RASPBERRY, VARIETY TEST—PROJECT H 11

Several new introductions are being compared with standard commercial varieties such as the Cuthbert and Herbert. The Viking, a variety originated by the Vineland Experimental Station, Ontario, has proved exceptionally vigorous and hardy. Canes of this variety have been distributed to various commercial growers for further testing.

STRAWBERRY, VARIETY TEST—PROJECT H 21

A large number of varieties have been tested during the past ten years. While the strawberry cannot be expected to give as good results under semi-arid conditions as are obtained in a more humid climate, the results secured suggest that more strawberries might be grown in the southern Okanagan with a view to supplying the local demand. Good yields have been secured from such varieties as Senator Dunlap, Clark Seedling, Magic Gem and Portia. The last-named is a variety originated at the Central Experimental Farm, Ottawa, and has proved exceptionally good as a canning berry.

## Vegetables

BEANS, DISTANCE OF PLANTING—PROJECT H 58

BEANS, VARIETY TEST—PROJECT H 61

Largest yields were obtained by planting 4 inches apart. Beans planted 2 inches apart were nearly one week later than the same variety planted 4 inches apart.

Davis White Wax (O-6903), an improved strain from the Central Experimental Farm, was outstanding for earliness, yield and quality. An improved strain of Jones White from the Manitoba Agricultural College is a very promising variety, a good yielder and the highest quality of all varieties tested.

BEETS, VARIETY EXPERIMENT—PROJECT H 68

Early Wonder (Ewing) with 36 pounds per 30-foot row was the heaviest yielder of twelve strains tested. Early Model (Bruce) and Early Model (Graham) gave 32 and 30 pounds per row. All were excellent in quality.

BEETS, DIFFERENT DATES OF SEEDING—PROJECT H 65

CARROTS, DIFFERENT DATES OF SEEDING—PROJECT H 79

Carrots and beets were seeded at intervals of ten days from March 27. The early seedings were ready for use earlier than the later seedings but if not harvested grew coarse and rough. The late seedings produced both carrots and beets of excellent quality for winter use. At least two seedings should be made in every garden.

CARROTS, VARIETY EXPERIMENT—PROJECT H 83

Yields of two 32-foot rows planted March 24 and harvested October 19:—

| Variety | Source of seed | Total yield |
|---|---|---|
| | | pounds |
| Selected Chantenay | McDonald | 105 |
| Red St. Valery | Rennie | 100 |
| Nantes Half Long | McDonald | 96 |
| Improved Danvers | Dupuy & Ferguson | 95 |
| Hutchison | Gregory | 90 |
| Garden Gem | McKenzie | 85 |
| Scarlet Horn Earliest | Dupuy & Ferguson | 75 |
| Guerande or Ox Heart | Steele Briggs | 70 |

CELERY, BLANCHING EXPERIMENT—PROJECT H 90

CELERY, VARIETY EXPERIMENT—PROJECT H 94

Climatic conditions at this Station make the growing of celery a difficult problem. From a number of tests made this year it is believed that celery may be grown by digging trenches six to eight inches in depth. After preparation of a seed-bed in the bottom of the trench, set out the plants and keep filling the trench as the plants grow. Plants set out July 22 in this way made a fair growth. If set out earlier before irrigation has to be discontinued they will probably produce some good celery for home use.

CUCUMBERS, VARIETY EXPERIMENT—PROJECT H 106

Early Russian (Burpee) proved most prolific of 34 strains, with 145 cucumbers from three hills. Giant Pesa (Dupuy and Ferguson), Crystal Spring (Bolgiano), Harris Perfection (Harris), Early Fortune (Dreer), and Davis Perfect (Bolgiano) gave good results.

EGG PLANT, VARIETY EXPERIMENT—PROJECT H 107

Extra Early Dwarf (Will) is a heavy-bearing variety of small fruits which may be slightly earlier than the standard varieties but is difficult to sell after the latter are ready. Black Beauty and New York Purple appeared to be about equal in yield and quality.

HERBS, VARIETY EXPERIMENT—PROJECT H 108

Sage, dill, catnip and wormwood have been grown at this Station successfully for a number of years and were uninjured by the severe winter of 1924-25.

CORN VARIETY EXPERIMENT—PROJECT H 102

The following results were obtained from two thirty-foot rows of each variety planted May 12. The last column shows the rank for earliness. The wide variation in height, length of cob, earliness and yield of the same variety from different sources indicates that some varieties are either wrongly named or far off type.

| Variety | Source of seed | First date ready to use | Height in inches | Average length of cob | Number of cobs | | | Total | Range for earliness |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Before Aug. 1 | Aug. 1-15 | After Aug. 15 | | |
| Golden Bantam | Stokes | July 25 | 72 | 7 | 21 | 36 | 68 | 125 | 2 |
| Golden Bantam | Graham | Aug. 15 | 54 | 5 | ..... | 30 | 80 | 110 | 22 |
| Golden Bantam | James | " 1 | 66 | 4½ | 25 | 75 | ..... | 100 | 10 |
| Bolearly | Burbank | " 6 | 54 | 5 | ..... | 39 | 60 | 99 | 16 |
| Golden Bantam | McDonald | " 5 | 60 | 5 | ..... | 63 | 35 | 98 | 14 |
| Whipple Early | Harris | " 15 | 78 | 6 | ..... | 20 | 77 | 97 | 22 |
| Early Harvester | Bolgiano | July 15 | 54 | 6 | 28 | 26 | 40 | 94 | 1 |
| Golden Bantam | Moore | " 30 | 66 | 7 | 28 | 65 | ..... | 93 | 7 |
| *Pocahontus* | Harris | " 30 | 72 | 9 | 4 | 36 | 48 | 88 | 7 |
| Borden Wonder Bantam | Bolgiano | Aug. 20 | 78 | 8 | ..... | ..... | 88 | 88 | 25 |
| Black Mexican | McDonald | " 20 | 78 | 8 | ..... | ..... | 84 | 84 | 25 |
| Early Fordhook | Burpee | " 3 | 72 | 8 | ..... | 68 | 15 | 83 | 11 |
| Golden Giant | Rennie | " 3 | 78 | 7 | ..... | 36 | 46 | 82 | 11 |
| Alameda Sweet 229 | Morse | " 12 | 78 | 10 | ..... | 51 | 30 | 81 | 20 |
| Howling Mob | Burpee | " 9 | 78 | 9 | ..... | 22 | 58 | 80 | 19 |
| Early Catawba | Burpee | " 5 | 72 | 4½ | ..... | 33 | 45 | 78 | 14 |
| Bantam Evergreen | Graham | " 7 | 84 | 8 | ..... | 51 | 27 | 78 | 17 |
| Nuetta | Wills | July 28 | 66 | 7 | 15 | 10 | 53 | 78 | 5 |
| Sixty day | Childs | " 27 | 48 | 6 | 35 | 30 | 13 | 78 | 4 |
| Early Cory | Graham | Aug. 3 | 78 | 8 | ..... | 77 | ..... | 77 | 11 |
| Stowell Evergreen | Graham | " 20 | 84 | 8 | ..... | ..... | 76 | 76 | 25 |
| Banting | O-6653 | July 25 | 48 | 7 | 42 | ..... | 34 | 76* | 2 |
| Imp. Early Dakota | Wills | Aug. 13 | 60 | 6 | ..... | 24 | 48 | 72 | 21 |
| Golden Bantam | James | July 31 | 60 | 5 | 12 | 15 | 45 | 72 | 9 |
| Whipple Yellow | Harris | Aug. 20 | 84 | 10 | ..... | ..... | 70 | 70* | 25 |
| Gebu | Wills | July 28 | 60 | 5½ | 14 | ..... | 50 | 64 | 5 |
| Early Mayflower | McDonald | Aug. 8 | 66 | 6 | ..... | 34 | 27 | 61 | 18 |
| Early Burbank | Burbank | " 20 | 60 | 6 | ..... | ..... | 58 | 58* | 25 |
| Malakoff | Vaughan | " 18 | 54 | 6 | ..... | ..... | 41 | 41* | 24 |
| Alpha | Harris | ..... | 48 | 5 | ..... | ..... | 25 | 25* | ..... |

* Badly damaged by the pheasants.

## LETTUCE, DIFFERENT DATES OF SOWING—H 114

## LETTUCE, VARIETY EXPERIMENT—H 116

In 1924 this Station began investigations into the possibility of producing head lettuce. The results in 1924 and again in 1925 have been disappointing. Lettuce is essentially a cool weather crop. The plants start off well until the first really warm weather when "tipburn" sets in and destroys the crop. This is a physiological disease and is explained that the plants do not develop a root system of sufficient extent to supply the moisture lost through transpiration in very hot weather. The tender parts of the plants, usually the tips, suffer from lack of moisture, turn brown and decay sets in. Until some method of overcoming this trouble is found, commercial plantations are not feasible. Investigations will be continued along cultural lines.

## CANTALOUPE, VARIETY EXPERIMENT—PROJECT H 122

Seventy-eight strains and varieties were tested in 1924. Of them all, for commercial purposes, the list can be narrowed down to Hoodoo, Hearts of Gold, Pollock, Perfecto, Gold Standard, Rockyford, Emerald Gem and H-B. The demand is steadily growing for a salmon-fleshed melon and therefore the Pollock, Perfecto and Rockyford, being more or less green-fleshed will certainly be displaced by salmon-fleshed varieties. The Gold Standard is a promising introduction. A large block was planted this year but was destroyed by insects and had to be replanted with another variety. The H-B is an early, well-netted, good flavoured variety but is inclined to run to "jumbos" or oversized melons. Nothing better than Hoodoo or Hearts of Gold has been found at this Station yet. Growers should choose their source of seed very carefully as considerable variation was found in different strains of the same variety.

TABLE 26—CANTALOUPE VARIETY TEST

| Variety | Number strains tested | Average number melons | Highest number melons | % before Aug. 15 | % Aug. 15 to Sept. 1 | % after Sept. 1 | Ave. weight in ounces |
|---|---|---|---|---|---|---|---|
| Hoodoo | 10 | 116 | 159 | 1 | 9 | 89·0 | 32 |
| Gold Standard | 1 | 104 | 104 | 5 | 8·5 | 86·5 | 44 |
| Fordhook | 1 | 94 | 94 | 6·5 | 21 | 72·5 | 36 |
| Perfecto | 4 | 91 | 102 | 0 | 27 | 73 | 33 |
| Pollock | 19 | 88·5 | 121 | 0·5 | 11·5 | 88 | 35 |
| Hearts of Gold | 6 | 87·5 | 106 | 1·0 | 13·0 | 86 | 35 |
| Hackensack | 1 | 88 | 88 | 4·5 | 6·8 | 88·7 | 72 |
| Sugar Sweet | 2 | 86 | 106 | 0 | 11·5 | 88·5 | 44 |
| Rockyford | 2 | 86 | 125 | 1·9 | 14·1 | 84 | 32 |
| Unsurpassed | 1 | 85 | 85 | 0 | 15 | 85 | 36 |
| H-B | 1 | 83 | 83 | 6 | 36 | 58 | 54 |
| Emerald Gem | 7 | 82 | 104 | 2·5 | 19·5 | 78 | 35 |
| Honey Dew | 4 | 72 | 114 | 0 | 0·35 | 99·65 | 48 |
| Greeley Wonder | 1 | 70 | 70 | 0 | 7 | 93 | 60 |
| Tip Top | 2 | 69 | 72 | 0 | 13 | 87 | 51 |
| Paul Rose | 2 | 67 | 74 | 0 | 8 | 92 | 51 |
| Irondequoit | 1 | 63 | 63 | 0 | 5 | 95 | 80 |
| Sulton Invincible | 1 | 60 | 60 | 0 | 0 | 100 | 38 |
| Sulton King George | 1 | 58 | 58 | 0 | 0 | 100 | 42 |
| Sulton Superlative | 1 | 51 | 51 | 0 | 0 | 100 | 42 |
| Bender | 2 | 47·5 | 55 | 0 | 0 | 100 | 60 |
| Milwaukee Market | 2 | 45·5 | 51 | 1 | 25 | 74 | 62 |
| Sutton Scarlet | 1 | 38 | 38 | 0 | 0 | 100 | 42 |
| Early Orange | 1 | 37 | 37 | 3 | 47 | 50 | 72 |
| Oka | 1 | 37 | 37 | 0 | 3 | 97 | 72 |
| Sutton Al | 1 | 33 | 33 | 0 | 3 | 97 | 36 |
| Sutton Triumph | 1 | 28 | 28 | 0 | 4 | 96 | 42 |
| Casaba | 1 | 20 | 20 | 0 | 0 | 100 | 84 |

### ONION, SEED VERSUS SETS, PROJECT H 134

This year the sets were badly attacked by maggot. In five years tests' sets have twice shown less injury by maggot than seed. Twice the sets have been almost completely destroyed and in the fifth test the results were about even. Date of planting does not appear to offer a control for maggots. Weather conditions prevailing at time of planting may be responsible for varying results.

### ONIONS, VARIETY EXPERIMENT, PROJECT H 138

Southport Yellow Globe (McKenzie) and Ailsa Craig (Graham) gave the highest yield of eighteen strains with 20 pounds each per thirty-foot row. Yellow Globe Danvers (Graham) and Red Wethersfield (McDonald) followed very closely with 18 and 17 pounds respectively.

### PEA, VARIETY EXPERIMENT, PROJECT H 154

Of thirty strains tested the Invermere seedlings numbers, two, six, and one, were outstanding in growth of vine, yield and quality of pea. Extra Early Pedigree (Gregory) is a very early dwarf variety but a low yielder.

### PEPPER, VARIETY EXPERIMENT, PROJECT H 157

Twenty-six strains were tested. Harris Earliest (Harris) was the heaviest yielder and produced fruits of good type and quality. World beater (Bolgiano), a cross between Chinese Giant and Ruby King, combines the size of the former with the longer form and earliness of the latter. It ranked second in yield.

## POTATOES, HOME-GROWN VS. NORTHERN-GROWN SEED, PROJECT H 174

In 1923 certified seed of the following varieties from the same sources was grown in the Okanagan and in the Bulkley valleys. The seed from these two crops was planted in the same district in 1924. In 1925 seed from the 1924 Bulkley valley crop, (Northern-grown) was brought to Summerland and planted beside seed from the 1924 Summerland crop (locally grown) on plots each 66 feet by 9 feet or 3/220-acres with the following results.

TABLE 27.—POTATO, HOME-GROWN VS. NORTHERN-GROWN SEED

| Variety | Commercial | Small | Total | Yield per acre | |
|---|---|---|---|---|---|
| | | | | tons | lb. |
| Irish Cobbler, Local | 86½ | 11 | 97½ | 3 | 1,150 |
| Irish Cobbler, Northern | 196½ | 8 | 204½ | 7 | 997 |
| Green Mountain, Local | 162 | 10 | 172 | 6 | 613 |
| Green Mountain, Northern | 212½ | 14 | 226½ | 8 | 610 |
| Early St. George, Local | 124 | 23 | 147 | 5 | 780 |
| Early St. George, Northern | 208½ | 21 | 229½ | 8 | 830 |

There is a general belief that vitality of potatoes for seed is reduced by continuous growing under semi-arid conditions such as exist in the Okanagan. The above results would indicate that by the third year there is a distinct loss in vitality.

This experiment will be continued for further confirmation.

## POTATOES, TEST OF VARIETIES, PROJECT H 186

Nine varieties were tested on gravelly loam soil which had grown beans the previous year. They were planted April 17 and harvested September 16. During the growing season soil moisture was adequate for normal growth.

The results obtained are as follows on 1/220-acre.

TABLE 28.—POTATO VARIETY TEST

| Variety | Source | Yield per acre | | | |
|---|---|---|---|---|---|
| | | Marketable | | Unmarketable | |
| | | bush. | lb. | bush. | lb. |
| Green Mountain | D.E.S. Invermere | 434 | 38 | 36 | 40 |
| Burbank | D.E.S. Invermere | 372 | 1 | 18 | 25 |
| Jersey Royal | U.B.C. | 309 | 24 | 55 | 15 |
| Early Rose | D.E.S. Invermere | 302 | 2 | 36 | 50 |
| Gold Coin | D.E.S. Invermere | 302 | 2 | 22 | 26 |
| Up to Date | U.B.C. | 221 | 0 | 198 | 54 |
| Rural Russet | D.E.S. Invermere | 213 | 38 | 44 | 12 |
| Eureka | U.B.C. | 202 | 35 | 221 | 0 |
| Sir Walter Raleigh | D.E.S. Invermere | 184 | 10 | 62 | 27 |

## SQUASH, VARIETY EXPERIMENT, PROJECT H 201

## VEGETABLE MARROW, VARIETY EXPERIMENT, PROJECT H 216

Ten strains of winter squash and marrow were tested and two strains of summer squash, Golden Hubbard (Harris) and English Vegetable Marrow (Graham) gave the best yields of the former. Cocozelle Bush (Dreer) and Early White Bush Scalloped (Morse) were about equal in the early varieties.

## TOMATO, FERTILIZER EXPERIMENT, PROJECT C 388

## CANTALOUPE, FERTILIZER EXPERIMENT, PROJECT C 157

This experiment was commenced in 1924 to secure information on the economy of using various commercial fertilizers with and without barnyard manure in growing cantaloupes and tomatoes.

In 1925 the yields were nearly twice as great on all plots with barnyard manure as on those having no manure. No appreciable difference was observed in the use of commercial fertilizers over the check rows with no fertilizers. There may have been sufficient fertility in all the soil to produce an average crop and the increased yield on the plots where barnyard manure was applied was due to improved water-holding capacity of the soil.

## TOMATO, BREEDING, PROJECT H 204

## TOMATO, VARIETY TEST, PROJECT H 211

Nineteen strains of Earliana were planted in a block for selection purposes. Eight plants of each strain were picked and weighed and the results shown in table 29. Individual selections were made from all these strains for breeding work in 1926, and in addition from the majority of the early scarlet-fruited varieties in the variety tests.

Sixty-six strains and varieties were tested in thirty-foot rows in the variety tests. Soil conditions varied greatly in the test plot and as one row only of each was tested the possibility of experimental error is great. The results for yield and earliness are shown in table 30.

TABLE 29.—STRAINS OF EARLIANA TESTED 1925—(YIELD OF EIGHT PLANTS)

| Strains of Source of Seed | Total | August | September | Earliness | Remarks |
|---|---|---|---|---|---|
| | lb. | lb. | lb. | | |
| Ewing | 174·5 | 69·0 | 105·5 | 9 | Good type |
| Vaughan | 173·0 | 92·0 | 81·0 | 2 | Some cracking |
| McLachlan | 169·5 | 102·0 | 67·5 | 1 | Uniform |
| Langdon | 169·0 | 84·0 | 85·0 | 4 | Much cracking rough |
| McLachlan | 163·5 | 70·0 | 93·5 | 7 | Uniform |
| Dreer | 160·5 | 65·5 | 95·0 | 12 | Good type |
| Langdon | 144·5 | 74·0 | 70·5 | 5 | |
| Livingston | 141·0 | 84·5 | 56·5 | 3 | |
| Burpee | 138·0 | 74·0 | 64·0 | 5 | |
| Moore | 129·5 | 70·0 | 59·5 | 7 | Smooth, good |
| Langdon | 128·0 | 69·0 | 59·0 | 9 | |
| Moore | 124·0 | 45·0 | 79·0 | 18 | Smooth, good |
| Moore | 122·0 | 50·5 | 71·5 | 15 | Smooth, good |
| Harris | 110·5 | 50·5 | 60·0 | 15 | Much blossom end rot |
| H. & Vick | 108·5 | 56·5 | 52·0 | 14 | |
| Stokes | 105·5 | 50·0 | 55·5 | 17 | |
| Burrell | 104·0 | 60·0 | 44·0 | 13 | |
| Ferry | 102·0 | 66·0 | 36·0 | 11 | Deep stem end |
| Ferry | 85·5 | 34·0 | 51·5 | 19 | |

TABLE 30.—TOMATOES—VARIETY TESTS

| Variety | Source of seed | 1925 yield | Yield in Aug. | Yield in Sept. | Earliness | Remarks |
|---|---|---|---|---|---|---|
| | | lb. | lb. | lb. | | |
| Special Early | Morse | 181·5 | 111·0 | 70·5 | 2 | |
| John Baer | S.B. | 160·0 | 280·0 | 80·0 | 16 | |
| Avon Early | Morse | 156·0 | 109·0 | 47·0 | 3 | |
| Earliana | Vaughan | 151·5 | 119·5 | 32·0 | 1 | Large |
| Danish Export | Wibolt | 151·5 | 84·5 | 67·0 | 11 | Too small |
| Redhead | Langdon | 146·5 | 42·0 | 104·5 | 35 | |
| Bolgiano | Bolgiano | 145·5 | 93·0 | 52·5 | 9 | |
| Alacity X Hipper | 0-5463 | 145·5 | 81·5 | 64·0 | 15 | Rough |
| Norton Wilt Resistant Stone | Livingston | 144·0 | 29·0 | 115·0 | 46 | |
| Stone | " | 141·5 | 14·0 | 127·5 | 57 | Good but not uniform |
| Alacrity x 0-1051 | 0-5453 | 141·5 | 60·5 | 81·0 | 24 | |
| New 50 day | Buckbee | 141·0 | 83·5 | 57·5 | 12 | |
| Bolgiano | Bolgiano | 141·0 | 89·0 | 52·0 | 10 | Rough |
| Early Burbank | Avison | 140·5 | 54·5 | 86·0 | 28 | Rough |
| Early Maxcott | Graham | 140·0 | 42·0 | 98·0 | 35 | Large, smooth |
| Avon Early | Hart & Vick. | 138·0 | 108·0 | 30·0 | 4 | |
| Chalks Early Jewel | S.B. | 136·0 | 41·0 | 95·0 | 37 | |
| Bonny Best | Stokes | 135·5 | 42·5 | 93·0 | 33 | |
| Earliana Grade 2 | Langdon | 134·0 | 94·0 | 40·0 | 8 | B.E. Rot |
| Early Detroit | Ferry | 132·5 | 24·5 | 108·0 | 49 | Pink soft |
| Garebe Globe | Kelowna | 132·5 | 96·0 | 36·5 | 7 | Very rough |
| Beauty | Livingston | 132·5 | 66·0 | 66·5 | 22 | Pink, large |
| First of All | McKenzie | 130·0 | 64·0 | 66·0 | 23 | |
| Avon Early | Ferry | 130·0 | 97·5 | 32·5 | 5 | |
| My Maryland | Bolgiano | 128·5 | 8·5 | 120·0 | 64 | |
| Abbotsford Argo | Horn | 128·5 | 46·5 | 82·0 | 32 | |
| Matchless | Livingston | 128·5 | 50·0 | 78·5 | 29 | |
| Bonny Best | Stokes | 128·0 | 78·5 | 49·5 | 17 | |
| Burbank | Bruce | 128·0 | 77·5 | 50·5 | 19 | |
| 1XL Extra Early | Rennie | 127·5 | 97·5 | 30·0 | 5 | |
| Self Pruning | Burpee | 126·5 | 34·5 | 92·0 | 43 | Pink |
| Abbotsford Argo | Horn | 126·0 | 83·0 | 43·0 | 13 | Smooth, too small |
| Chalks Early Jewel | Burpee | 125·5 | 33·0 | 92·5 | 45 | Good type |
| Open Air Perfection | Brand | 123·5 | 38·0 | 85·5 | 38 | Too small |
| Rosy Morn | Livingston | 123·0 | 18·0 | 105·0 | 52 | Pink, very soft |
| Sunrise | Landreth | 122·5 | 58·5 | 64·0 | 25 | |
| Redhead | Langdon | 121·5 | 67·0 | 54·5 | 21 | |
| Way Ahead | Bruce | 121·0 | 78·0 | 43·0 | 18 | Rough |
| Bonny Best | Stokes | 120·0 | 38·0 | 82·0 | 38 | Good type |
| John Baer | Ferry | 120·0 | 57·0 | 63·0 | 26 | |
| Norton | Morse | 119·0 | 20·5 | 98·5 | 51 | |
| Earliest of All | S.B. | 119·0 | 47·5 | 71·5 | 31 | Very rough |
| N.D. Earliana | Widge | 119·0 | 83·0 | 36·0 | 13 | 7 plants |
| Marvel | Morse | 116·5 | 12·5 | 104·0 | 59 | Good type |
| Best of All | James | 115·5 | 35·0 | 80·5 | 42 | Small |
| Pink | 0-5463 | 115·5 | 33·5 | 82·0 | 44 | Pointed, pink |
| Open Air Perfection | Brand | 115·0 | 42·5 | 72·5 | 33 | Very small |
| Greater Baltimore | Stokes | 114·5 | 49·0 | 65·5 | 30 | Very small |
| Earliana | Moore | 107·5 | 69·5 | 38·0 | 20 | |
| Coreless | Livingston | 102·0 | 6·5 | 95·5 | 65 | |
| Norduke | Morse | 102·0 | 11·0 | 91·0 | 61 | Big, soft, rough |
| Magnum Bonum | James | 101·5 | 36·5 | 65·0 | 40 | Very rough |
| Matchless | Burpee | 96·5 | 14·0 | 82·5 | 57 | Large, smooth |
| First and Best | Bruce | 96·5 | 36·0 | 60·5 | 41 | |
| Bonny Best | Langdon | 96·0 | 25·5 | 70·5 | 48 | Ring cracks |
| Alacrity x Earlibell | 0-5455 | 91·0 | 55·0 | 36·0 | 27 | Very rough |
| San Jose Canner | Morse | 89·5 | 15·0 | 74·5 | 55 | |
| Bonny Best | Landreth | 83·0 | 21·5 | 61·5 | 50 | |
| Bloomsdale | " | 79·0 | 17·0 | 62·0 | 53 | Smooth, good |
| Landreth | " | 72·0 | 16·5 | 55·5 | 54 | |
| Matchless | Burpee | 69·5 | 9·5 | 60·0 | 63 | |
| Manifold | Livingston | 66·0 | 26·5 | 39·5 | 47 | |
| Monumental | Bolgiano | 65·5 | 10·0 | 55·5 | 62 | |
| Pepper | Diener | 65·5 | 11·5 | 54·0 | 60 | Pink |
| Magnus | Livingston | 43·5 | 14·5 | 43·5 | 56 | |
| Favorite | Livingston | 28·0 | 4·0 | 24·0 | 66 | Blossom-end rot bad. |

## TOMATO IRRIGATION EXPERIMENT—PROJECT H. 415

This experiment has been carried on for six years. The plan followed this year was the same as in 1924, namely, four plots each one-twentieth of an acre in area were planted to Avon Early tomatoes. The plants were set out on May 16 and were spaced three and one-half feet apart each way.

Irrigation water was applied by the furrow method and was measured separately for each plot. The acre-inch was used as the unit of measurement. It was possible to apply the full amount of water this year. The rates and dates of application for each plot are shown in table 31.

TABLE 31.—IRRIGATION OF TOMATOES, WATER APPLIED 1925

Date, and rate of application in acre-inches

| Plot | May 10 | July 2 | July 15 | Aug. 1 | Aug. 15 | Sept. 1 | Total |
|---|---|---|---|---|---|---|---|
| A | 2·0 | 2·0 | ..... | 2·0 | ..... | ..... | 6·0 |
| B | 3·0 | 3·0 | ..... | 3·0 | 3·0 | ..... | 12·0 |
| C | 3·6 | 3·6 | 3·6 | 3·6 | 3·6 | ..... | 18·0 |
| D | 4·0 | 4·0 | 4·0 | 4·0 | 4·0 | 4·0 | 24·0 |

The natural precipitation available to the crop is shown in the following table, together with the average precipitation for the same months for the previous nine years.

TABLE 32—IRRIGATION OF TOMATOES, NATURAL MOISTURE

| Month | Precipitation in inches | |
|---|---|---|
| | Oct. 1, 1924, to Sept. 30, 1925 | Average for previous nine years |
| October (1924) | 0·97 | 0·78 |
| November | 0·99 | 0·88 |
| December | 1·75 | 1·32 |
| January (1925) | 1·69 | 0·89 |
| February | 0·34 | 0·57 |
| March | 0·29 | 0·54 |
| April | 0·54 | 0·78 |
| May | 0·58 | 0·65 |
| June | 0·93 | 1·16 |
| July | 0·07 | 0·73 |
| August | 0·15 | 0·78 |
| September | 0·56 | 0·77 |
| | 8·86 | 9·85 |

The precipitation it will be noticed is slightly below the average.

The yield of marketable ripe fruit produced by each plot during August and September is shown in the following table:—

TABLE 33—IRRIGATION OF TOMATOES—YIELD PER PLOT, 1925

| Plot | Water applied in inches per plot | Yield per pounds in plot, 1/20th acre | | |
|---|---|---|---|---|
| | | August | September | Total |
| A | 6 | 241 | 73 | 314 |
| B | 12 | 314 | 106 | 420 |
| C | 18 | 664½ | 188 | 852½ |
| D | 24 | 595½ | 189½ | 785 |

A summary of six years' results with this experiment is given in the following table:—

TABLE 34—IRRIGATION OF TOMATOES, AVERAGE YIELD PER PLOT, 1920-1925

| Plot — Total water applied | A — 6 in. | B — 12 in. | C — 18 in. | D — 24 in. |
|---|---|---|---|---|
| 1920 yield | 159·7 | 232·3 | 243·5 | 251·7 |
| 1921 " | 158·0 | 138·0 | 229·5 | 226·0 |
| 1922 " | 136·7 | 133·0 | 159·7 | 130·5 |
| 1923 " | 1,151·5 | 941·0 | 670·0 | 711·0 |
| 1924 " | 1,789·4 | 2,130·7 | 2,273·9 | 2,106·4 |
| 1925 " | 314·0 | 420·0 | 852·5 | 785·0 |
| Average | 618·2 | 665·8 | 738·2 | 701·7 |

The year 1923 was characterized by unusually wet weather in June and lighter irrigation was necessary. The exact amount to apply will vary with soil, location, etc. Generally speaking, moderate amounts of water are desirable and over-irrigation, especially in the early part of the season, will reduce the yields.

### TOMATO, METHODS OF TRAINING—PROJECT H. 207

For ten years tomato plants have been pruned and trained in various ways. In every case the unpruned plants have greatly outyielded the others, while pruning seems to increase the tendency of the tomatoes to crack. The difference in maturity is so slight that the returns do not justify the trouble and expense of staking. The results of this project have been so uniform that it is not considered necessary to carry it any longer and it will be discontinued.

## PLANT BREEDING PROJECTS

ONION, BREEDING, TRUENESS TO TYPE.. .. .. .. .. .. .. .. PROJECT H. 128
ONION, SEED PRODUCTION.. .. .. .. .. .. .. .. .. .. .. .. " H. 133
CANTALOUPE, BREEDING.. .. .. .. .. .. .. .. .. .. .. .. .. " H. 118
BEANS, BREEDING FOR YIELD.. .. .. .. .. .. .. .. .. .. .. " H. 56

A large number of individual selections have been made in these classes for further testing.

The following projects are under way and have been previously reported or require further testing before results are reported:—

Asparagus, variety test.. .. .. .. .. .. .. .. .. .. .. .. ..Project H. 54
Cabbage, variety test.. .. .. .. .. .. .. .. .. .. .. .. .. .. " H. 77
Cauliflower, variety test.. .. .. .. .. .. .. .. .. .. .. .. .. " H. 88
Corn, suckering experiment.. .. .. .. .. .. .. .. .. .. .. .. " H. 101
Water melon, variety test.. .. .. .. .. .. .. .. .. .. .. .. .. " H. 125
Okra, variety test.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. " H. 126
Parsnip, dates of sowing.. .. .. .. .. .. .. .. .. .. .. .. .. " H. 142
Parsnip, variety experiment.. .. .. .. .. .. .. .. .. .. .. .. " H. 145
Pumpkin, variety experiment.. .. .. .. .. .. .. .. .. .. .. .. " H. 188
Salsify, variety experiment.. .. .. .. .. .. .. .. .. .. .. .. " H. 197
Spinach, variety experiment.. .. .. .. .. .. .. .. .. .. .. .. " H. 199
Radish, variety experiment.. .. .. .. .. .. .. .. .. .. .. .. " H. 192
Rhubarb, variety experiment.. .. .. .. .. .. .. .. .. .. .. .. " H. 356
Turnips, variety experiment .. .. .. .. .. .. .. .. .. .. .. .. " H. 214

## Flowers

### DAHLIAS, VARIETY EXPERIMENT—PROJECT H 268

Dahlias suffer greatly from the heat. Buds turn brown and the early blooms are illshapen or disfigured. Later in the season they improve. Late planting is recommended. This should be delayed until June if possible.

Removal of the early buds will partly control the trouble. It would appear that the moisture lost through transpiration is greater than the early root system can maintain and the blooms are the first part of the plant to suffer.

In the Vernon district where the plan of mulching deeply with straw or coarse manure covered with a thin layer of soil has been followed splendid results with Cannas and Dahlias have been obtained. This practice should be followed generally by those wishing to secure large blooms.

### EVERLASTING FLOWER, VARIETY EXPERIMENT, PROJECT H 269

The following may be seeded in the open, may be grown with little trouble and make attractive boquets when dried: Statice Bonduellii, Statice sinuata, Acroclinium, Rhodanthe.

When planting, scatter seeds lightly on the surface of the soil and barely cover with soil. Then cover with a mulch of straw or leaves to retain moisture until germination is complete.

The following require to be started in the greenhouse or frames and transplanted to the open: Celosia (cockscomb), Globe amaranth.

PERENNIAL BORDER
Experimental Station, Summerland, B.C.

### HERBACEOUS PERENNIALS, VARIETY EXPERIMENT— PROJECT H 274

In older lands perennials form the background for the majority of well-established gardens. There is a growing interest in them in the Okanagan as the country passes from the pioneering stage. The perennial border at this Station serves to show what flowers may generally be grown. A succession of bloom from early April until the late fall may be had with Arabis (Rock Cress), Aquilegia (Columbine), Alyssum, Campanula (Bluebells), Anchusa Marguerites, Dianthus (Pinks), Oriental Poppies, Iris, Pæonies, Delphiniums, Pyrethrum, Gypsophila, Aubretia, Shasta Daisy and Hollyhocks, all of which are easily grown and bloom profusely.

## IRIS, VARIETY TEST—PROJECT H 276

The following iris have been tested out in the perennial border since 1916. An additional test bed of 31 varieties was planted this fall.

TABLE 35—IRIS VARIETY TEST

| Variety | Wintered | Height of leaves | Height flower stalk | First bloom | Full bloom | Bloom over |
|---|---|---|---|---|---|---|
| | | | | May | May | June |
| | | in. | in. | | | |
| Reine des Belges | Medium | 8 | 14 | 12 | 14 | 8 |
| Gracchus | Poorly | 7 | 12 | 13 | 20 | 2 |
| Ossian | Medium | 6 | 16 | 13 | 15 | 4 |
| Gazelle | Medium | 7 | 13 | 13 | 18 | 6 |
| Salvatori | Well | 12 | 16 | 13 | 18 | 1 |
| Alcazar | Well | 10 | 16 | 13 | 18 | 4 |
| Honorable | Medium | 6 | 14 | 13 | 18 | 6 |
| Sambucina Solomon | Well | 10 | 20 | 13 | 19 | 8 |
| Rhein Nixe | Well | 15 | 30 | 13 | 19 | 10 |
| Mrs. G. Reuthe | Medium | 8 | 16 | 13 | 22 | 10 |
| Eldorado | Medium | 8 | 16 | 13 | 20 | 4 |
| Princess Victoria Louise | Well | 10 | 18 | 13 | 18 | 4 |
| Loreley | Well | 12 | 18 | 14 | 20 | 6 |
| Queen of May | Well | 14 | 24 | 15 | 20 | 10 |
| Nibelugen | Well | 12 | 20 | 15 | 22 | 6 |
| Parc de Neuilly | Well | 12 | 27 | 15 | 22 | 15 |
| Monsignor | Well | 12 | 18 | 16 | 25 | 15 |
| White Knight | Well | 12 | 16 | 16 | 22 | 12 |
| Caprice | Well | 16 | 24 | 16 | 22 | 15 |
| Wyomissing | Medium | 8 | 14 | 17 | 20 | 4 |
| Madame Chereau | Well | 14 | 30 | 18 | 22 | 10 |
| Flavescens | Well | 10 | 18 | 18 | 22 | 4 |
| Mrs. H. Darwin | Well | 15 | 27 | 18 | 22 | 8 |
| Asiatica | Well | 7 | 14 | 18 | 18 | 28 |
| Mithras | Medium | 10 | 14 | 18 | 21 | 10 |
| Perfection | Well | 16 | 30 | 18 | 22 | 10 |
| Prosper Laugier | Badly | 12 | 18 | 18 | 22 | 4 |
| Gagus | Medium | 15 | 18 | 18 | 22 | 8 |
| Clio | Well | 10 | 16 | 18 | 22 | 15 |
| Albert Victor | Medium | 12 | 24 | 20 | 24 | 15 |
| Juniata | Well | 16 | 30 | 20 | 24 | 12 |
| Jacquesiana | Medium | 10 | 20 | 24 | 31 | 20 |
| Verschnur | Well | 15 | 24 | 24 | 28 | 8 |

## PAEONY, VARIETY EXPERIMENT—PROJECT H 280

The following pæonies have been tested out in the perennial border. The soil is very light and the plants have not made as vigorous growth as they would in heavier soil. The blooming period is also shorter on this type of soil.

TABLE 36—PAEONY VARIETY EXPERIMENT

| Variety | Wintered | Height of plant in inches | First bloom — June | Full bloom — June | Bloom over — June |
|---|---|---|---|---|---|
| Henry Demay | Well | 24 | 1 | 6 | 20 |
| Auguste Lemoine | Well | 20 | 2 | 8 | 22 |
| Benoît François | Well | 24 | 8 | 10 | 30 |
| Multicolor | Well | 15 | 8 | 8 | 25 |
| Delachei | Well | 24 | 9 | 12 | 30 |
| Papilionaceae | Well | 14 | 12 | 12 | 25 |
| Rubra | Well | 10 | 12 | 12 | 25 |
| Eugène Verdier | Well | 14 | 12 | 14 | 28 |
| Pres. Wilder | Well | 13 | 13 | 15 | 30 |
| Chas. Von Geart | Well | 8 | 13 | 13 | 25 |
| Baronne Jas de Rothschild | Well | 10 | 13 | 13 | 25 |
| Mons Pancharlet | Well | 14 | 13 | 13 | 25 |
| Constant David | Well | 14 | 13 | 13 | 28 |

## PHILADEPHUS, VARIETY EXPERIMENT—PROJECT H 300

The Philadelphus is one of the most useful shrubs for general planting in the Okanagan. The different species offer a wide range of height and time of flowering, making them suitable for various locations. The following have been tested:—

TABLE 37—PHILADELPHUS VARIETY EXPERIMENT

| Species | Planted | Present height | Full bloom |
|---|---|---|---|
| Grandiflorus | 1917 | 12 ft. | June 8 |
| Satsumi | 1917 | 10 " | " 8 |
| Souvenir de Billardii | 1917 | 8 " | " 12 |
| Speciossimus | 1917 | 8 " | " 12 |
| Lemoinei Avalanche | 1922 | 3 " | " 14 |
| Lemoinei Mont Blanc | 1922 | 3 " | " 18 |
| Virginalis Boquet Blanc | 1922 | 4 " | " 13 |
| Lemoinei Conquetel | 1922 | 5 " | May 31 |
| Coronarius Aureus | 1922 | 3 " | " 31 |
| Lewisii | 1922 | 4½ " | June 8 |
| Voie Lactée | 1922 | 5 " | " 18 |
| Delavayi | 1922 | 5 " | May 31 |
| Coronarus Dianthiflorus | 1922 | 18 in. | " 31 |
| Lemoinei Candelabre | 1922 | 15 " | June 11 |

## ROSES, VARIETY EXPERIMENT—PROJECT H 302

Nine year tests with roses at this Station show that every three or four years severe winter-killing may be expected unless the plants are given protection. Hilling up with earth to a depth of 10 to 12 inches is recommended.

The following varieties came through the severe winter without protection and may be classed as hardy:—

American Beauty (H.P.)
Baroness Rothschild (H.P.)
George Dickson (H.T.)
Juliet (Per.)
Morning Star (Per.)
Soleil D'Or (Per.)
Yellow Druschki (H.T.)
Cheerful (H.T.)
Gen. Superior A. Janssen (H.T.)
Hugh Dickson (H.P.)
Mrs. John Laing (H.P.)
Queen of Fragrance (H.T.)
Ulrich Brunner (H.P.)

The following have been grown successfully for nine years and with protection may be expected to survive these "test winters."

Frau Karl Druschki (H.P.)
King George V (H.T.)
Lyon Rose (H.T.)
Mme. Ed. Herriott (Per.)
Prince de Bulgarie (H.T.)
Triumph (H.T.)
George Ahrends (H.P.)
La France (H.T.)
Mme. Caroline Testout (H.T.)
Paul Neyron (H.P.)
Souv. de Pres. Carnot (H.T.)
Viscountess Folkstone (H.T.)

## CLIMBING ROSES, VARIETY EXPERIMENT—PROJECT H. 303

The following survived the winter of 1924-25; Excelsa H.W., Paul Scarlet Climber.

In addition to these the following have been grown for nine years and may be expected to survive with proper protection.

Captain Christy (H.P.)
Dorothy Perkins (H.W.)
Vielchenblau (Poly.)
Coronation (H.W.)
Tausenschon (Poly.)
White Dorothy Perkins (H.W.)

### SWEET PEA, BREEDING EXPERIMENT—H 560

Sweet peas of the Scarlet Duplex variety were planted 30 inches apart each way. All single blooms were removed from certain plants. All duplex blooms were removed from others. The seed from each plant was kept separate and planted out single plants 36 inches apart. Seed from duplex blooms produced single and duplex blooms. Seed from single blooms also produced both single and duplex blooms. The duplex character is evidently not an inherited character. Duplex blooms set seed very sparingly.

### SWEET PEA, CROSSING EXPERIMENT—PROJECT H 561

This experiment begun in 1925 will take one more year at least to produce results. Seed saved this year will be planted out in 1926. In plants grown from pods selected in 1924 dominant rogues were found indicating that some cross-fertilization is taking place in sweet peas grown for seed.

### SWEET PEA INTENSITY OF COLOUR EXPERIMENT—PROJECT H 562

This is an attempt to discover whether the change in intensity of colour of some varieties is inherited or physiological. It will require some years to secure reliable information on this point.

### SWEET PEA, VARIETY EXPERIMENT—PROJECT H 287

From one year's results it would appear that greatly improved sweet peas may be secured by planting the seed in flats in cold-frames about February and transplanting to the open when four to five inches high.

The following projects are also under way and have either been reported on fully in previous reports or require further work before being ready for reports.

| | | | | | |
|---|---|---|---|---|---|
| Annual flowers, | Variety Experiment | | | Project | H-261 |
| Antirrhinum | " | " | | " | H-380 |
| Aster Annual | " | " | | " | H-263 |
| Aster Perennial | " | " | | " | H-262 |
| Cineraria | " | " | | " | H-223 |
| Crocus | " | " | | " | H-267 |
| Hyacinth | " | " | | " | H-275 |
| Narcissus | " | " | | " | H-278 |
| Tulip | " | " | | " | H-290 |
| Gladiolus | " | " | | " | H-272 |
| Propagation of trees and shrubs by cuttings | | | | " | H-282 |
| Hedges Variety Experiment | | | | " | H-298 |
| Syringa | " | " | | " | H-305 |
| Ornamental Evergreen Trees and Shrubs | | | | " | H-376 |
| Trees and Shrubs Ornamental and Shelter, Variety Experiment | | | | " | H-307 |

## POULTRY

Only one breed of poultry is kept on this Station that being the white Wyandotte. At the end of December 1925, the flock consisted of, 130 hens; 265 pullets; 31 males, making a total of 426 birds.

The situation of the present site for a poultry plant has been somewhat unfortunate. It is a level piece of land, very poor soil, practically a bed of stone, upon which irrigation is impracticable. The soil is too stony to cultivate and too poor to grow green feed unless water be supplied. It was selected because it was more or less useless for other purposes; it is sheltered from the winds, and further being representative of many similar sections in the valley, it was used more as an experiment. The result has been that because of lack of crops it has not been possible to keep the land free from contamination and the past two years there has been a slight decrease in the vitality of the breeding stock and in the health and livability of the growing chicks.

Because of this condition and the fact that a similar state might prevail in other flocks a special visit was made in July to the Station by C. H. Weaver, Animal Pathologist in charge of poultry diseases, of the Central Experimental Farm, Ottawa. According to Dr. Weaver the land has become unfit for intensive poultry culture and until a new location is secured the practice of growing the young chicks on cultivated land entirely away from the poultry plant will be adhered to. The removal of the chicks this year to a cultivated orchard where there was plenty of shade and green feed was very beneficial. This practice will be rigidly adhered to in order to see if land such as the present plant is built upon could be used for adult birds, providing the young stock is brooded and reared upon fresh soil each year. In June the young stock were taken off the poultry plant and removed to the orchard where they picked up marvelously, and when put into laying-quarters in the fall looked very fit and in good condition. They have laid very well so far this winter and have not shown any loss of flesh or condition other than that which is usual after good laying. They have not been forced in the least and have been kept entirely confined to their laying-houses. Furthermore there has been no sickness and no deaths.

### FERTILITY IN FIRST EGGS LAID AFTER PROLONGED REST—PROJECT P174

This experiment was started to ascertain whether it is economical to incubate the first, second or third eggs laid by a hen after prolonged rest.

Only birds giving ultimate fertility were recorded. Six hens gave chicks from all three eggs, while four hens retained infertility for the same; the remainder produced various results, running from infertile eggs to chicks and vice versa.

Judging from the results, which are inconclusive as yet, being from too few birds, it might be advisable to exclude from the incubator the first two eggs laid by a hen after a prolonged rest of at least three or four weeks. Table 38 gives the figures from the experiment.

TABLE 38—FERTILITY IN EGGS

| —— | Infertile | Dead germs | Dead in shell | Chicks hatched |
|---|---|---|---|---|
| First eggs | 12 | 3 | 1 | 11 |
| Second eggs | 9 | 3 | 3 | 12 |
| Third eggs | 7 | 4 | 4 | 12 |

### OTHER EXPERIMENTS UNDER WAY

Green feed versus Epsom salts—Project P. 95.

Corn versus no corn for laying pullets—Project P. 170.

Fish-meal versus beef-scrap—Project P. 87.

Cod-liver oil for laying pullets—Project P. 168.

Breeding for egg size—Project P. 114A.

# GENERAL

## CHEMISTRY

### PROJECT C. 10—SUGAR BEET INVESTIGATION

Tests were continued to ascertain the suitability of climatic and seasonal conditions of the district for growing sugar beet for factory purposes. A new project was undertaken during the year.

### PROJECT C. 149—FERTILIZERS

To test the value of barnyard manure and green manure alone and in conjunction with commercial fertilizers in a two-year rotation of corn and annual hay under irrigation, this experiment was begun in 1925 and is being continued.

## FIBRE CROPS

### PROJECT E. 26—GROWING HEMP FOR SEED

This experiment was continued to determine if hemp can be grown economically in this district.

## TOBACCO

### PROJECT T. 47—VARIETY TESTS OF TOBACCO

This experiment was begun this year to determine the varieties and types of tobacco best suited to the southern Okanagan valley. Eleven varieties were tested on silt-loam bench-soil and produced excellent stands of tobacco. The final results of the cured leaf will not be known until next autumn.

This experiment was also conducted in the district of Kelowna on eight blocks of land, each block several miles apart, located in various directions within a fifteen mile radius of Kelowna. These lands included bench and low land, and land under different systems of irrigation. The different soils were classed as clay, light clay, sandy loam, light sandy loam, volcanic silt and alkali. The growing of tobacco under such variable soil, moisture and climatic conditions gave much valuable cultural information. The results at harvest time indicate that excellent crops of tobacco can be grown on a wide variety of soils typical of the Kelowna district. The work is being continued to determine the curing qualities of the varieties grown this year and further to test the most suitable varieties to grow.

## IRRIGATION WORKS

A considerable amount of time was spent early in the year, repairing the main and lateral flumes on the Station. The whole wood flume system is pretty well worn out,having been in use ten years, and the amount of labour now necessary to keep it in working order is very high. Plans are in progress to install a new system of concrete pipe mains. Several laterals were renewed during the year; new galvanized iron flumes being installed on the variety apple-orchard block and on a section of the Chemistry division. A galvanized iron pipe was installed to the Poultry division in order to get water to that section.

A six-inch wood pipe was relaid before frost along the railway to supply water under pressure for irrigation purposes and fire protection to the Dairy Division and greenhouses. This takes delivery from the pressure tank on the hill. A fire hydrant was installed in this line to protect the horse-barn, dairy barn and herdsman's cottage. At the same time as this pipe was trenched a new domestic line was laid in the same trench to supply the dairy barn, herdman's cottage and greenhouses.

Irrigation water was sufficient at all times during the season for the first time in the history of the Station. This was due to the efficiency of the pumping outfit in the canyon which supplemented the water purchased from the municipality of Summerland. Due to the service of the storage dam sufficient water out of storage was available to keep this pump going for sixty days during July and August. This insured a steady supply of water for all crops during that period of greatest need.

## BUILDINGS

The new dairy barn, to house twenty head, was completed during the year. A cottage for the accommodation of the herdsman was built near the dairy barn. Work on the Superintendent's house was continued and the exterior and much of the interior finish completed during the year. Considerable painting to the exterior of the Station building was done.

## EXTENSION

Exhibition material was forwarded to the Experimental's Farms' exhibit at the Vancouver Exhibition. Arrangements are now going forward to visit the leading exhibitions in the district in the fall of 1926.

The annual Farmers' Institute picnic for the entire Okanagan Valley was held on the second Saturday in June. It was a hugh success if attendance can be taken as a fair criterion of the interest that was aroused. Up to 1,500 people were actually counted in, and the estimates on attendance ran as high as 2,000. A basket-lunch was held in the Station orchards at noon. Demonstrations were given by the staff on winter-injury to apple trees and on stationary spray-plants. President Klink, of the University of British Columbia, was the only speaker. Stock-judging competitions and children's sports provided instruction and amusement. Great credit should be given to the committee of the Local Farmers' Institutes, who greatly assisted the staff of the Station in making the event such a success.

Numerous fruit-growers' meetings were addressed at various times during the year by members of the staff.