DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

# EXPERIMENTAL SUB-STATIONS

BEAVERLODGE, ALTA.

FORT VERMILION, ALTA.

GROUARD, ALTA.

FORT SMITH, N.W.T.

FORT RESOLUTION, N.W.T.

SWEDE CREEK, YUKON

SALMON ARM, B.C.

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## Interim Reports of the Experimentalists in Charge

FOR THE YEAR ENDING MARCH 31, 1921

Printed by authority of the Hon. S. F. TOLMIE, Minister of Agriculture, Ottawa, 1921

# EXPERIMENTAL SUB-STATION, BEAVERLODGE, ALTA.

## REPORT OF THE SUPERINTENDENT, W. D. ALBRIGHT

### THE SEASON

The season of 1920-21 was, on the whole, favourable to crop raising in the district. During the period under review, April 1, 1920, to March 31, 1921, precipitation occurred on ninety-four days, the heaviest during twenty-four hours taking place on May 28, when 0·75 inches of rain fell. The wettest month of the year was September, rain falling on no less than sixteen days. This considerably handicapped work on the Sub-station. However, a few days of fair weather early in October, accompanied by very light frosts, assisted matters considerably. One inch of snow fell on the seventh of the month, the lowest temperature in October, 13° F., being recorded on this date. The week nearest to the middle of October was good, and the potato harvest was finished by the 15th of the month. Grain stacking was practically completed by the 22nd, as well as all root and garden crops harvested, including between seven and eight hundred bushels of turnips—an excellent crop. The winter was very mild, and during the entire season the lowest point to which the thermometer dropped was -26° F. This was the reading at the Station on January 5th.

Threshing was complete by early in December (during which month the mean temperature was 10·6° F.), the yields being, almost without exception, excellent. The best plot of barley (O.A.C. 21) yielded 70 bushels to the acre; while the heavier seedings of Ligowo oats, in the thickness of seeding test, yielded no less than 103 bushels per acre. Huron wheat, which was badly frosted, produced 38 bushels per acre.

TABLE of Meteorological observations taken at Beaverlodge, Grande Prairie, Alberta, from April 1, 1920, to March 31, 1921, giving the maximum, minimum, and mean temperature for each month, also rainfall, snowfall, and total precipitation.

| Months | Maximum | Minimum | Range | Mean | Highest | Date | Lowest | Date | Rainfall | Snowfall | Total Precipitation | Number of days Precipitation | Heaviest in 24 hours | Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | ° | ° | ° | ° | | ° | | | | | | | |
| April | 36·50 | 18·53 | 17·96 | 27·51 | 50·0 | 18th | −12·0 | 3rd | 1·42 | 4·00 | 1·82 | 7 | 0·70 | 20th |
| May | 52·66 | 32·64 | 20·01 | 42·64 | 69·0 | 7th | 20·0 | 1st | 1·15 | ..... | 1·15 | 6 | 0·75 | 28th |
| June | 62·37 | 40·70 | 21·68 | 51·54 | 76·0 | 28th & 29th | 31·0 | 11th | 3·17 | ..... | 3·17 | 13 | 0·67 | 6th |
| July | 75·37 | 50·43 | 24·93 | 62·89 | 89·0 | 16th | 40·0 | 3rd | 2·52 | ..... | 2·52 | 7 | 1·07 | 22nd |
| August | 69·74 | 45·88 | 23·85 | 57·80 | 86·0 | 15th | 32·5 | 29th | 2·48 | ..... | 2·48 | 10 | 1·37 | 17th |
| September | 56·15 | 35·30 | 20·85 | 45·72 | 72·0 | 3rd | 28·0 | 15th | 1·80 | ..... | 1·80 | 16 | 0·38 | 25th |
| October | 44·80 | 27·70 | 17·09 | 36·24 | 58·0 | 1st | 13·0 | 19th | 1·55 | 1·00 | 1·85 | 7 | 0·58 | 7th |
| November | 31·93 | 15·29 | 16·64 | 23·61 | 52·0 | 2nd | 0·4 | 24th | ..... | 4·30 | 0·43 | 4 | 0·18 | 22nd |
| December | 17·41 | 3·79 | 13·62 | 10·60 | 37·0 | 4th | −20·0 | 26th | ..... | 7·50 | 0·75 | 3 | 0·50 | 27th |
| January | 13·19 | −1·32 | 14·51 | 5·93 | 40·0 | 1st | −26·0 | 17th | ..... | 14·00 | 1·40 | 9 | 0·30 | 5th |
| February | 28·32 | 9·85 | 18·46 | 19·08 | 43·0 | 24th & 25th | −22·0 | 20th | 0·17 | 8·00 | 0·97 | 5 | 0·30 | 2nd |
| March | 28·93 | 9·09 | 19·83 | 19·00 | 48·0 | 8th | −22·0 | 12th | ..... | 12·00 | 1·20 | 7 | 0·40 | 18th |
| | | | | | | | | | 14·26 | 50·80 | 19·34 | 94 | | |

METEOROLOGICAL RECORD at Dominion Experimental Station, Beaverlodge, 1916-1920

| Month | Average monthly Temperature | | Snowfall in inches | Total Precipitation | Days Sleighing |
|---|---|---|---|---|---|
| | Maximum | Minimum | | | |
| 1916 | ° | ° | | | |
| January | − 5·76 | −24·87 | 7·00 | ·700 | 31 |
| February | 25·97 | 5·79 | 3·00 | ·300 | 29 |
| March | 28·42 | 6·32 | 12·00 | 1·450 | 24 |
| April | 51·46 | 29·30 | 0 | ·086 | 0 |
| May | 60·40 | 35·83 | 0 | ·215 | 0 |
| June | 70·05 | 44·51 | 0 | ·445 | 0 |
| July | 66·77 | 44·58 | 0 | 3·980 | 0 |
| August | 68·16 | 43·16 | 0 | ·470 | 0 |
| September | 60·44 | 37·86 | 0 | ·520 | 0 |
| October | 51·50 | 30·74 | 2·00 | ·560 | 0 |
| November | 35·08 | 17·68 | 1·00 | ·100 | 0 |
| December | 15·76 | − 2·56 | 15·00 | 1·500 | 14 |
| | 44·02 | 22·36 | 40·00 | 10·326 | 98 |
| Mean Annual Temperature | | 33·19 | | | |
| 1917 | | | | | |
| January | 11·85 | − 7·43 | 25·00 | ·250 | 31 |
| February | 15·46 | − 6·25 | 8·00 | 1·000 | 28 |
| March | 31·82 | 19·90 | 9·50 | ·950 | 31 |
| April | 44·16 | 24·91 | 0 | ·370 | 11 |
| May | 57·00 | 34·19 | 10·00 | 6·620 | 0 |
| June | 64·86 | 41·76 | 0 | 1·020 | 0 |
| July | 72·95 | 45·80 | 0 | ·415 | 0 |
| August | 69·90 | 43·08 | 0 | ·886 | 0 |
| September | 61·30 | 34·80 | 0 | ·210 | 0 |
| October | 45·80 | 28·01 | 9·00 | 1·820 | 2 |
| November | 46·90 | 29·10 | 2·00 | ·390 | 0 |
| December | − 5·48 | −19·22 | 26·00 | 2·600 | 31 |
| | 43·37 | 21·63 | 89·50 | 16·535 | 134 |
| Mean Annual Temperature | | 32·50 | | | |
| 1918 | | | | | |
| January | 14·90 | − 0·32 | 8·75 | 1·12 | 31 |
| February | 18·85 | − 2·18 | 12·00 | 1·20 | 28 |
| March | 29·09 | 7·67 | 12·00 | 1·36 | 31 |
| April | 49·60 | 26·46 | 4·00 | 0·60 | 14 |
| May | 58·06 | 33·09 | 0 | 0·22 | 0 |
| June | 65·00 | 42·66 | 0 | 2·29 | 0 |
| July | 69·37 | 46·04 | 0 | 3·59 | 0 |
| August | 67·51 | 46·35 | 0 | 1·71 | 0 |
| September | 66·83 | 39·55 | 0 | 0·42 | 0 |
| October | 47·48 | 27·32 | 1·75 | 0·975 | 0 |
| November | 34·60 | 18·73 | 5·50 | 0·55 | 0 |
| December | 27·54 | 10·58 | 11·00 | 1·10 | 31 |
| | 45·73 | 24·66 | 55·00 | 15·135 | 135 |
| Mean Annual Temperature | | 35·19 | | | |

METEOROLOGICAL RECORD at Dominion Experimental Station, Beaverlodge—*Concluded*

| Month | Average monthly Temperature | | Snowfall in inches | Total Precipitation | Days Sleighing |
|---|---|---|---|---|---|
| | Maximum | Minimum | | | |
| 1919 | ° | ° | | | |
| January | 29·93 | 14·29 | 6·50 | 0·65 | 31 |
| February | 16·42 | − 1·10 | 7·00 | 0·70 | 28 |
| March | 20·16 | 0·32 | 19·50 | 1·95 | 31 |
| April | 51·36 | 30·23 | 4·00 | 0·82 | 0 |
| May | 56·63 | 33·40 | 0 | 1·04 | 0 |
| June | 62·46 | 39·63 | 0 | 2·48 | 0 |
| July | 70·58 | 45·97 | 0 | 2·22 | 0 |
| August | 67·13 | 45·67 | 0 | 2·14 | 0 |
| September | 61·56 | 39·65 | 0 | 1·78 | 0 |
| October | 38·80 | 18·41 | 15·50 | 2·18 | 10 |
| November | 20·96 | 4·25 | 22·00 | 2·34 | 30 |
| December | 20·84 | 4·45 | 17·50 | 1·76 | 31 |
| | 43·07 | 22·93 | 92·00 | 20·08 | 161 |
| Mean Annual Temperature | | 33·00 | | | |
| 1920 | | | | | |
| January | 10·90 | − 5·96 | 38·50 | 3·85 | 31 |
| February | 33·03 | 13·68 | 2·00 | 0·20 | 29 |
| March | 28·67 | 9·22 | 21·20 | 2·12 | 31 |
| April | 36·50 | 18·53 | 4·00 | 1·82 | 30 |
| May | 52·66 | 32·64 | 0 | 1·15 | 6 |
| June | 62·38 | 40·70 | 0 | 3·17 | 0 |
| July | 75·16 | 50·40 | 0 | 2·52 | 0 |
| August | 69·70 | 45·90 | 0 | 2·66 | 0 |
| September | 56·15 | 35·36 | 0 | 1·80 | 0 |
| October | 44·80 | 27·70 | 1·00 | 1·65 | 0 |
| November | 32·16 | 15·95 | 4·30 | 0·43 | 0 |
| December | 17·40 | 3·80 | 7·50 | 0·75 | 31 |
| | 43·30 | 23·99 | 78·50 | 22·12 | 158 |
| Mean Annual Temperature | | 33·64 | | | |

Five year averages:—

| | |
|---|---|
| Temperature | 33°·50 F. |
| Snowfall | 71·00 inches |
| Precipitation | 16·837 inches |
| Days sleighing | 137 |

## FORAGE CROPS

### SEC. I—INTRODUCTORY

Each succeeding year emphasizes the wisdom of having featured forage crops in the early experimental work at Beaverlodge. Most crucial of all is the problem of seeding down to hay and pasture crops. Preconceived opinions on this, as on nearly every other phase of northern agriculture, are discounted by the peculiarity of climatic conditions. Among these may be enumerated:—

(*a*) A limited and irregular precipitation, averaging perhaps 15 to 18 inches per annum, but running as low as ten inches, with a tendency very often to drouthy conditions in spring and early summer, the period when hay crops need plenty of moisture.

(*b*) Conditions that ordinarily result in quite a rank growth of cereals, which thus become "smothering" rather than "nurse" crops to grasses and clovers seeded amongst them.

(*c*) A comparatively short and tardy growing season, with a late grain harvest, followed often by a dry autumn, affording little opportunity for new seedings of grasses and clovers to make sufficient top and root growth after the grain has been cut.

(*d*) Conditions that render it difficult to germinate and destroy weed seeds, some of which lie over, even in well-fallowed soil, to spring up vigorously when slow-starting crops like grasses are sown. This complicates the problem of seeding down without nurse crops.

(*e*) Lack of natural inoculation of the clovers commonly employed in rotation cropping.

(*f*) A comparatively brief and tardy season during which soil temperature is high enough for nitrification, resulting in a very limited nitrogen supply to all crops, save those such as cereals for which a fresh supply of nitrates and other plant food is liberated by annual cultivation. May not this, especially in view of the unusually limited moisture supply, have much to do with the well-known tendency of perennial hay crops to yield sparingly under western conditions?

In connection with this point, it was noted that notwithstanding an extreme precipitation in the spring and early summer of 1920, the growth of grass, while somewhat better than in the previous year, was still in the main disappointing, save in the case of plots seeded without nurse crops on well-prepared land of 1919. On some of these latter areas the growth was immense, running as high as four tons per acre from certain plots of brome grass. Furthermore, these plots that had been seeded without nurse crops were very much more forward than those that had been seeded with grain, for all that a good "catch" had been obtained with the grain in 1919. The contrast in respect both to yield and forwardness was especially marked in the case of the brome grass. The four plots of this seeded without nurse crops in 1919 were between five and six feet tall when cut on July 28, and yielded an average of about 3½ tons per acre. The twelve plots seeded with grain were not cut until August 19, were not then fully headed, and not over two feet tall; while the average yield was around half a ton per acre. It was conspicuous that in a few limited areas of these nurse crop plots where the drill had skipped grain in 1919, the brome grew tall and rank as in the check plots mentioned above. A gap of a square yard was sufficient to bring out the contrast, the full significance of which is not yet understood.

Upon several of the foregoing points the work at Beaverlodge is gradually throwing light and furnishing information of fundamental value for the planning of rotation experiments later on.

It has already been demonstrated that grasses can be grown very successfully if seeded without nurse crops, though it has not been proven that this is the most profitable practice.

It has been shown that the production of grass seed on a commercial scale is a comparatively safe and remunerative specialty for this remote region, with its acute transportation problem.

It has been pretty well established that winter-killing is little to be feared in regard to the grasses and not especially formidable in the case of clovers and alfalfa, providing hardy strains are employed and vigorous stands secured. While red clover has in one year been killed outright and often sustains an impairment of its stand, it has on more than one occasion wintered perfectly.

During the past year some striking data on inoculation have been secured, giving promise that, once our farm soil is generally inoculated, the inclusion of hardy strains of clovers in our seeding-down mixtures may increase both the annual yields and the profitable producing duration of our meadow stands, by capturing from the atmosphere some nitrogen to supplement the inadequate supply of soil nitrates that is rendered available in our cool climate when the heavy soil lies for several years in glebe. This, of course, remains to be demonstrated, but it is one of the questions now engaging attention.

## SEC. II—THE NURSE CROP EXPERIMENT

The plan and purpose of this experiment have been described in previous reports. In 1918 three acre blocks of cereals, viz., barley, wheat and oats, were each divided into four quarter-acre strips, the grain being sown at rates graded from thin up to thick seeding. Crosswise of the twelve quarter-acre strips of cereals, ten kinds of clovers and grasses were sown and harrowed in, making 120 fortieth-acre plots of hay crops seeded on the three grains. The strips of clovers and grasses extended beyond the grain to constitute a check range (A) seeded without nurse crop. Range B was a second check, duplicating A, only sown about a week later. About the end of August the south halves of the plots in both check ranges (A and B) were clipped with mower bar set high and the clippings were cured into hay, which was weighed.

In the 1919 seeding the same general plan was followed, but in addition a quarter-acre of oats for green feed was sown on May 21, and the grass and clover seeds extended across it, making ten nurse-crop plots more than in the year before.

The same plan was followed in the 1920 repetition of the seeding though, unfortunately, an infestation of Shepherd's Purse compelled the ploughing up of fifteen plots.

### RATES OF SOWING

The nurse crops in this experiment have been sown as follows:—

Barley— 4, 6, 8 and 10 pecks per acre.
Wheat— 5, 6, 7 and 8 pecks per acre.
Oats—10, 12, 14 and 16 pecks per acre.

Oats for green feed were sown in 1919 at from five pecks per acre on one side of the strip, gradually increased to ten pecks on the other; in 1920 at ten pecks.

The grasses and clovers were sown in 1918 at the following rates per acre:—

Alfalfa, red and sweet clover—10 pounds each.
Alsike and white Dutch clover— 5 pounds each.
Timothy and Western rye grass—6 pounds each.
Meadow Fescue, Kentucky Blue and Brome—12 pounds each.

In 1919 the quantities of grass and clover seeds were increased 50 per cent all around. In 1920 the same rate was maintained for all save the timothy, which was dropped back to the original rate of six pounds.

### DATES OF SEEDING, ETC.

In 1918 the nurse crops were drilled on April 30 and May 1, the grasses and clovers being sown on May 2 and 3, except check range B, which was sown on May 10. The south halves of check ranges A and B were clipped on August 28.

In 1919 the Marquis wheat was sown April 26; the Victory oats May 1; the O.A.C. No. 21 barley May 2. Weather delayed the sowing of the small seeds until May 9. On check Range B and also on the Green Feed strip the grasses and clovers were sown May 21; south halves of check ranges clipped September 9.

In 1920 the nurse crop of wheat (Huron) was drilled May 20; of oats (Ligowo) 20th and 21st; of O.A.C. No. 21 barley, May 21, and of oats for green feed May 31. Grass and clover seeds sown May 24, save on green-feed nurse crop and on check range B, where they were sown May 31 and June 3 respectively. South halves of check ranges were clipped September 6 and weighed about forty days later, after an interval of wretched weather.

### LESSONS TO DATE

The further this experiment progresses, the more cautious does the staff become about drawing conclusions, beyond the tentative ones advanced in the introduction to this report. Seasonal variations and other factors invest the subject with the romance of uncertainty. Surface contour and soil quality are conflicting factors. Plots that produce extra well in one year sometimes fall short in the second or third,

whether because of depletion resulting from the initial big crop or because of some other circumstance, it is often hard to decide. Perhaps it is best to attempt few present deductions, but rather to carry the data down to date in tabular form until the completion of a five-year or longer period furnishes more comprehensive facts to go upon.

This much may be said: in the absence of inoculation it is scarcely worth while seeding the clovers at all, especially with nurse crops. As a rule, in this experiment, results of seeding uninoculated plots in this way have been so poor that the clovers have been called failures and ploughed up. Where no nurse crops were used the results were somewhat better, but still far from good.

Where no nurse crop is used native weeds give trouble, even on the comparatively clean land of the Station. On the small plots these are handpulled. In fields they would have to be clipped, and this would not be wholly effectual. Besides, it would have to be done before the first year's crop was ready to cut for hay.

Where a nurse crop of grain is employed, weeds are fairly well held in check during the season of seeding, but are liable to be abundant in the weak and slow-starting crop of hay in the year following the nurse crop. Moderately thick seeding of grass is advised as an aid towards keeping weeds in check. It is also proposed to try seeding without nurse crops and pasturing after the grass is nicely started, so as to consume such rapid growing annuals as lambsquarter, which become myriad-seeded giants where not subdued by fast growing crops like grain.

TABLE I.—Showing yields of hay per acre, Nurse Crop Test—1918 Seeding.—Three Years' Results

| Crop | Seeded without nurse crop | | | | | | | Seeded with nurse crop | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Average yields S. halves Ranges A and B, clipped in 1918. Lbs. per acre | | | | Average yields N. halves Ranges A and B not clipped in 1918. Lbs. per acre | | | Average yields following a nurse crop. Lbs. per acre | | |
| | 1918 | 1919 | 1920 | Three years crop | 1919 | 1920 | Aggr. two years | 1919 | 1920 | Aggr. two years |
| Alfalfa | 600 | 520 | ..... | ..... | 640 | ..... | ..... | ..... | ..... | ..... |
| Alsike Clover | 480 | 600 | ..... | ..... | 680 | ..... | ..... | ..... | ..... | ..... |
| Red Clover | 900 | 480 | ..... | ..... | 720 | ..... | ..... | ..... | ..... | ..... |
| Sweet Clover | 2,400 | 1,600 | ..... | ..... | 2,680 | ..... | ..... | 253 | ..... | ..... |
| White Dutch Clover | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Timothy | 2,980 | 3,640 | 2,200 | 8,820 | 3,960 | 3,200 | 7,160 | 1,170 | 1,850 | 3,020 |
| Western Rye Grass | 1,540 | 3,880 | 2,960 | 8,380 | 4,480 | 3,360 | 7,840 | 973 | 2,686 | 3,659 |
| Meadow Fescue | 1,040 | 2,320 | 1,840 | 5,200 | 2,960 | 1,640 | 4,600 | 976 | 1,746 | 2,722 |
| Kentucky Blue | ..... | 1,240 | 1,600 | 2,840 | 640 | 1,360 | 2,000 | 73 | 1,370 | 1,443 |
| Brome Grass | 1,160 | 3,360 | 2,920 | 7,440 | 3,800 | 3,840 | 7,640 | 490 | 2,581 | 3,071 |
| Totals, Grasses only | 6,720 | 14,440 | 11,520 | 32,680 | 15,840 | 13,400 | 29,240 | 3,682 | 10,233 | 13,915 |
| Averages, Grasses only | 1,344 | 2,888 | 2,304 | 6,536 | 3,168 | 2,680 | 5,848 | 736 | 2,046 | 2,783 |

TABLE 2.—Comparing various cereals and rates of sowing of them as Nurse Crops. 1918 Seeding. Average yield of Hay from Five Grasses

| Designation | 1918 Crop (Year seeding) | 1919 Crop | 1920 Crop | Aggregate yield |
|---|---|---|---|---|
| | Lbs. per acre | Lbs. per acre | Lbs. per acre | Lbs. per acre |
| Average 5 plots seeded with— | | | | |
| Barley at 4 pecks per acre | ..... | 1,288 | 1,672 | 2,960 |
| " 6 " | ..... | 1,056 | 1,776 | 2,832 |
| " 8 " | ..... | 688 | 2,252 | 2,940 |
| " 10 " | ..... | 760 | 2,040 | 2,800 |
| Mean of all barley plots | ..... | 948 | 1,935 | 2,883 |
| Average 5 plots seeded with— | | | | |
| Wheat at 5 pecks per acre | ..... | 872 | 2,056 | 2,928 |
| " 6 " | ..... | 1,040 | 2,688 | 3,728 |
| " 7 " | ..... | 488 | 2,168 | 2,656 |
| " 8 " | ..... | 672 | 2,056 | 2,728 |
| Mean of all wheat plots | ..... | 768 | 2,242 | 3,010 |
| Average 5 plots seeded with— | | | | |
| Oats at 10 pecks per acre | ..... | 448 | 1,912 | 2,360 |
| " 12 " | ..... | 488 | 1,968 | 2,456 |
| " 14 " | ..... | 504 | 1,984 | 2,488 |
| " 16 " | ..... | 536 | 1,992 | 2,528 |
| Mean of all oat plots | ..... | 494 | 1,964 | 2,458 |
| Average of 5 plots— | | | | |
| S. halves Range A seeded alone | 1,192 | 2,656 | 2,368 | 6,216 |
| " B " | 1,496 | 3,120 | 2,240 | 6,856 |
| Mean of 10 plots S. halves Ranges A and B seeded alone | 1,344 | 2,888 | 2,304 | 6,536 |
| Average of 5 plots— | | | | |
| N. halves Range A seeded alone | ..... | 3,184 | 2,528 | 5,712 |
| " B " | ..... | 3,152 | 2,832 | 5,984 |
| Mean of 10 plots N. halves Ranges A and B seeded alone | ..... | 3,168 | 2,680 | 5,848 |

TABLE 3.—Showing yields of hay per acre Nurse Crop Test—1919 Seeding. Two Years' Results

| Crop | Seeded without nurse crop | | | | Seeded with nurse crop |
|---|---|---|---|---|---|
| | Average yield S. halves Ranges A and B, clipped in 1919 | | | Average yield N. halves Ranges A and B, not clipped in 1919. | Average yield after nurse crop |
| | Lbs. per acre | | | Lbs. per ac. | Lbs. per ac. |
| | 1919 | 1920 | Two years crop | 1920 | 1920 |
| Alfalfa | 800 | 1,520 | 2,320 | 1,480 | ..... |
| Alsike Clover | 800 | 1,160 | 1,960 | 480 | ..... |
| Red Clover | 740 | 480 | 1,220 | 400 | ..... |
| Sweet Clover | 600 | 2,869 | 3,469 | 2,205 | ..... |
| White Dutch Clover | ..... | ..... | ..... | ..... | ..... |
| Timothy | 2,480 | 3,675 | 6,155 | 2,875 | 1,268 |
| Western Rye Grass | 1,080 | 5,520 | 6,600 | 3,450 | 1,356 |
| Meadow Fescue | 440 | 3,920 | 4,360 | 4,475 | 873 |
| Kentucky Blue | ..... | 3,595 | 3,595 | 2,855 | ..... |
| Brome Grass | 1,880 | 7,450 | 9,330 | 6,650 | 991 |
| Totals, Grasses only | 5,880 | 24,160 | 30,040 | 20,305 | 4,483 |
| Average, Grasses only | 1,176 | 4,832 | 6,008 | 4,061 | 897 |

29550—3½

TABLE 4.—Comparing various cereals and rates of sowing of them as Nurse Crops—1919 Seeding. Average yield of Hay from Five Grasses

| Designation | 1919 Crop (Year Seeding) | 1920 Crop | Aggregate yield |
|---|---|---|---|
| | Lbs. per ac. | Lbs. per ac. | Lbs. per ac. |
| Average 5 plots seeded with— | | | |
| Barley at 4 pecks per acre | | 882 | |
| " 6 " | | 799 | |
| " 8 " | | 860 | |
| " 10 " | | 829 | |
| Mean of all barley plots | | 842 | |
| Average 5 plots seeded with— | | | |
| Wheat at 5 pecks per acre | | 804 | |
| " 6 " | | 831 | |
| " 7 " | | 1,017 | |
| " 8 " | | 1,261 | |
| Mean of all wheat plots | | 978 | |
| Average 5 plots seeded with— | | | |
| Oats at 10 pecks per acre | | 1,184 | |
| " 12 " | | 1,034 | |
| " 14 " | | 622 | |
| " 16 " | | 641 | |
| Mean of all oat plots | | 870 | |
| Average of 5 plots— | | | |
| S. halves Range A seeded alone | 1,248 | 5,478 | 6,726 |
| " B " | 1,104 | 4,186 | 5,290 |
| Mean of 10 plots S. halves Ranges A and B seeded alone | 1,176 | 4,832 | 6,008 |
| Average of 5 plots— | | | |
| N. halves Range A seeded alone | | 4,140 | |
| " B " | | 3,962 | |
| Mean of 10 plots N. halves Ranges A and B seeded alone | | 4,051 | |
| Average of 5 plots seeded with oats, sown May 21 for green feed | | 960 | |

TABLE 5.—Showing yields of Hay per acre Nurse Crop Test, 1920 Seeding. 1920 Results

| Crop | South halves of check ranges | | Averages of both ranges |
|---|---|---|---|
| | Range A. Seeded May 24 | Range B. Seeded June 3 | |
| | Lbs. per acre | Lbs. per acre | Lbs. per acre |
| Alfalfa | 1,600 | 1,600 | 1,600 |
| Alsike Clover | 1,040 | 560 | 800 |
| Red Clover | 1,000 | 320 | 660 |
| Sweet Clover | 1,440 | 1,360 | 1,400 |
| White Dutch Clover | | | |
| Timothy | 1,680 | 400 | 1,040 |
| Western Rye Grass | 1,840 | 800 | 1,320 |
| Meadow Fescue | | | |
| Kentucky Blue | | | |
| Brome Grass | 1,280 | 1,040 | 1,160 |
| Totals | 9,880 | 6,080 | 7,980 |
| Averages | 988 | 608 | 798 |
| Totals, Grasses only | 4,800 | 2,240 | 3,520 |
| Averages, Grasses only | 960 | 448 | 704 |

Among the legumes sweet clover offers promise as a rotation crop for the provision of summer pasture. It seems likely that with inoculation it may be successfully seeded in a nurse crop. It is hoped that alsike and red clover may also be fitted in. It would appear that alfalfa, owing to the cost of seed of hardy strains, should for reasons of economy, be seeded alone.

Kentucky Blue is a very slow starting grass which seems to do fairly well, however, about the third year.

Western rye and brome are the most hardy, drouth-resistant and productive grasses, the former being especially adapted for hay and the latter for pasture. Timothy may be profitably grown on some of the richer and moister lands. It usually produces a more abundant crop than the other grasses in the year of seeding, i.e., where no nurse crop is used, and is perhaps the easiest grass to seed successfully with a nurse crop. It makes a good quality of hay, is easy to cure and according to the Experimentalist's experience to date, has usually been ready to "make" at a season when the weather was more settled than that prevailing at an earlier date when rye grass should be cut. It is, however, under Peace river conditions, a short-term crop.

### SEEDING DOWN WITH NURSE CROP ON SPRING PLOUGHED STUBBLE

The main nurse crop test being located on well prepared breaking (as in 1918 and 1919), or summer-fallow (as in 1920), it was thought well to supplement this by some trials of seeding down with a nurse crop of oats sown late for green feed, on spring-ploughed stubble. The ten kinds of clovers and grasses in the main nurse crop test were accordingly seeded thus about the end of May, 1919. In addition, two mixtures were used: one, called the thin mixture, being composed of several clovers and grasses of a quantity estimated equivalent to the average amount of seed per acre used where these were sown separately. The thicker mixture was designed to approximate the thicker seedings in the grass and clover mixture experiment, described in a later section of this report.

Fairly promising catches were obtained, but the legumes, being sown without inoculation, largely winter-killed and were ploughed up, while the grasses, notwithstanding copious moisture, produced a disappointing crop. No definite inference should be drawn from the lower yield of the thicker of the two mixtures, since this may have been due to location.

On the portion of land ploughed up, oats were drilled June 16, 1920, at two bushels per acre and seeded to ten 1/32 acre plots (each 16 rods by ½ rod) of the ten grasses and clovers sown the year before and at the same rates per acre. In this last trial the seed of alfalfa, alsike, red and sweet clovers was inoculated with nitro-culture. Casual examination in the autumn gave the impression that on at least portions of the plots the catch of legumes was much more vigorous and promising than has usually been obtained when seeding down clovers with nurse crops at this station.

TABLE 6.—Stubble Nurse Crop Test—1919 Seeding—1920 Crop. Size of plots $\frac{1}{16}$ acre

| Designation | Net yield per acre after deducting weeds | Per cent weeds deducted |
|---|---|---|
| | lbs. | |
| Timothy | 1,200 | 8 |
| Western Rye Grass | 640 | 15 |
| Meadow Fescue | 640 | 7 |
| Kentucky Blue | ..... | ..... |
| Brome | 784 | ..... |
| Thin Mixture (¼ acre) | 1,713 | ..... |
| Thick Mixture (¼ acre) | 1,168 | ..... |

GREEN FEED VERSUS HAY

As bearing upon the nurse crop question, it is interesting to note in connection with the 1919 seeding on the green feed nurse crop, that two swaths of the green feed bound on August 22, when the oats were barely in the milk, yielded a little over three tons of oat hay per acre. This was in the main nurse crop experiment, situated on well-prepared breaking.

In 1920 the green feed was allowed to mature fairly well, and yielded 6,500 pounds per acre, after making a very ample discount of 20 per cent for moisture from the gross weight of 8,120 pounds actually taken. In another experiment in 1920, where oats were used as a nurse crop in a thickness of seeding test with timothy and rye grass, the oats were cut in the milk, and yielded 5,760 pounds of oat hay per acre. Needless to say, this class of feed is greatly relished by live stock.

## SEC. III—GRASS AND CLOVER MIXTURE EXPERIMENT

### (*a*) RESULTS FROM SEEDING OF 1918

On June 5, 1918, 48 fortieth-acre plots were sown on a thoroughly well prepared piece of breaking for a clover and grass mixture experiment. Three leguminous crops, viz., alfalfa, red clover, and a blend of red clover with alsike, were used as three bases for comparison. Taking the alfalfa ranges, for example, the plan of experiment was as follows:—

A plot of alfalfa only was sown at the rate of 12 pounds per acre. Next to this was a plot sown with 10 pounds of alfalfa plus 8 pounds of timothy; 3rd, alfalfa, 10 pounds, plus Western Rye grass, 8; 4th, alfalfa, 10 pounds, plus meadow fescue, 15; 5th, alfalfa, 10, with the above three grasses combined at the respective rates of 5, 5 and 9; 6th, alfalfa, 10, with these same three grasses and also red top and Kentucky blue, at the respective rates of 4, 4, 7, 4 and 4; 7th, same as 6th, but seeded on a strip of Marquis wheat sown in April, the grass seed being covered; 8th, same as 7th, but grass seeds not covered. This completes range A of the series. Range B practically duplicates Range A, only in reverse order, and with only two-thirds the quantity of seed.

Precisely the same combinations of grasses were used with red clover and with the red clover and alsike blend, the only variation being that in the latter case the quantities of clover were 10 pounds of red and four of alsike for the first plot in Range A, with 8 of red and 2 of alsike in the plots of that range where grasses were introduced. In each of the three series, Range B was seeded only two-thirds as heavily as A, and in B the arrangement was such as to bring two plots of legumes where the nurse crop occurred. Excepting the eighth plot of each range, seed was covered with a single disc drill running light.

Almost perfect stands and uniform, healthy growth were obtained on all the 36 plots of this experiment seeded without nurse crop. The clovers had a healthier colour and were more uniform in growth than in other experiments where they had been seeded earlier.

On August 28, 1918, the south halves of all the 36 plots were clipped high. The clippings were cured into hay, and weights are included in the tabulated results.

The twelve "nursed" plots (six of legumes only and six of the five-grass mixtures) germinated a fair stand, but it was hardly to be discerned by fall. In the spring of 1919 the grasses in the grain stubble showed a fair stand, but a very tardy and disappointing growth. The legumes could have established a very successful alibi.

In 1919 the yield of the five-grass mixtures was only a quarter of a ton per acre.

In 1920 it was 2,174 pounds per acre from the red and alsike series; 2,017 from the red clover series; and, 1,721 from the alfalfa series, or an average of 1970.6.

Much information is compressed into the grass and clover table 1, which deals only with the results from the 36 plots seeded without any nurse crop. The chief points, however, can be more clearly presented in a succession of simpler tables, as given below.

TABLE 1.—Seeded June 5, 1918. Lbs. per acre

| Designation | South halves range A (full seeding) | | | | South halves range B (two-third seeding) | | | | S. one-hal's (av. 2 ranges) 3 crops | North halves (av. 2 ranges) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1918 | 1919 | 1920 | 3-yr. aggr. | 1918 | 1919 | 1920 | 3-yr. aggr. | | 1919 | 1920 | 2-yr. aggr. |
| Alsike and red clover series:— | | | | | | | | | | | | |
| Clovers only | 1,440 | 800 | 1,920 | 4,160 | 1,280 | 800 | *1,920 | 4,000 | 4,080 | 1,080 | *880 | 1,960 |
| Clover and timothy | 2,400 | 2,000 | 2,800 | 7,200 | 2,400 | 3,200 | 3,760 | 9,360 | 8,280 | 3,240 | 2,920 | 6,160 |
| " western rye grass | 2,000 | 4,000 | 2,560 | 8,560 | 1,920 | 4,080 | 3,600 | 9,600 | 9,080 | 4,600 | 4,560 | 9,160 |
| " meadow fescue | 1,680 | 2,720 | 2,880 | 7,280 | 1,280 | 2,000 | 2,400 | 5,680 | 6,480 | 3,560 | 3,240 | 6,800 |
| " three grasses | 1,840 | 4,080 | 4,160 | 10,080 | 2,960 | 2,400 | 2,080 | 7,440 | 8,760 | 4,880 | 4,040 | 8,920 |
| " five grasses | 1,760 | 3,200 | 1,200 | 6,160 | 1,920 | 2,400 | 2,720 | 7,040 | 6,600 | 3,720 | 3,360 | 7,080 |
| Averages | 1,853 | 2,800 | 2,586 | 7,240 | 1,960 | 2,480 | 2,746 | 7,186 | 7,213 | 3,513 | 3,166 | 6,680 |
| Red clover series:— | | | | | | | | | | | | |
| Clover only | 640 | 720 | 1,760 | 3,120 | 800 | 800 | *1,760 | 3,360 | 3,240 | 1,040 | *1,520 | 2,560 |
| Clover and timothy | 3,360 | 2,480 | 3,440 | 9,280 | 2,080 | 3,200 | 2,960 | 8,240 | 8,760 | 2,760 | 2,880 | 5,640 |
| " western rye grass | 1,760 | 3,760 | 3,280 | 8,800 | 1,840 | 3,760 | 4,240 | 9,840 | 9,320 | 3,520 | 3,080 | 6,600 |
| " meadow fescue | 1,920 | 2,800 | 2,160 | 6,480 | 1,040 | 2,640 | 2,400 | 6,080 | 6,280 | 2,170 | 2,200 | 4,370 |
| " three grasses | 2,640 | 2,720 | 1,920 | 7,280 | 1,520 | 2,640 | 2,480 | 6,640 | 6,960 | 3,440 | 2,480 | 5,920 |
| " five grasses | 2,560 | 2,800 | 2,320 | 7,680 | 1,440 | 2,080 | 2,720 | 6,240 | 6,960 | 3,160 | 2,760 | 5,920 |
| Averages | 2,080 | 2,546 | 2,480 | 7,106 | 1,453 | 2,520 | 2,760 | 6,733 | 6,920 | 2,681 | 2,486 | 5,168 |
| Alfalfa series:— | | | | | | | | | | | | |
| Alfalfa only | 2,080 | 1,520 | 1,600 | 5,200 | 1,280 | 880 | *1,600 | 3,760 | 4,480 | 1,560 | *880 | 2,440 |
| Alfalfa and timothy | 3,040 | 2,880 | 1,760 | 7,680 | 2,240 | 2,640 | 1,600 | 6,480 | 7,080 | 2,720 | 1,960 | 4,680 |
| " western rye grass | 2,400 | 3,520 | 2,880 | 8,800 | 1,840 | 3,360 | 3,280 | 8,480 | 8,640 | 3,920 | 2,880 | 6,800 |
| " meadow fescue | 1,760 | 2,800 | 2,240 | 6,800 | 1,680 | 2,560 | 1,760 | 6,000 | 6,400 | 3,720 | 1,640 | 5,360 |
| " three grasses | 2,400 | 2,800 | 2,640 | 7,840 | 1,760 | 2,800 | 2,240 | 6,800 | 7,320 | 4,000 | 2,640 | 6,640 |
| " five grasses | 1,680 | 2,560 | 1,760 | 6,000 | 1,600 | 2,800 | 2,720 | 7,120 | 6,560 | 2,800 | 1,960 | 4,760 |
| Averages | 2,226 | 2,680 | 2,146 | 7,053 | 1,733 | 2,506 | 2,200 | 6,440 | 6,746 | 3,120 | 1,993 | 5,113 |
| Grand averages—3 series | 2,053 | 2,675 | 2,404 | 7,133 | 1,715 | 2,502 | 2,568 | 6,786 | 6,959 | 3,104 | 2,548 | 5,653 |

*Estimated figures.

COMPARISON OF THREE BASIC LEGUMES

Grass and clover mixtures table 2 summarizes the yields of hay from twelve plots where alfalfa was used, the twelve where red clover was employed and the twelve where red and alsike constituted the leguminous base. Reference to the fourth column of the table shows that so far as this one seeding is concerned, results slightly favour the red and alsike base. This may be accidental. Returns from subsequent sowings are awaited.

TABLE 2.—Comparison of three leguminous bases in grass and clover mixtures. Seeding of 1918 (south halves only considered)

| Designation | Pounds per acre | | | |
|---|---|---|---|---|
| | 1918 | 1919 | 1920 | Aggr. 3 crops |
| Average yield 12 plots:— | | | | |
| Red clover and alsike series | 1,906 | 2,640 | 2,666 | 7,213 |
| Red clover series | 1,766 | 2,533 | 2,620 | 6,929 |
| Alfalfa series | 1,979 | 2,593 | 2,173 | 6,746 |
| Average yield 36 plots:— | | | | |
| Three series | 1,883 | 2,588 | 2,486 | 6,595 |

EFFECTS OF DIFFERENT RATES OF SEEDING

That thick seeding of grasses will usually give the heaviest first-crop, but that it is more prone to become sod-bound and in the long run is likely to be surpassed by a more moderate rate, is an opinion that seems to find some support in grass and clover table 3, presenting comparative summaries of three-year yields from the full-seeded ranges A and the thinner-seeded ranges B.

TABLE 3.—Comparing the south halves of Ranges A (full seeding) with Ranges B (two-thirds seeding), seeded 1918. Presenting average yields in pounds per acre from three crops, 1918-20.

| Designation | Ranges A (Full seeding) | Ranges B Two-third seeding) |
|---|---|---|
| | Aggr. 3 crops | Aggr. 3 crops |
| Alsike and red clover series | 7,240 | 7,186 |
| Red clover series | 7,106 | 6,733 |
| Alfalfa series | 7,503 | 6,440 |
| Averages—Three series | 7,133 | 6,786 |
| Advantage of full seeding | 347 | |

N.B.—In the year of seeding, 1918, the full-seeded ranges averaged 338 pounds more crop than did ranges B. In the second year, 1919, ranges A averaged 173 pounds more, but in the third year, 1920, ranges B surpassed ranges A by 164 pounds.

DOES IT PAY TO CLIP?

To determine whether it pays to clip and cure the hay crop offering the first season on plots seeded without nurse crop, weights were taken separately of the south halves (clipped in 1918) of all the 36 plots involved. Grass and clover table 4 presents the results.

TABLE 4.—Summarizing results of clipping versus not clipping the crop offering in the year of seeding down. Yields in pounds per acre. 1918 seeding.

| — | Alsike and red clover series | Red clover series | Alfalfa series |
|---|---|---|---|
| Clipped halves of plots:— | | | |
| 1918 yield | 1,906 | 1,766 | 1,979 |
| 1919 yield | 2,640 | 2,533 | 2,593 |
| 1920 yield | 2,666 | 2,620 | 2,173 |
| 3-yrs. aggregate | 7,213 | 6,919 | 6,745 |
| Unclipped halves of plots:— | | | |
| 1919 yield | 3,513 | 2,681 | 3,120 |
| 1920 yield | 3,166 | 2,486 | 1,993 |
| 2-years aggregate | 6,679 | 5,167 | 5,113 |
| Net gain from clipping average | 534 | 1,752 | 1,632 |
| Net gain from clipping of all three series | 1,306 | | |

TABLE 5.—Comparing the three legumes with each other and the averages of the three grown singly with the averages of the several grass mixtures in which they have been combined. 1918 Seeding.

| Designation | Total (3 years) crop from halves clipped in 1918 | Total (2 years) from halves not clipped in 1918 |
|---|---|---|
| Red clover and alsike only | 4,080 | 1,960 |
| Red Clover only | 3,240 | 2,560 |
| Alfalfa only | 4,480 | 2,440 |
| Average of three legumes plus:— | | |
| Timothy | 8,040 | 5,493 |
| Western rye grass | 9,013 | 7,520 |
| Meadow fescue | 6,386 | 5,510 |
| Three grasses | 7,680 | 7,160 |
| Five grasses | 6,706 | 5,920 |

N.B.—Average two years aggregate yield (1919 and 1920) from six plots of the five-grass mixture seeded June 5, 1918, on a nurse crop of wheat, sown last of April—1,485 pounds per acre.

### (*b*) RESULTS FROM SEEDING OF 1919

The 1919 seedings for the grass and clover mixture experiment are located, range for range, directly opposite the 1919 seedings. The plan of experiment is essentially the same, save that the duplicate range of each series, instead of being seeded at precisely two-thirds the rate of A, received exactly the same quantities of legume seed throughout, but had the quantities of grass seed reduced to one-half. The net effect was roughly the same, so far as total quantities were concerned, but the variation was made in quest of a more suitable mixture.

As in 1918, there were 30 plots without and 12 with nurse crops. The latter consisted of one strip of Ruby wheat sown on May 2 at six pecks per acre, and cut September 9, and a corresponding strip of Abundance oats sown May 21 at 10 to 12 pecks per acre and harvested September 19 when quite ripe, save one binder swath cut for oat hay on August 22. The yield of oat hay from this seeding was only 3,366 pounds per acre, the land being a lightish knoll and suffering more from early drouth than other portions of the Station area.

The preparation was breaking of 1918, double-disced twice that summer and floated. The land being rocky and full of tough "grubs," this treatment failed to kill the grass, and repeated discing in the spring, though it reduced the upper layer to the consistency of an ash bed, still left many grass roots vital. On the two strips sown to grain, these native perennials, as well as the seedings of grasses and clovers, were pretty well held in check. Not so the remaining area, which after being double-disced about six times in all, was finally back-set deeply to kill the rootstalks. It was then double-disced once more, harrowed and sown, the seed being covered with a single-disced drill running light. The same means were used to cover the seed sown on the grain strips. Though it apparently mutilated the cereals somewhat, the ultimate effect on them was perhaps as beneficial as harmful.

Owing to the delay in preparation, as explained above, these plots were not disposed of until June 11, and, though excellent catches and a medium growth were obtained, no crop was cut. All weeds in the plots seeded without nurse crops were hand-pulled, and in spite of the fact that the land was clean breaking, a fair-sized wagon load was removed from a little over an acre. Most of them were the indigenous lambsquarter, which seems most prolific on the most finely prepared seed beds, and which grows very rank stems where not held in check by a vigorous-growing crop like grain.

Reference to grass and clover table 6 will show that the 1920 yields of hay after nurse crops was a little over half a ton per acre following the wheat, and a little under half a ton following the oats. This result in favour of wheat accords with those obtained in the main nurse crop test. (See Sec. 11).

The following tables, corresponding, with one necessary omission, to the tables analysing results of the 1918 seeding, will be sufficient to carry the data forward for future tabulation.

TABLE 6.—Seeded June 11, 1919. Pounds per acre, 1920

| Designation | Ranges A | Ranges B | Averages 2 ranges |
|---|---|---|---|
| Alsike and red clover series— | | | |
| Clovers only | 1,080 | 560 | 820 |
| Clovers and timothy | 2,520 | 2,920 | 2,720 |
| " western rye grass | 3,080 | 2,680 | 2,880 |
| " meadow fescue | 3,080 | 2,360 | 2,720 |
| " meadow fescue | 3,080 | 2,360 | 2,720 |
| " three grasses | 3,840 | 2,520 | 3,180 |
| " five grasses | 3,600 | 2,920 | 3,260 |
| Averages | 2,867 | 2,327 | 2,597 |
| Red clover series:— | | | |
| Clover only | 720 | 760 | 740 |
| Clover and timothy | 2,520 | 2,960 | 2,740 |
| " western rye grass | 2,400 | 2,840 | 2,620 |
| " meadow fescue | 2,440 | 2,120 | 2,280 |
| " three grasses | 3,080 | 2,680 | 2,880 |
| " five grasses | 2,840 | 2,800 | 2,820 |
| Averages | 2,333 | 2,360 | 2,346 |
| Alfalfa series:— | | | |
| Alfalfa only | 1,520 | 1,760 | 1,640 |
| " western rye grass | 2,280 | 4,000 | 3,140 |
| " meadow fescue | 3,240 | 2,680 | 2,960 |
| " three grasses | 2,560 | 3,400 | 2,980 |
| " five grasses | 4,120 | 3,920 | 4,020 |
| Averages | 2,666 | 3,066 | 2,866 |
| Grand averages—3 series | 2,622 | 2,584 | 2,603 |

SUPPLEMENT TO TABLE 6.—Yields Five-grass mixtures after Nurse Crops

| Designation | Red and alsike with five grasses | Red clover with five grasses | Alfalfa with five grasses | Averages |
|---|---|---|---|---|
| After ruby wheat | 1,440 | 1,040 | 1,240 | 1,240 |
| After oats for green feed | 1,000 | 520 | 1,240 | 920 |
| Averages | 1,220 | 780 | 1,240 | 1,080 |

TABLE 7.—Comparison of these leguminous bases in Grass and Clover Mixtures. Seeding of 1919. (Whole plots considered)

| Designation | Lbs. per acre, 1920 |
|---|---|
| Average of 12 plots, Red clover and alsike series | 2,597 |
| Average of 12 plots, Red clover series | 2,346 |
| Average of 12 plots, Alfalfa series | 2,866 |
| Average of 36 plots, all three series | 2,603 |

TABLE 8.—Comparing Ranges A (full seeding) with Range B (two-thirds seeding).—1919 seeding. 1920 crop

| Designation | Ranges A | Ranges B |
|---|---|---|
| Alsike and red clover series | 2,867 | 2,327 |
| Red clover series | 2,333 | 2,360 |
| Alfalfa series | 2,666 | 3,066 |
| Averages three series | 2,622 | 2,584 |
| Average advantage in favour of thicker seeding | 38 | |

TABLE 9.—Comparing the three legumes with one another and the averages of the three grown singly with the averages of the several grass mixtures in which they have been combined. 1919 Seeding. 1920 Crop

| Designation | Lbs. per acre, 1920 |
|---|---|
| Red clover and alsike only | 820 |
| Red clover only | 740 |
| Alfalfa only | 1,640 |
| Average of three legumes plus timothy | 2,640 |
| " " " western rye grass | 2,880 |
| " " " meadow fescue | 2,653 |
| " " " three grasses | 3,013 |
| " " " five grasses | 3,366·6 |

(*c*) RESULTS FROM SEEDING OF 1920.

Due east of the 1918 and 1919 seedings for this experiment, and following practically the same arrangement, was the 1920 repetition.

The quantities of seed per acre were the same as in the initial seeding, 1918. The land was well-prepared summerfallow, but owing to wet weather sowing was delayed until June 16. The nurse crop introduced this time was a strip of Liberty-Ottawa-480 hulless oats, sown May 22 and cut August 30. This strip was located on the east side of the block and covered two plots of the legumes only in range A of each series, and two plots of the five-grass mixture in range B of each series. The seed sown on the extreme last plots in each range was not covered. The seed on most of the other plots was covered with a single-disced drill, running light. The exceptions were nine plots of legumes only, which were sown after sundown and harrowed in before daybreak, to protect the inoculating bacteria from sunlight. Working in the dark, with seed made sticky by treatment with the nitro-culture medium, an uneven application of seed was made on these plots, which mars the

results to a slight extent. It is pleasing to record that a fairly abundant supply of nodules was later observed on the roots of the clovers and alfalfa where inoculated seed had been sown.

On September 8 the south halves of all the thirty-six plots seeded without a nurse crop were clipped, with the mower bar set high as usual, to leave a long stubble for winter protection. On October 21 the clippings were hauled to the barn and weighed after having been turned three times, during a period of almost impossible haying weather. Weights follow in grass and clover mixtures table 10.

TABLE 10.—Presenting 1920 yields of Hay per acre from south halves of 36 plots. Seeded June 16, 1920, cut September 8

| Designation | Ranges A | Ranges B | Averages 2 ranges |
|---|---|---|---|
| Red clover and alsike series:— | | | |
| Clovers only | 320 | 560 | 440 |
| Clovers and timothy | 1,360 | 1,280 | 1,320 |
| " western rye | 1,120 | 1,280 | 1,200 |
| " meadow fescue | 1,200 | 1,520 | 1,360 |
| " three grasses | 720 | 1,760 | 1,240 |
| " five grasses | 1,200 | 2,240 | 1,720 |
| Averages | 986 | 1,440 | 1,213 |
| Red clover series:— | | | |
| Clover only | 560 | 320 | 440 |
| Clover and timothy | 2,400 | 800 | 1,600 |
| " western rye | 80 | 1,040 | 560 |
| " meadow fescue | 720 | 720 | 720 |
| " three grasses | 1,760 | 880 | 1,320 |
| " five grasses | 1,840 | 1,200 | 1,520 |
| Averages | 1,226 | 826 | 1,026 |
| Alfalfa series:— | | | |
| Alfalfa only | 560 | 2,160 | 1,360 |
| Alfalfa with timothy | 1,120 | 1,840 | 1,480 |
| " western rye | 880 | 1,760 | 1,320 |
| " meadow fescue | 1,040 | 960 | 1,000 |
| " three grasses | 2,000 | 1,040 | 1,520 |
| " five grasses | 1,840 | 1,440 | 1,640 |
| Averages | 1,240 | 1,533 | 1,386 |
| Grand averages—3 series | 1,150 | 1,266 | 1,208 |

## SEC. IV. SPECIAL ALFALFA EXPERIMENTS

Perseverence may yet have its reward in connection with the alfalfa experiments. Some very striking facts observed in 1920 warrant the hope that inoculation may enable the profitable culture of this crop, to the extent, at least, of supplementing present farm grown rations of roughage with a protein-rich, high calcium-carrying fodder. Whilst the irregularity with which inoculation took place in the first year's seeding defeats the original purpose of comparing varieties and methods of culture, the incidental demonstrations bid fair far to outweigh in importance what it might have hoped to learn from the direct comparisons.

The plan of the cultural and variety test experiments having been fully detailed in section III of the 1919 report, it will be unnecessary to repeat at length.

### (*a*) VARIETIES OF ALFALFA

In 1918, six varieties were seeded in duplicate ranges using seed treated with nitro-culture, two flanking or check plots, one in each range, being sown with untreated seed by way of an incidental experiment in inoculation. From undeter-

mined causes the attempt at artificial inoculation of the twelve plots was almost a complete failure, hence, while perfect stands had been obtained, a fine, even, healthy growth occurring in the season of sowing, results in the dry spring and early summer of 1919 were extremely disappointing and crops averaging around half a ton per acre were harvested. The plots sown with untreated seed, no doubt from certain accidental advantages of position, yielded slightly more than those of corresponding varieties sown with treated seed. Very few nodules indeed could be found on any of the whole fourteen plots. After haying, the seven plots in the south range were double-disced.

In the spring of 1920, in which the subsoil was saturated as it had not been for years, the general growth of these alfalfa plots was still short and sickly, with grass and native weeds getting quite a start, particularly on the range which had not been disced the previous summer. However, as the summer advanced, it was observed that here and there were patches varying in size from a square foot or so up to a square rod or more, where the alfalfa showed up in marked contrast to the surrounding areas, being perhaps two feet tall and of dark green colour, when the rest of the area was perhaps six inches high and a very sickly yellow. Examination showed that the roots under these good patches were plentifully supplied with nodules, while on the remaining areas scarcely a nodule could be found. Inoculation was much more general on the range which had been disced after haying in 1919. It occurred as abundantly on the two check plots as on those sown with treated seed. Indeed, it looked as though from a certain spot on one of these the bacteria had been carried by water down a "draw" which traversed all the plots in the south range. In this "draw" strong growing and well inoculated patches were numerous and comparatively extensive, occupying most of the area traversed by the running water.

On July 24, 1920, during a steady rain, loam from a plot of well inoculated sweet clover was broadcast over the twelve alfalfa plots which had been originally sown with treated seed. The crop was cut August 2 and on August 4, after the hay crop was removed, the whole seven plots in the south range were again double-disced. As summer advanced, some of the plots in both ranges seemed to improve considerably in respect to colour and vigour of growth, while some in the north range manifested little or no improvement. The south range showed considerable improvement in every plot. Under the circumstances, it is scarcely worth while attempting to compare varieties as to relative yields, but since the records may serve an incidental purpose, they are set down in Alfalfa table 1.

TABLE 1.—Showing yield six varieties of Alfalfa, 1919 and 1920 crops, from the 1918 Seeding. Fortieth-acre plots. Yields in pounds per acre

| Variety | North Range | | | South Range | | | Average Yield 4 2 Ranges |
|---|---|---|---|---|---|---|---|
| | Yield 1919 | Yield 1920 | Yield 2-year aggregate | Yield 1919 | Yield 1920 | Yield 2-year aggregate | |
| Ontario variegated | 760 | 1,440 | 2,200 | 880 | 1,880 | 2,760 | 2,480 |
| Grimm | 920 | 1,360 | 2,280 | 1,240 | 1,280 | 2,520 | 2,400 |
| Baltic | 1,440 | 1,680 | 3,120 | 1,320 | 1,960 | 3,280 | 3,200 |
| Turkestan | 1,000 | 1,520 | 2,520 | 1,040 | 1,680 | 2,720 | 2,620 |
| Liscombe | 880 | 1,440 | 2,320 | 1,120 | 1,680 | 2,800 | 2,560 |
| Ottawa | 960 | 1,488* | 2,448 | 1,200 | 1,480 | 2,680 | 2,564 |
| Averages | 993 | 1,488 | 2,481 | 1,133 | 1,660 | 2,793 | 2,637 |
| Check plots | 1,600 | 1,680 | 1,640 | 1,040 | 2,280 | 1,660 | 1,650 |

* Weight of this plot was lost. The figures set down here are an average of the yields of the other five plots in the range.

(*b*) CULTURAL TESTS WITH ALFALFA

In general, the accident of the uneven results from the attempt at inoculation upset this experiment as it did the variety test. Some interesting facts were observed none the less. In the first place the test was located on a much loamier and more open type of soil and whether from this or other causes, the symbiotic bacteria appear to have distributed themselves more readily and thoroughly. Strange to say, judging from casual appearances, the broadcast area seems to have become more thoroughly inoculated than the drills. Variation in soil texture may have had something to do with this. All portions had been double-disced after haying in 1919, but the drills had been intercultivated several times as well. In the broadcast area considerable evidence of inoculation was noticed in 1919, a good deal more in the early part of 1920 and by the time of cutting the 1920 aftermath, it had become pretty general, the result being a very encouraging and fairly even growth, with a profitable second cutting of hay. If such crops can be obtained regularly and the stands maintained in good condition over a period of years, alfalfa will yet have a place to fill in Peace River agriculture.

In the table below (No. 2), little significance should be attached to the comparison of different spacings and rates of sowing, but special interest attaches to the results from the broadcast seeding as indicating the possibilities of the crop.

Duplicate ranges had been originally seeded in this experiment, but the south one was ploughed up in 1920. Some very stubborn roots were encountered, which were especially difficult to cut where occurring in rows. A good many nodules were exposed though not evenly distributed throughout all parts.

TABLE 2.—Presenting yields of Alfalfa in Cultural Test, 1918 Seeding. North range only considered. Pounds per acre

| Designation | Rate of seeding per acre lbs. | Yield 1919 | Yield 1920 | | | Total, 2-years crop |
|---|---|---|---|---|---|---|
| | | | First cutting | After-math | Total, 2 cuttings | |
| 30-inch drills | 2·0 | 3,120 | 1,980 | 840 | 2,820 | 5,940 |
| 30-inch " | 4·0 | 2,400 | 1,260 | 720 | 1,980 | 4,380 |
| 24-inch " | 2·5 | 1,320 | 1,740 | 1,440 | 3,180 | 4,500 |
| 24-inch " | 5·0 | 960 | 1,200 | 1,320 | 2,520 | 3,480 |
| Broadcast average of several rates | ..... | 1,243 | 1,250 | 1,775 | 3,025 | 4,268 |

## SEC. V. INOCULATION TESTS WITH LEGUMES

Though discussed pretty fully under the preceding section, this subject still calls for the presentation of certain data secured through specific experiments, not only with alfalfa, but with other legumes as well.

The plan of the 1918 seeding was detailed in section IV, subsection (*a*), "Varieties of Alfalfa," describing an experiment dovetailing into the one under present discussion.

On June 16, 1919, twelve fortieth-acre plots of red clover, alfalfa and sweet clover were sown on a good piece of summer-fallow. Of each of these legumes, two plots were sown with seed treated with nitro-culture and two with untreated seed. Illness of the superintendent on the day the seed was prepared for sowing resulted in some errors in the lay-out. For instance, instead of having the inoculated and uninoculated plots separated by paths, as intended, they were laid out adjoining each other, so that portions of plots not intended to be inoculated quite evidently received some bacteria by overlapping of treated seed and in other ways, hence the yields recorded were not a full criterion of the advantage which inoculation conferred. Observation of the growing crop supplies far more striking evidence. No difference whatever was

discerned in 1919, but as the first crop of 1920 came on, it required no label stakes to pick out readily every inoculated plot of clover and alfalfa. The growth of these was uniformly green, healthy and vigorous, while the uninoculated plots had a much inferior growth and the semi-blighted, yellowish appearance that denoted insufficient nitrogen. This was more conspicuous on the portions more remote from the inoculated plots. In fact, on these inner portions, it is safe to say the crop was only about half that on the inoculated plots.

Following the first cutting, the benefit of inoculation was equally or even more apparent in the vigour and colour of the aftermath.

In the case of the sweet clover, the contrast was not so plain with either cutting.

Examination of the roots disclosed the fact that under the green, vigorous foliage of alfalfa and red clover, nodules were abundant on the roots, while elsewhere they were sparing or absent. This observation was fully confirmed when the plots were ploughed up in September, to clear the ground for other work in 1921.

For the reasons explained above, reinforced by certain considerations of convenience, it is impossible to present fair tabular data of this test. The following table, however, will give some idea of the possibilities of growing these several legumes under the advantage of complete or partial inoculation.

TABLE 1

| Designation | 1st cutting July 28 | Aftermath cut early September | Aggregate of two cuttings |
|---|---|---|---|
| | lbs. per ac. | lbs. per ac. | lbs. per ac. |
| Red Clover—Average of 2 plots (one inoculated) | 840 | 860 | 1,700 |
| Sweet Clover—Inoculated (one plot) | 4,000 | 1,600 | 5,600 |
| Alfalfa—Average of 2 plots (one inoculated) | 3,186 | 1,591 | 4,777 |

N.B.—All these plots had been more or less injured by hoeing out Shepherd's Purse. The red clover had also sustained considerable winter injury, by ice forming over the crowns following a mid-winter chinook.

On June 16, 1920, one plot each of alfalfa, sweet clover, red clover and alsike was sown with nitro-culture-treated seed on summer-fallowed land which had run together considerably as the result of wet weather and a certain amount of trampling. This was particularly true of the area where the sweet clover and alfalfa were sown. All the seed was sown after sundown and harrowed in before dawn. Super-excellent catches were obtained, save on a corner of the hardest trampled ground. The south of each plot was cut in the autumn, producing yields as follows:—

TABLE B.—1920 Crop from inoculated plots seeded June 16, 1920

| Designation | Lbs. hay per acre |
|---|---|
| Sweet Clover | 3,520 |
| Alfalfa | 1,360* |
| Red Clover | 2,880 |
| Alsike | 3,840 |

* Alfalfa figures incomplete.

OTHER STRIKING RESULTS FROM INOCULATION

In 1918 certain specimen plots of alsike and common red clover had been sown at the back of the experimental grounds with home-grown seed, no attempt being made to inoculate either seed or soil, and no means of accidental or natural inoculation being apparent. In the following year the crop was disappointing and in 1920

it bade fair to be equally so, but after a time a few conspicuously good patches of limited area were observed, affording the same kind of contrast as was noticed in the alfalfa plots seeded the same year (see Sec. IV). Examination discovered abundance of nodules on the roots of these good patches and few or none anywhere else. Soil from these thrifty inoculated patches was stored for future use and some was distributed over the red clover and alsike plots in the 1920 seeding of the nurse crop test discussed in section II.

### INOCULATION OF VETCHES AND PEAS

Until the past season the superintendent of the Beaverlodge Station has been inclined to suppose that the wild vetch and wild peavine, so prevalent over the Peace River country, would inoculate naturally for all the cultivated species of vetches and peas. Some observations in 1920 are interesting. Plots of hairy vetches, common vetches, grass peas, the Arthur variety of common field peas and many varieties of garden peas were growing on the Station. Exploration with spade and mattock revealed that while both the vetches and the grass peas were plentifully supplied with nodules, the field peas alongside had scarcely any at all. It is desired in 1921 to try experiments in artificial inoculation of field peas, garden peas and vetches.

## SEC. VI—THICKNESS OF SEEDING TEST WITH GRASSES

### (A) SEEDING OF 1919

In May, 1919, a small piece of land which had grown variety plots of grain the summer before was backset and smoothed by harrowing twice. On June 10, eight fortieth-acre plots of timothy and rye grass were sown at several different rates per acre. The north half of the range (taking in one-half of each plot) was on the same day sown with a nurse crop of oats for green feed, at three bushels per acre. On August 22 two binder swaths of these oats were cut for oat hay, turning a yield of 6,240 pounds per acre. The balance of the block of oats was cut September 25.

Unfortunately the halves of the grass plots intended to be sown without any nurse crop had a partial one of volunteer barley, from plots shattered badly the year before. This rendered it impracticable to compare the yields of timothy and rye grass hay in the year of seeding, the barley and grass having been mown and raked up together.

The accompanying table would seem to indicate that where weeds are controlled by clean tilth, supplemented by hand weeding, better yields may be obtained from moderate than from very thick seedings of timothy and that where a nurse crop is employed, it is advisable to use a little extra grass seed in order to allow for the thinning effect of the nurse crop method of seeding.

The experiment also contrasts with fresh force the results of seeding with and without nurse crops.

TABLE 1.—1919 Seeding. 1920 Crop

| Designation | With Nurse crop. Lbs. hay per acre 1920 | Without Nurse crop. Lbs. hay per acre 1920 |
|---|---|---|
| Timothy at 2 lbs. per acre | 880 | 5,440 |
| " 3 lbs. " | 1,520 | 5,360 |
| " 4 lbs. " | 1,680 | 5,600 |
| " 5 lbs. " | 2,320 | 5,200 |
| " 6 lbs. " | 2,240 | 4,640 |
| Western Rye Grass at 4 lbs. per acre | 800 | 4,000 |
| " 5 lbs. " | 1,120 | 4,160 |
| " 6 lbs. " | 1,200 | 3,680 |

N.B.—Conditions for this test were apparently quite uniform and fair, unless for the thickest seeding of rye grass, which was on rising ground.

(B) SEEDING OF 1920

On May 31 the experiment described under (*a*) was repeated with certain variations. The land was well-worked summerfallow and the seeding was done May 31. The plots were each three rods long (3/160 acre) and of each plot one square rod was sown without nurse crop, while of the other two rods practically one-half was sown with oats for green feed, and one half with beardless barley. The rates of seeding of the western rye grass were increased from 4, 5 and 6 pounds per acre respectively to 6, 8 and 10.

The nurse crops were cut August 23, the oats just then coming into the milk. The yield of oat hay was 5,760 pounds per acre. The barley yielded satisfactorily. Being badly lodged and so located that it was necessary to run the binder in the direction in which the grain lay, the barley had to be cut extremely close, the table often dragging on the ground. This may affect the 1921 crop of hay.

TABLE 2.—1920 Seeding. 1920 Crop clipped from portions of plots seeded alone

| Designation | Pounds hay per acre |
|---|---|
| Timothy at 2 lbs. per acre | 1,600 |
| " 3 lbs. " | 1,760 |
| " 4 lbs. " | 1,440 |
| " 5 lbs. " | 2 400 |
| " 6 lbs. " | 2,400 |
| Western Rye Grass at 6 lbs. per acre | 1,920 |
| " 8 lbs. " | 1,120 |
| " 10 lbs. " | 1,120 |

N.B.—Though weights were carefully taken, yet, as the weighing was done with a five-ton wagon scale and the areas involved were only one square rod each, a possible element of error in balancing may explain some of the irregularity in results.

## SEC. VII—GRASSES AND CLOVERS FOR SEED PRODUCTION

Little additional work has been done on this important line, for the reason that practically all the plots now under test are required to afford data in certain experiments on hay production. However, a very encouraging result was obtained from about a quarter-acre (1,242 square yards, to be exact) of western rye grass, seeded without nurse crop in 1918 and cut for seed in 1919, when, with very imperfect means for threshing, it yielded at the rate of 303 pounds of seed per acre, which the Dominion Seed Laboratory at Calgary graded No. 1. In 1920 this same area produced 105 pounds, equal to 409 pounds per acre, which the Seed Laboratory again graded No. 1, before it was cleaned. The crop had been cut with a binder and stood for months in stook, exposed to weather, some of the stooks having meantime to be reset, to make room for the plough teams. This and other work reported in 1919 support the view that grass seed production might be very profitably engaged in by Grande Prairie farmers as a cash-crop specialty. One strong point is that the grasses mature seed earlier than do most cereals. In 1919 the rye grass was cut for seed in the latter half of August and was then shattering considerably. In 1920 it was cut on August 23.

It has been thought that in order to obtain seed of clovers in this district it would be necessary to leave the first cutting. In 1920, however, there were, in certain tests, inoculated plots of red and sweet clover cut for hay in July which bade fair to mature some seed from the aftermath could they have been left to do so, but as it was necessary to plough the land early in preparation for future work, the aftermath was made into hay.

## SEC. VIII—COMPARING FOURTH-YEAR CROPS OF TIMOTHY AND WESTERN RYE GRASS

In 1916 plots of western rye grass, timothy, meadow fescue and other hay crops were seeded alone. In the two succeeding summers the western rye grass gave an aggregate per acre yield of 5 tons, 1,558 pounds per acre, as against 3 tons, 328 pounds for timothy and 3 tons 91 pounds for meadow fescue. It was intended to plough up these plots in 1919 and horses were permitted to graze them closely in the fall, winter and spring. It was finally decided to leave them for seed production. Under the adverse conditions prevailing in the early summer of 1919, the timothy and fescue produced next to nothing. The rye grass yielded a small crop which was cut for summer before, was backset and smoothed by harrowing twice. On June 10, eight seed. In 1920 these plots were again cut for hay, the rye grass yielding 2,477 pounds per acre, while the average of the fescue and timothy (weighed together and yielding about equally) was at the rate of 890 pounds. The comparative aggregates for the three crops of hay (ignoring the 1919 result) was 7 tons, 35 pounds from the rye grass; 3 tons, 1,218 pounds from the timothy; and 3 tons, 981 pounds from the meadow fescue.

## SEC. IX—FIELD ROOTS

Copious moisture provided favourable conditions for field roots, the adverse factors being late seeding (June 1) a slight delay in thinning, and the necessity for early harvesting to ensure the keeping quality of the crop. As it turned out, some of them might with safety have been left longer, but experience of previous seasons had demonstrated the imprudence of taking risks, particularly with mangels.

TABLE 1

| Kind of Roots | Date Harvesting | Yield per acre, 1920 | | |
|---|---|---|---|---|
| | | lbs. | tons | lbs. |
| Turnips, Greystone (McD.) | Oct. 16 | 46,802 | 23 | 802 |
| Swede Turnips, Canadian Gem | " 16 | 26,346 | 13 | 346 |
| Sugar Beets, Klein Wanzleben | Oct. 8 | 15,981 | 7 | 1,981 |
| Mangels, Yellow Intermediate | Sept. 15 | 15,342 | 7 | 1,342 |
| Carrots, Danish Champion | Oct. 15 | 11,141 | 5 | 1,141 |

## SEX. X—ANNUAL CROPS FOR HAY, ENSILAGE AND PASTURE

Under this head were comprehended tests with oats, oats and peas, oats and common vetches, oats, peas and vetches, winter rye, rape, Siberian millet, Sudan grass, corn and sunflowers, besides an interesting comparison of some two dozen varieties of vetches, peas and clovers, the seed of which was picked by Dr. L. J. O'Brien, M.D., of Grande Prairie, in Salonica, and kindly turned over to the Station for trial. Certain of these crops were introduced into several different tests.

### OATS, PEAS AND VETCHES

The first experiment in this section was one to compare oats alone with oats and peas, oats and common vetches, and oats, peas and vetches. These plots were drilled in on June 3, on a good piece of summer-fallow. The peas were of the Arthur variety. The variety of oats was the Banner, except in the o.p.v. plot, where the supply had to be supplemented with Ligowo. Growth was heavy, especially the growth of oats. The plots were cut with a binder on September 18 and weighed October 23, allowance being estimated for a still somewhat sappy condition of the sheaves. It will be noticed that the oats outyielded any of the combinations, especially the combina-

tion of oats and peas. This is true not merely of the 1920 crop, but of the three-year average. One reason for this is the greater susceptibility of peas to frost. Another may be the lack of inoculation of the peas.

TABLE 1

| Designation | Yield 1920 lbs. per ac. | Yield 3-year Aggregate | Yield 3-year Averages |
|---|---|---|---|
| Plot 1—Oats only | 8,529 | 18,781 | 6,260 |
| " 2—Oats and vetches | 8,239 | | |
| " 3—Oats, peas and vetches | 8,425 | | |
| " 4—Oats and peas | 7,073 | 16,960 | 5,653 |

VETCHES, MILLET, RAPE, ETC.

On a piece of summer-fallow prepared as for the previous test, but remote therefrom in point of location, ten plots of annual forage crops were seeded on June 4. These were each 1 by 2 rods in size, but more or less overspread the intervening paths, so that the actual area of each was about a seventy-third of an acre.

The seed was sown broadcast by hand and covered with a single-disc drill running light. Some of the yields are compared in annual forage crop table No. 2. There being reason to question the accuracy of the recorded yields of Arthur and grass peas, these are withheld. The rape was not weighed, as its sappy condition would interfere with the making of a fair comparison.

The growth of rape was very thick but not tall, perhaps owing to overcrowding. Some isolated plants on it grew very strong and large.

As to the matter of frost hardiness, it was noticed that the Sudan grass was most readily injured, followed by the millet, peas, vetches and oats in the order named. It seemed as though the vetches and grass peas withstood the frost better than the common field peas, but of this the staff are not positive.

TABLE 2.—Presenting green weights, except millet, which was frosted and pretty well dried out when cut

| Kind of Crop | Yield |
|---|---|
| | lbs. per ac. |
| Oats and peas | 23,506 |
| Oats and vetches | 20,659 |
| Hairy vetches | 17,374 |
| Common vetches | 16,060 |
| Millet, Siberian | 5,037 |
| Sudan grass—growth poor and yield small, badly frosted | |

## SEC. XI. MISCELLANEOUS

In June a row each was sown of common red clover, alsike clover and Altaswede clover, the seed for which latter was supplied by courtesy of Prof. G. H. Cutler, of the University of Alberta. All the seed was treated with nitro culture. The Altaswede made the least growth of any in the year of sowing, but this is said to be its habit.

On July 9 a row of Arctic sweet clover was sown with seed supplied by the University of Saskatchewan. Previous to the sending of this seed out, it was scarified and also inoculated by the soil method.

### DISCING TO RENEW MEADOWS

In August, 1919, immediately after haying, a large number of plots had the disc harrow run one round across them, lapping half and cutting up the sod pretty thoroughly. In the spring of 1920 these disced strips were harrowed. Observation revealed little or no certain benefit attributable to the treatment.

A strip of well-established and strong-growing winter rye was grazed until June, extremely wet weather having prevented its being satisfactorily grazed down earlier. An adjoining strip which had not been pastured was mown for hay on July 6, being then fairly well headed and about five feet tall. This area yielded at the rate of 2 tons 509 pounds cured hay per acre.

The area pastured was mown for hay and yielded 1 ton 193 pounds per acre.

Both these areas employed for hay and pasture were on the poorest part of the rye field.

### SUNFLOWERS

An acre and a half of Giant Russian sunflowers, sown with a grain drill the latter part of May, at the rate of about seven to eight pounds per acre, yielded at the rate of 27,620 pounds, or 13 tons 1,620 pounds per acre, wilted weight. Late seeding and wet weather had retarded the maturity and reduced the yield. When cut early in October, they were less than five per cent in head.

Another kind, grown in the garden, proved much earlier, being fully headed when the Giant Russians were scarcely commencing to bloom. A small plot in the garden, representing some of each kind, yielded at the rate of 19 tons 1,930 pounds per acre.

### OATS AND SUNFLOWERS MIXED

Through an inadvertence two rows of this earlier kind of sunflowers were sown through a piece of oats for green feed, sown late on spring-ploughed stubble. Capitalising the mistake in the interest of science, the scuffler was run through between the rows, destroying all the oats, except those growing close to the rows. The effect of the oats was to reduce the height of the sunflowers, but not to prevent them heading out. The mixture was cut with a grain binder and the yield figured out to 9 tons 1,072 pounds per acre.

# FIELD HUSBANDRY

## SEC. I—THICKNESS OF SEEDING EXPERIMENT

A thickness of seeding test with spring wheat, oats and barley, undertaken in 1918, has been carried through its third year. This test is designed to serve a dual purpose, comparing (*a*) the results in grain production from seedings of various thicknesses, and (*b*) the suitability of various crops and rates of sowing thereof as nurse crops when seeding down.

Of each crop and acre block, 10 by 16 rods, has been divided into four quarter-acre strips and as nearly as could be regulated with the drill, the rates of sowing have been as follows:—

Wheat—5, 6, 7 and 8 pecks per acre respectively.

Oats—10, 12, 14 and 16 pecks per acre respectively.

Barley—4, 6, 8 and 10 pecks per acre respectively.

The varieties employed during the first two years were Marquis wheat, Victory oats and O.A.C. No. 21 barley. In 1920 the same barley was continued but the Marquis wheat was substituted by Huron and the Victory oats by Ligowo.

In 1918 and 1919 the land on which the experiment was conducted was breaking of the year previous. In 1920 a good piece of summer-fallow was available.

Frost and other vicissitudes have somewhat marred the results of this test to date, but the work has not been without value. The 1920 outcome was satisfactory in so far as the oats and barley are concerned, save that the two thicker seedings of oats were accidentally combined at stacking time.

Frost and bad harvest weather spoiled the sample and greatly reduced the yield of wheat, the straw of which had looked good for sixty or seventy bushels per acre.

The date of harvesting these twelve quarter-acre strips has been governed largely by the weather, the aim being to leave them as long as possible without running undue risk of frost injury. It has thus come about that the four strips of each kind of grain have always been cut on the same day. This may confer an undue advantage on the thicker seedings, which are rather more forward in ripening. However, from another standpoint, it may be fair enough, since in a region where full maturity is precarious, any system of culture that advances it is likely to result in an improved yield and sample in commercial practice.

Three years' observations have indicated that within the scope of our experiment each half-bushel of oats added to the rate of seeding has hastened maturity by from one day to a day and a quarter. In the case of the wheat and the barley, the advantage in this respect has not been so apparent.

Observation of growth, count of sheaves and other evidence has revealed no great variation in weight of straw as among the several seedings, the thicker rates tending to produce a finer and shorter straw. In respect to the thickness of stand, the difference is not in direct ratio to the amount of seed used, for stooling is much freer in thin seedings.

Careful observation has thus far discovered no positive relationship between rate of seeding and tendency to lodge. Considerable lodging has occurred at times in the oats and barley but it seems to be attributable to such factors as vigour of growth, lay of land, nature of soil and incidence of wind.

One point that has been very definitely established is that lodged portions are extremely susceptible to frost injury.

### BEST RATES OF SEEDING

The experiment has not progressed sufficiently far to warrant positive conclusions concerning optimum rates of seeding, but results to date seem to suggest the advisa-

bility of seeding on summer-fallow or well-prepared breaking about seven pecks per acre of wheat, two bushels of barley and not less than three and a half or four bushels of oats. For less fertile soil a somewhat smaller quantity is perhaps preferable.

TABLE I.—THICKNESS OF SEEDING, 1920

| | Yield per Acre | Yield per Acre | Average Yield 2 Years 1919-20 | Average Yield 2 Years 1919-20 |
|---|---|---|---|---|
| | Lbs. | Bush. Lbs. | Lbs. | Lbs. |
| Wheat— | | | | |
| Seeded May 20, 1920; harvested Sept. 10. | | | | |
| Seeded at 5 pecks per acre | 2,340 | 39 00 | 5,047 | 2,523·5 |
| * " 6 " | 2,072 | 34 32 | 4,839 | 2,419·0 |
| " 7 " | 2,448 | 40 48 | 5,155 | 2,577·5 |
| " 8 " | 2,544 | 42 24 | 5,667 | 2,833·5 |
| Oats— | | | | |
| Seeded May 20 and 21, 1920; harvested Sept. 7. | | | | |
| Seeded at 10 pecks per acre | 3,080 | 90 20 | 5,666 | 2,833·0 |
| " 12 " | 3,400 | 100 00 | 5,919 | 2,959·5 |
| " 14 " | | | 6,511 | 3,255·5 |
| " 16 " | 3,480 | 102 12 | 6,511 | 3,255·5 |
| Barley— | | | | |
| Seeded May 21, 1920; harvested Aug. 27. | | | | |
| Seeded at 4 pecks per acre | 2,352 | 49 00 | | |
| " 6 " | 2,610 | 54 18 | | |
| " 8 " | 2,640 | 55 00 | | |
| " 10 " | 2,665 | 55 25 | | |

*It is suspected that this plot may have been fed to the threshing machine a little too fast to permit of complete separation.

## SEC. II—MANURING EXPERIMENT

To determine the value of barnyard manure per ton, when applied to the hard-burned, cold-clay type of soil occurring in certain localities of the north country, an experiment was commenced in 1918, planned on the following lines.

A fairly level and uniform knoll top of the type of soil described was divided into halves, both to be cropped under a rotation of summer-fallow, wheat, oats, barley. The east half was manured in 1918, the initial year of fallow, and the application is to be repeated every fourth year. The west half is to remain unfertilized during the progress of the test.

There was no scale available to weigh the first dressing of manure, but it was estimated at twenty tons per acre. Future applications are to be weighed.

As yet, no path divides the two portions of the piece. Each plot consists of 1,729 square yards, or a little over 35 per cent of an acre.

The first crop was Turkey Red winter wheat, sown August 14, 1918, and harvested August 20, 1919. No very great difference in growth was apparent to the eye, but the manured portion threshed at the rate of 38 bushels, 29 pounds per acre, while the unmanured yielded only 32 bushels, 53 pounds, a difference of about 17 per cent.

From force of circumstances, the wheat stubble lay until late in the spring of 1920, when it was ploughed, harrowed, floated and drilled to oats, under weather conditions which prevented a first-class tilth. Growth was very moderate. For a time the superiority of the manured half was quite apparent, but became somewhat less conspicious after the whole piece was headed. At harvest we were disappointed to find only about ten per cent more sheaves on the east than on the west half, though the straw was longer and seemed rather better headed and matured. Corroboration of these latter impressions was afforded by weighing the total crops at stacking, and the yields of grain at threshing, the advantage of manuring amounting to 27 per cent in the total weight of crop and 32·7 per cent in the weight of grain.

FACTS BETTER THAN IMPRESSIONS

Had no weights been taken, but casual impressions only relied upon, how far short would we have come of making proper allowance for the effect of the manure.

It is possible, of course, that some unsuspected difference in natural conditions may have affected the results, but to the best of our knowledge the test is substantially a fair one. The table summarizes the case.

LOSS OF WEIGHT FROM CURING IN STACK

Incidentally, it may be remarked that much grain in the north country last year was stacked in very tough condition, some almost curing into ensilage stacks. The experimental grain was much more fit than that in most commercial fields and yet, between the time of stacking in October and threshing, a month later, one lot lost over fifteen per cent in weight. The stack being a narrow one, with the damp sheaves purposely placed to the outside, probably cured out exceptionally well. The grain was in very fair condition when it came from the machine.

TABLE 2.—Maturing Test, 1920

A.—1919 RESULTS, WINTER WHEAT

| Designation | Area | Yield total crop per acre—lbs., at stacking | Yield grain per acre | Yield grain per acre |
|---|---|---|---|---|
| | Sq. yds. | | Lbs. | Bush. Lbs. |
| Manured | 1,729 | ..... | 2,309 | 38 29 |
| Unmanured | 1,729 | ..... | 1,973 | 32 53 |
| Difference | ..... | ..... | 336 | 5 16 |
| Per cent | ..... | ..... | 17% | |

B.—1920 RESULTS, OATS

| | | | | |
|---|---|---|---|---|
| Manured | 1,729 | 6,718 | 2,191 | 64 15 |
| Unmanured | 1,729 | 5,290 | 1,651 | 48 19 |
| Difference | ..... | 1,428 | 540 | 15 30 |
| Per cent | ..... | 27% | 32·7% | |

C.—TWO YEARS RESULTS COMBINED

| | | | | |
|---|---|---|---|---|
| Manured | ..... | ..... | 4,500 | |
| Unmanured | ..... | ..... | 3,624 | |
| Difference | ..... | ..... | 876 | |

Advantage to date in favour of manuring, nearly 24·2%.

## SEC. III—EFFECT OF SUNFLOWERS, CORN, RAPE AND POTATOES ON FOLLOWING GRAIN CROP

An interesting bit of sampling was done to compare the effect of four different classes of hoed crops upon the subsequent yield of grain. An inferior clay knoll, where experimental plots of sunflowers, corn, rape and potatoes were grown in 1919, was cross-drilled May 21 to Liberty hulless oats.

Following the hoed crop, the land received no ploughing, discing or any other tillage, save that before commencing to sow grain the single disc drill was run once lengthwise of the last year's rows of hoed crop. As the soil was of a clayey nature, this was inadequate preparation, but spring had opened so extremely late that all

tillage was reduced to a minimum. Besides expediting operations, it was sought by this means to forward maturity at the expense of growth.

At harvest, on August 28, the grain being still decidedly on the green side, duplicate sheaves, eight in all, were pulled from carefully measured areas in representative portions of the crop. These sheaves were tied up, put away and threshed by hand in February. Each sheaf was taken from an area ten drills (five feet) wide by half a rod long, being a ten hundred and fifty-sixth of an acre. A point was made of taking the four samples of each series from precisely the same drill runs, to guard against error from irregularity in the feed. The average results of the duplicate sampling probably come near revealing the information sought. If any element of unfairness entered it arose probably from the fact that the sunflowers had not been harvested in 1919, but stood all winter, accumulating a big drift of snow. In spring the stalks were removed.

TABLE C.—Effect of various hoed crops on following grain crop. Yield of hulless oats

| — | Threshed grain per acre | Total crop per acre |
|---|---|---|
| | Bush. Lbs. | Tons. Lbs. |
| After Potatoes | 42 07 | 2 438 |
| " Sunflowers | 30 19 | 1 1,646 |
| " Corn | 29 04 | 1 1,217 |
| " Rape | 26 23 | 1 871 |

## SEC. IV—SOWING WINTER RYE WITH SPRING GRAIN

About the end of May, 1919, a sixteen-acre plot of oats was cross-drilled almost directly to winter wheat and another to winter rye. Both made a thick mat of growth, which checked the spring grain considerably. The rye formed some heads, but the total crop tied on this area was 35 per cent less than where only grass seed had been sown on the grain. Eliminating the rye, the yield of oats was found to have been cut nearly in half.

Probably from having got too far advanced, the wheat winter-killed completely and the rye suffered heavily also, so that a very thin stand of it came through in 1920. Nevertheless, this thin crop of rye made sixteen hundred pounds of well-headed crop per acre, as against only six hundred and forty pounds of western rye grass and twelve hundred pounds of timothy, both seeded under like conditions.

The 1920 repetition of this experiment was amended in method, according to a suggestion of Mr. W. F. Stevens, now secretary of the Stock Growers' Protective Association, who has taken a much appreciated interest in the work at Beaverlodge, and to whom we are indebted for various helpful suggestions. A rod-wide strip of winter rye was cross-drilled June 17 at the rate of about five pecks per acre on four quarter-acre plots of barley which had been sown a month previous and were up well. This sowing of rye adjoined and was supplementary to the nurse crop test (see Sec. I). There were four strips of barley seeded at four, six, eight and ten pecks per acre respectively. A single-disk drill was of necessity employed, although a shoe drill is recommened by Mr. Stevens as better for this particular work. The cross-drilling appeared to mutilate the spring grain badly, but after a few weeks its thinning effect was not very noticeable.

Just prior to harvesting, eight samples of barley were pulled by hand and put away until winter, when they were carefully weighed and threshed. Four samples (one from each thickness of sowing) were taken from the strip where rye was drilled a month after the barley and four corresponding lots from areas where clover had been seeded with the barley. The averages denoted an advantage of 6·4 per cent in total crop and 4 per cent in threshed grain from the areas seeded to rye. The apparent advantage may have been accidental, but it would appear from the

figures, supplemented by observations of the standing crop, that in the moist season of 1920, the net effect on the barley crop of cross-drilling winter rye after the spring grain was well established, could not have been very adverse. The barley threshed from the blocks where this experiment was run averaged nearly fifty-five bushels per acre.

The rye made a thick growth and prolonged wet weather after the barley harvest prevented fall pasturing, to which resort would otherwise have been had to keep the rye from jointing before winter, this being considered liable to result in winter killing.

TABLE 4.—Sowing Winter Rye with Spring Grain

| | With Rye | | With Clover | |
|---|---|---|---|---|
| | Total crop | Grain | Total crop | Grain |
| | Ozs. | Ozs. | Ozs. | Ozs. |
| Barley seeded at 4 pecks per acre | 14·5 | 6·5 | 15 | 7·5 |
| " " 6 " | 14 | 6·5 | 14 | 6·5 |
| " " 8 " | 16·5 | 8· | 14 | 6·5 |
| " " 10 " | 13 | 6·5 | 11·5 | 6 |
| | 58·0 | 27·5 | 54·5 | 26·5 |

## CEREALS

### SEC. I—INTRODUCTORY

The winter of 1919-20 will be remembered as a long hard one with an extreme fall of snow (11' 10" at Beaverlodge), which came October 20 and lasted until well into May. During the early winter there was no frost at all in the ground and a proportion of the first snow melted and helped to soak more deeply a soil already well moistened by a wet autumn. In the spring considerable further penetration occurred and this being followed by a rainy summer, resulted in a subsoil saturation quite unprecedented in the Experimentalist's previous six years' experience in the North country. Water stood in many a cellar where such a condition had never been known before. Few fields in the vicinity of the Station saw drill or harrow until the middle to twentieth of May, and after seeding had progressed satisfactorily for about ten days, operations were practically suspended by an unseasonable period of precipitation, continuing at frequent intervals until the twentieth of June, so that many farmers completed the sowing of oats for green feed in late June or even July, while a considerable intended acreage remained unseeded.

With such abundant moisture and a foreshortened growing season, it appeared wise to sacrifice growth of straw for the sake of hastening maturity; hence, on the Station the land was given less spring cultivation than usual. Ranges of oat plots were located on both summer fallow and potato ground. Both were prepared in the spring by harrowing only, the potato land having received no deep tillage whatever since the removal of the crop. Comparison of yields shows that the potato ground thus scantily treated produced a satisfactory growth of straw which, though less rank than was grown on summer-fallow, stood upright, ripened a little earlier and in the case of several varieties yielded more. That fifty-four and fifty-five bushels of wheat, one hundred and thirty-six of oats and seventy-one of barley could be produced on unmanured, unploughed potato ground, inferior in natural quality to the average of the Station farm and of the district, speaks well for the cereal possibilities of the less frost-subject areas of the North country.

A small separator especially adapted for plot work proved a great convenience and while the building in which it is installed was not ready for use until late Novem-

ber, the variety plots standing in stook until that time, yet threshing was completed in a period of favourable weather and with satisfactory outcome. It was, however, found an economy of time, in some cases, to beat out by hand enough grain to afford pure seed and samples, running the balance through the machine to obtain the total yield of the plot.

## SEC. II—SPRING WHEAT

### SOURCE OF SEED

Six prominent varieties of spring wheat and one extra plot of Marquis were sown May 18, in twenty-seventh acre strips on a clay loam knoll, broken in 1918, cropped to potatoes in 1919 and drilled (crosswise of the potato rows) with no intervening tillage except a double harrowing in the spring of 1920. The source of the seed was as follows:—Ruby, from Ottawa in 1918, grown since at Beaverlodge; Red Bobs, from Wheeler in 1919, propagated since at Beaverlodge; Marquis and Huron received from Ottawa in spring of 1916, propagated since at Beaverlodge; Early Red Fife, received from Lacombe in 1920; Kitchener, received from a farmer in Southern Saskatchewan; special strain of pure Marquis, from Ottawa, 1920. It was found that the Marquis grown at Beaverlodge showed signs of having hybridized with the Huron, hence a pure strain was received in 1920 and grown at a distance from the other plots.

### STANDING OF VARIETIES

For the sixth successive season Huron wheat has outyielded Marquis, in plots always located side by side. Its six-year average of 43 bushels 51 pounds per acre as compared with 34 bushels 55 pounds of its rival, represents an annual betterment of nearly nine bushels or over twenty-five per cent.

That both these varieties should have been exceeded in the 1920 yield by Red Bobs and Kitchener is rather surprising and may possibly be explained in part by a variation in soil quality, though such was not recognized at time of seeding and is not yet definitely known to be a fact.

The extra plot of Marquis (special strain Ottawa seed) grown at a distance from the variety test plots and on a rather loamier type of soil, but similarly prepared, gave the heaviest yield of all, viz., 55 bushels 48 pounds, and although seeded and harvested simultaneously with the Red Bobs, its sample was satisfactorily mature. It is believed that the superiority of this plot over its fellow of the same variety was due chiefly to soil variation rather than to any important difference in the quality of the seed. All of this goes to illustrate that with the utmost possible care in conducting experimental work, its results as to any particular season are subject to an element of mischance or error, so that only averages extending over a considerable period may be accepted with confidence.

The Red Bobs emerged from the shot blade a good two days in advance of the adjoining plot of Marquis and seemed to be fully that much ahead in maturity, thus having a decided advantage in a season when most varieties had scarcely time to reach their best. The Kitchener, on the other hand, seemed rather later than the others in heading out and yet in stage of maturity it appeared to be nothing behind the Early Red Fife, Huron and Marquis. Careful observation of all these varieties has been supplemented by the examination of samples pulled in advance of maturity.

An incidental object in the taking of such premature samples was to study the subject of colour in wheats.

### A GOOD EARLY WHEAT

The only really good-coloured wheat from our 1920 crop was the Ruby, which was tolerably mature when harvested, August 21, seventeen days before the Red Bobs was ripe. The Ruby at Beaverlodge is cut on the green side to avoid shattering. Its

yield of almost 40 bushels per acre of bright, hard, red wheat, bringing its three-year average up to 32 bushels 26 pounds, as compared with 40 bushels 25 pounds for Marquis and 45 bushels 29 pounds for Huron, commends it to the favourable attention of all for whom a very early wheat is essential.

Prelude has been dropped from the list.

TABLE I—Spring Wheats

| Variety | Date of cutting | Time to mature fully | Yield per acre, 1920 | Yield per acre 6-year average 1915–20 | Yield per acre 3-year average 1918–20 | Yield per acre 2-year average 1919–20 |
|---|---|---|---|---|---|---|
| | | days. | bush. lbs. | bush. lbs. | bush. lbs. | bush. lbs. |
| Kitchener | Sept. 10 | 115 | 54 13 | ..... | ..... | ..... |
| Red Bobs | " 7 | 112 | 54 00 | ..... | ..... | 49 30 |
| Huron | " 10 | 115 | 50 10 | 43 51 | 45 29 | 48 13 |
| Early Red Fife | " 10 | 115 | 48 29 | ..... | ..... | ..... |
| Marquis | " 7 & 10 | 114 | 46 21 | 34 55 | 40 25 | 46 18 |
| Ruby | Aug. 21 | 98 | 39 49 | ..... | 32 26 | 36 54 |
| Marquis Special | Sept. 7 | 114 | 55 48 | ..... | ..... | ..... |

## SEC. III—OATS

Four varieties of oats were last spring added to the list of six previously under test. Of the four additional kinds there was insufficient seed to permit of their being included in the range primarily set aside for the oat plots, hence the six kinds previously under test were sown there on the potato ground prepared as for the wheats and barleys. These same six with the four additions were then sown in another range of shorter plots, laid out on a well-prepared summer-fallow where variety plots of cereals had been grown in 1918. The potato ground lay to the west and is designated "West Range." The summer-fallow allotment is known as the "East Range."

### CORRESPONDING RESULTS FROM DUPLICATE RANGES

It is gratifying to find that the six varieties which occurred in both ranges stood in precisely the same order in each. Some of the ranker growing, such as Victory and Banner, yielded a little more grain from the potato ground than from the summer-fallow because the straw on the former stood straight and the crop ripened earlier and more evenly.

Both ranges were sown May 19, and owing to the lateness of the season the drill was opened out rather more than usual, the intended rate of seeding being four bushels per acre (by weight) or a little better.

Harvesting progressed for the most part in order of ripening, from August 20 to September 10, one or two slight deviations from this rule being occasioned by the temporary inaccessibility of certain plots flanked by uncut ones of another kind whose leaning margins obstructed the pathways.

### SOURCE OF SEED SUPPLIES

Seed of the Victory, Ligowo, and Daubeney was originally obtained from Ottawa and has been acclimatized at Beaverlodge for several years; the Abundance was procured in 1917 from a careful neighbouring farmer and has since been propagated at the Station; four or five pounds of the Liberty (hulless) was received from Ottawa in 1918 and has been multiplied since to the extent of some two hundred and fifty bushels, besides which quite a few bushels were distributed by local sale out of the 1919 crop; Banner, received from Ottawa in 1919, is in its second year of local propagation. Of the 1920 additions, the Gold Rain came from Lacombe; O.A.C. No. 3, from its parent

institution, Guelph, Ont.; Tartar King from Fort Vermilion; the Leader from a Winnipeg seed house which features it.

### MOST PRODUCTIVE VARIETIES

Of the kinds grown longest at the Station, Victory not only heads the list in 1920, but also leads the five-year, four-year and three-year averages, and in the two-year average is exceeded only by Banner, whose very high 1919 yield from an unduplicated plot may have been in some degree accidental. However, the Banner registers a good second in 1920. These two oats are close rivals, the Victory seeming rather the later. Indeed, the Victory is the latest oat on our list, with the possible exception of the Leader, whose vegetation this year showed a tendency to lodge, but whose yield of 122 bushels 31 pounds per acre from a very tangled straw, cut much on the green side and imperfectly harvested, seems to promise capacity for a high yield under conditions where it stands up well and ripens fully.

### THE HULLESS OAT PROMISING

Easily distancing all others in popular interest is the hulless oat, Liberty-Ottawa-480. Though yielding from the average of its two plots only about 78 per cent as much meat as the Victory, it has certain strong claims to attention. Not only does its hulless character render it particularly advantageous for the feeding of young pigs and for other special purposes, but it possesses certain field qualities of high merit. Barring only those precocious, slender oats of the Daubeney and O.A.C. No. 3 class, it is the earliest kind under test at Beaverlodge. Its straw, of medium length, stands up better than that of any other variety we have; it resists shattering uncommonly well and is a very soft, pleasant oat to handle in the sheaf.

Although the Liberty is early, whitening rather sooner than such kinds as Abundance and Ligowo, a word of caution against premature cutting is in order. If an ordinary hull-carrying oat is reaped too green, the loss will not be so apparent, because the hull, which is formed first, is a fairly constant quantity, consequently the percentage reduction in yield from too early harvesting will be less striking than in the case of the Liberty, where the meat only is considered. It is noteworthy that the west plot of Liberty, cut September 4, yielded 7 bushels 11 pounds per acre more than the east plot, harvested a week earlier. The yield of the better matured plot was equivalent to about 110 bushels of ordinary oats.

### THE LIBERTY ON A FIELD SCALE

Confirmation of the above conclusion in regard to data of harvesting was afforded by a multiplying block of nearly three acres, part of which was cut August 30, while the balance of the piece was whittled off four days later. Exact measurements showed that the yields of the two areas were respectively 59 bushels 14 pounds and 64 bushels 9 pounds per acre—an increase of 8·1 per cent from an additional four days to mature. Owing to a light frost, however, the germination of the more mature crop was somewhat impaired, the relative germination percentages being 91 as compared with 82. From the standpoint of seed, it was a doubtful economy to let the crop stand, but from the standpoint of feeding value, it paid well to do so. In fact, from the latter standpoint, even more time to ripen would have been of advantage.

It is of interest to note that the more mature portion of this field crop produced a yield per acre equivalent to the kernel in 91 bushels 27 pounds of ordinary oats. This crop was grown on a well-prepared summer-fallow and received no weeding or special care whatsoever. It was sown May 22 and after harvest ran the gauntlet, with the rest of the grains, of an extremely trying period of autumn weather. The appearance of this multiplying block throughout the summer was exceedingly fine, and not only demonstrated the excellent field qualities of the variety, but went to answer the occasional question, " Could you equal or approach these small plot yields on larger areas ?"

It is to be regretted that an absolute comparison between the O.A.C. No. 3 and the Daubeney is not obtainable. The only known mishap in threshing was a mixing of the crop of the two plots of Daubeney. The quantity threshed was apportioned between the two plots by estimate according to results from adjoining varieties which occurred in both ranges. The division is probably fair or nearly so. In any case, it does not affect the standing of the variety. As our records stand, the O.A.C. No. 3 seems to have a decided advantage over the Daubeney. However, it is too soon to draw conclusions.

### RELATIVE EARLINESS OF OATS

The question of earliness in oats, like strength of straw, though important, is not so simple to gauge as might be supposed. In the first place, there might be sharp variations in a field of a given variety, due to slight differences in the land. If the soil conditions of a plot range are not absolutely uniform—and they rarely are—an element of error may creep in here. Close examination will often reveal sharp discrepancies between the behaviour of the duplicate plots of a given variety or various portions of the same plot.

Rate of seeding also affects the matter and this again is complicated; because, a rate that is optimum for a variety with a certain size of kernel and certain stooling habit may not be optimum for one which differs in either or both these respects.

The character of the weather as maturity approaches very radically affects the rate at which an oat will "whiten unto the harvest." We have found, in date-of-harvest work, that in a cool, moist autumn there may be little change in colour of straw during two or three weeks' time. It sometimes seems as though the lower part of the straw turns greener rather than lighter for a while, and during this time a sucker growth starting out from the base may attain a height of from six to eighteen inches, as occurred in 1920.

Then, again, it is possible that even with other conditions constant, different varieties might exhibit varying degrees of coloration at a given stage of grain formation or maturity.

In view of all these facts, the tabular column denoting relative periods of maturity is submitted tentatively as being merely the result of our observations in the season of 1920. We suspect that the season and other conditions exaggerated the spread as to both yield and time of maturity as between early and late kinds.

TABLE 2—Oats

| Variety | Date of cutting | Estimated time to mature fully | Yield per acre 1920 | Yield per acre 5-year average 1916–20 | Yield per acre 4-year average 1917–20 | Yield per acre 3-year average 1918–20 | Yield per acre 2-year average 1919–20 |
|---|---|---|---|---|---|---|---|
| | | days | bush. lbs. | bush. lbs. | bush. lbs. | bush. lbs. | bush. lbs. |
| Victory | Sept. 7 | 116 | 134 08 | 106 32 | 108 33 | 118 11 | 126 33 |
| Banner | Sept. 7 and 10 | 113 | 128 12 | ..... | ..... | ..... | 130 22 |
| Leader | " 7 | 116 | 122 31 | ..... | ..... | ..... | ..... |
| Gold Rain | " 4 | 112 | 122 16 | ..... | ..... | ..... | ..... |
| Ligowo | " 4 | 111 | 116 06 | 102 30 | 106 16 | 117 16 | 115 00 |
| Abundance | " 4 | 111 | 111 10 | ..... | 100 18 | 111 16 | 111 13 |
| Tartar King | " 4 | 112 | 109 02 | ..... | ..... | ..... | ..... |
| Liberty | Aug. 28 / Sept. 4 | 109½ | 73 12 | ..... | ..... | 74 32 | 72 24 |
| O. A. C. No. 3 | Aug. 20 | 94½ | 85 26 | ..... | ..... | ..... | ..... |
| Daubeney | " 20 | 94½ | 78 28 | 79 13 | 83 09 | 88 12 | 82 02 |

NOTE.—West Range plots (after potatoes) one-twenty-seventh acre each.
East Range plots (after summer-fallow) one-thirtieth acre each.
Leader, Gold Rain, Tartar King and O.A.C. varieties—figures for single plots. Of other varieties figures represent average yield of duplicate plots, in respect of 1920 test.

## SEC. V—BARLEY

As the years pass the O.A.C. No. 21 barley maintains the lead it established when first tried out at this Station in 1914. Only once since has it been outclassed by any variety. In 1918 a windstorm at harvest nearly ruined all the barley plots. The two-rowed Chevalier, withstanding the wind better than the others, headed the list for that season. In ordinary years it is usually surpassed by both O.A.C. No. 21 and Manchurian, which latter, however, is too easily shattered to be safe for the district.

The earliness of Albert fails to compensate for its low yield and rather inferior sample.

The Guymalaye is a reasonably early and very productive sort, whose fat, greenish-brown kernel represents a concentrated feeding value. Its straw, however, is rather weak and too short for any except fertile land, such as fallow or breaking. For stubble ground, on which barley is generally desired to be grown, this is a vital objection.

A white hulless and beardless variety, obtained locally, was added to the list in 1920, with most satisfactory results as to yield and sample, but, unfortunately, the straw proved rather shorter and considerably weaker than that of the Guymalaye, so that a storm lodged it badly, making harvesting extremely difficult and necessitating much gleaning by hand to secure the full yield of the plot. For this reason we hesitate to recommend it, notwithstanding the very great desirability of the beardless character.

The Hannchen barley, a short-strawed, two-rowed kind, bred in Sweden and recommended by the University of Saskatchewan, where, in seven years out of eight, it outyielded all others, surpassing its nearest rival, the O.A.C. No. 21, by more than fifteen per cent, was introduced to Beaverlodge last spring in a sample of seed supplied by Professor Bracken. Grown side by side with the O.A.C. No. 21, it proved a couple of days later and was handicapped slightly through being harvested on the same day. From whatever cause or causes, it fell 12 bushels 31 pounds short on the season's yield.

It may be observed that while the variety plots grown from our own seed were almost or quite free of smut, the new introductions showed about three-tenths of one per cent smutty heads in the white hulless and two-tenths of one per cent in the case of the Hannchen. All the seed had been treated with formaldehyde, the hulless kinds by a special method.

The soil preparation for the barleys was the same as described for the spring wheats, but the natural soil quality was rather better. The test was believed to be fair to all the seven varieties. Seeding was done on May 19. The Albert was harvested on August 20 and the other kinds August 23 and 25, operations being interrupted by a rain. The extra two days favoured the plots which stood over.

TABLE 3.—Barley

| Variety | Date of cutting | Estimated time to mature fully | Yield per acre 1920 | Yield per acre 5-year average 1916–20 | Yield per acre 2-year average 1919–20 |
|---|---|---|---|---|---|
| | | days | bush. lbs. | bush. lbs. | bush. lbs. |
| O. A. C. No. 21 | Aug. 25 | 98 | 71 34 | 40 46 | 63 37 |
| Manchurian | " 23 | 99 | 64 33 | 34 45 | 54 45 |
| Hannchen | " 25 | 100 | 59 03 | ..... | ..... |
| Early Chevalier | " 25 | 99 | 55 06 | 35 26 | 51 00 |
| White Hulless | " 25 | 97 | 55 06 | ..... | ..... |
| Guymalaye | " 23 | 97 | 52 42 | ..... | 51 01 |
| Albert | " 20 | 93 | 34 42 | ..... | 31 04 |

## SEC. V—PEAS

That field peas are an uncertain crop at Beaverlodge, even on the high ground of the Station area is shown by the following chronological record of plot yields for six years past:—

| Variety | Year | Yield per acre | Remarks |
|---|---|---|---|
| | | lbs. | |
| Arthur | 1915 | 1,665 | |
| " | 1916 | 0 | Killed in August. |
| " | 1917 | 580 | Frosted before mature. |
| " | 1918 | 0 | Frosted in July. |
| " | 1919 | 1,463 | |
| " | 1920 | *1,877* | |

Average of 6 years — 930 — 15 bush. 30 lbs.

Though frost-hardy when young, peas are very susceptible to low temperatures after they pod out and the Arthur requires rather a longer time to mature than Marquis wheat. A garden row test was made in 1920 with a small quantity of Arthur against Alberly Blue, supplied by courtesy of Professor Cutler of the Alberta College of Agriculture. Results were very inconclusive, owing to the small area involved. Yields were: Arthur, 80½ ounces; Alberly Blue, 74 ounces. The latter was the better matured sample.

### MAY REQUIRE INOCULATION

It is quite possible that artificial inoculation may improve the growth. We have previously assumed that the prevalent wild vetch and peavine would inoculate naturally for field peas, but examination last summer discovered scarcely any nodules upon the roots of common field peas, though they were plentiful enough upon the roots of grass peas, common vetches and hairy vetches in adjoining plots.

## SEC. VI—FLAX

Frequently productive of a good yield of fine seed, flax is an uncertain crop at the Beaverlodge station. To be reasonably sure of ripening, it must be sown in good season, say the middle of May, or earlier. When this is done, it will occasionally be killed by a harder frost than usual in late May or early June, as happened in 1919, to all but the latest seedings, which, as chance had it, ripened up nicely during an open fall.

From seasonal difficulties and lack of adequate facilities, the 1919 crop was not threshed, though the last seeding produced a fair yield of medium quality seed. The 1920 harvest was much more successful.

In addition to the Premost, on which yields are calculated, observation plots of Novelty and fibre flax did well, though the latter is not a likely crop for the district, the staple being too subject to injury by autumn frosts.

The 1920 yield of Premost, seeded May 22, on unploughed potato ground and harvested September 7, was 25 bushels, 31 pounds per acre. The two-year average, omitting the 1919 crop, was 20 bushels, 45 pounds. Ignoring the 1919 crop, but averaging the two years production over three years, the result would still be 13 bushels, 49 pounds.

This is perhaps nearer what a long term trial would work out to.

## SEC. VII. WINTER GRAIN

For the third successive time, winter rye came through almost perfectly and Turkey Red winter wheat well enough to make a paying crop. Indeed, the latter succeeded rather better than usual, a block of slightly over a third of an acre turning out at the rate of 34 bushels 2 pounds per acre. This block had been seeded August 18, 1919, partly on fallow and partly on July breaking, the former area proving the better.

Dawson's Golden Chaff suffered considerably from the ice crust which formed under the snow, following a mid-winter chinook, and this plot was spotted. Having in a three-year trial proved much less hardy than the Turkey Red, it was decided to substitute this variety with O.A.C. No. 104, which was sown in 1920. The plot of Dawson's was sacrificed, in order to facilitate the harvesting of a rank plot of rye adjoining.

The growth of rye was tremendous, one stalk measuring 6 feet 9 inches; the average being very nearly six feet. The out-turn of grain was disappointing in comparison. Prairie chickens may have been partly responsible, as the stooks stood three months exposed in a remote quarter. Again, it is possible that the seeding of five pecks per acre was inadequate, as the seed had been considerably under 100 per cent in germination. Comparison of the yield from a four-peck as compared with a five-peck seeding, suggests this probability.

Pasturing winter rye until the twentieth of June (soft ground forbidding the grazing of it down much earlier) reduced the yield of grain to a fraction of the normal, and delayed maturity until the middle of September. Early pasturing for a brief period should prove serviceable in restricting the enormous growth of straw that otherwise makes harvesting and threshing so costly.

TABLE 4.—WINTER GRAIN

| Variety | Date of seeding | Date of harvest | Estimated time to mature fully | Yield per acre 1920 | Yield per acre 3-year average 1918–20 |
|---|---|---|---|---|---|
| | | | days | bush. lbs. | bush. lbs. |
| Rye, 4 pecks per acre | Aug. 18, 1919 | Aug. 23, 1920 | 373 | 34 54 | |
| Rye, 5 " | Aug. 18, 1919 | Aug. 23, 1920 | 373 | 44 54 | 48 25 |
| Wheat Turkey Red | Aug. 18, 1919 | Aug. 30, 1920 | 377 | 34 02 | 31 01 |

# APPENDIX

## TABLE 1.—SPRING WHEAT—VARIETY TEST

| Variety | Size of plot | Total yield of plot | No. of Sheaves | Date of Seeding | Date of Harvest | Yield per acre, 1920 | Yield per acre, 1920 | Aggregate 6-year yield, 1915–20 | Average 6-year yield | Aggregate 3-year yield, 1918–20 | Average 3-year yield | Aggregate 2-year yield, 1919–20 | Average 2-year yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | acres | lbs. | | | | lbs. | bush. lb. | lbs. | bush. lbs | lbs. | bush. lbs. | lbs. | bush. lbs. |
| Ruby | 1/27 | 88·5 | ..... | May 18 | Aug. 21 | 2,389 | 39 49 | ..... | ..... | 5,839 | 32 26 | 4,429 | 36 54 |
| Reb Bobs | 1/27 | 120·0 | 18 | " 18 | Sept. 7 | 3,240 | 54 00 | ..... | ..... | ..... | ..... | 5,941 | 49 30 |
| Marquis V. T | 1/27 | 103·0 | ..... | " 18 | "7 & 10 | 2,781 | 46 21 | 12,575 | 34 55 | 7,277 | 40 25 | 5,556 | 46 18 |
| Huron | 1/27 | 111·5 | ..... | " 18 | " 10 | 3,010 | 50 10 | 15,787 | 43 51 | 8,187 | 45 29 | 5,787 | 48 13 |
| Early Red Fife | 1/27 | 107·75 | ..... | " 18 | " 10 | 2,909 | 48 29 | ..... | ..... | ..... | ..... | ..... | ..... |
| Kitchener | 1/27 | 120·5 | ..... | " 18 | " 10 | 3,253 | 54 13 | ..... | ..... | ..... | ..... | ..... | ..... |
| Marquis Special | 1/27 | 124·0 | 21 | " 18 | " 7 | 3,348 | 55 48 | ..... | ..... | ..... | ..... | ..... | ..... |

## TABLE 5.—WINTER GRAIN

| Variety | Size of Plot | Yield of Plot | Yield per acre, 1920 | Yield per acre, 1920 | Date of Seeding | Date of Harvest | Aggregate yield 3 years, 1918–1920 | Average yield 3 years, 1918–1920 |
|---|---|---|---|---|---|---|---|---|
| | acres | lbs. | lbs. | bush. lbs. | | | lbs. | bush. lbs. |
| Rye, 4 pecks p.a. | 1290/43560 | 58 | 1,958 | 34 54 | Aug. 18 1919 | Aug. 23 1920 | | |
| Rye, 5 pecks p.a. | 1280/43560 | 74 | 2,518 | 44 54 | Aug. 18 1919 | Aug. 23 1920 | 8,140 | 48 25 |
| Turkey Red | 0·373 | 762 | 2,042 | 43 02 | Aug. 18 1919 | Aug. 30 1920 | 5,585 | 31 01 |

TABLE 2.—OATS

| Variety | Size of Plot | Estimated yield correc'd to area inten'd | No. of Sheaves | Date of Seeding | Date of Harvest | Yield per acre, 1920 | Yield per acre, 1920 | Aggregate 5-year yield, 1916-20 | Average 5-year yield | Aggregate 4-year yield, 1918-20 | Average 4-year yield | Aggregate 3-year yield, 1917-20 | Average 3-year yield | Aggregate 2-year yield, 1919-20 | Average 2-year yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | acres | | | | | lbs. | bu. lbs. | lbs. | bu. lbs. | lbs. | bu. lbs. | lbs. | bu. lbs. | lbs. | bu. lbs. |
| O.A.C. No. 3 | 1/30 | 97·2 | 18 | May 19 | Aug. 20 | 2,916 | 85 26 | | | | | | | | |
| Daubeney E | 1/30 | 89·8 | 18 | " 19 | " 20 | 2,694 | 79 08 | | | | | | | | |
| " W | 1/27 | 98·8 | 19 | " 19 | " 20 | 2,667 | 78 15 | | | | | | | | |
| " Average | | | | | | 2,680 | 78 28 | 13,496 | 79 13 | 11,326 | 83 09 | 9,014 | 88 12 | 5,580 | 82 02 |
| Liberty E | 1/30 | 79 | | " 19 | Aug. 28 | 2,370 | 69 24 | | | | | | | | |
| " W | 1/27 | 97 | 17 | " 19 | " 4 | 2,619 | 77 01 | | | | | | | | |
| " Average | | | | | | 2,494 | 73 12 | | | | | 7,644 | 74 32 | 4,944 | 72 24 |
| Abundance E | 1/30 | 123·6 | 19 | " 19 | " 4 | 3,708 | 109 02 | | | | | | | | |
| " W | 1/27 | 143 | 19 | " 19 | " 4 | 3,861 | 113 19 | | | | | | | | |
| " Average | | | | | | 3,784 | 111 10 | | | 13,673 | 100 18 | 11,372 | 111 16 | 7,574 | 111 13 |
| Tartar King E | 1/30 | 123·6 | 21 | " 19 | " 4 | 3,708 | 109 02 | | | | | | | | |
| Gold Rain E | 1/30 | 138·8 | 23 | " 19 | " 4 | 4,164 | 122 16 | | | | | | | | |
| Ligowo E | 1/30 | 133·3 | 20 | " 19 | " 4 | 3,999 | 117 21 | | | | | | | | |
| " W | 1/27 | 144·5 | 21 | " 19 | " 4 | 3,901 | 114 25 | | | | | | | | |
| " Average | | | | | | 3,950 | 116 06 | 17,493 | 102 30 | 14,483 | 106 16 | 11,983 | 117 16 | 7,820 | 115 00 |
| Leader E | 1/30 | 139·3 | 22 | " 19 | " 7 | 4,179 | 122 31 | | | | | | | | |
| Banner E | 1/30 | 142·9 | 24 | " 19 | " 7 | 4·287 | 126 03 | | | | | | | | |
| " W | 1/27 | 164·5 | 24 | " 19 | " 7 | 4,441 | 130 21 | | | | | | | | |
| " Average | | | | | | 4,364 | 128 12 | | | | | | | 8,884 | 130 22 |
| Victory E | 1/30 | 149·5 | | " 19 | " 10 | 4,485 | 131 31 | | | | | | | | |
| " W | 1/27 | 172 | 23 | " 19 | " 7 | 4,644 | 136 20 | | | | | | | | |
| | | | | | | 4,564 | 134 08 | 18,181 | 106 32 | 14,821 | 108 33 | 12,071 | 118 11 | 8,634 | 126 33 |

## TABLE 3.—BARLEY

| Variety | Size of Plot | Total yield of plot | Per cent smutty heads | No. of Sheaves | Date of Seeding | Date of Harvest | Yield per acre, 1920 | Yield per acre, 1920 | Aggregate 5-year yield, 1916-20 | Average 5-year yield, 1916-20 | Aggregate 2-year yield, 1919-20 | Average 2-year yield, 1919-20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | acres | | | | | | lbs. | bush. lbs. | lbs. | bush. lbs. | lbs. | bush. lbs. |
| Albert | 1/27 | 62 | ..... | 17 | May 19 | Aug. 20 | 1,674 | 34 42 | ..... | ..... | 2,984 | 31 04 |
| White hulless | 1/27 | 98 | 0·3 | 27 | " 19 | " 25 | 2,646 | 55 06 | ..... | ..... | ..... | ..... |
| Guymalaye | 1/27 | 94 | 100 heads | 18 | " 19 | " 23 | 2,538 | 52 42 | ..... | ..... | 4,898 | 51 01 |
| Manchurian | 1/27 | 115 | 10-20 " | 19 | " 19 | " 23 | 3,105 | 64 33 | 8,387 | 34 45 | 5,275 | 54 45 |
| Early Chevalier | 1/27 | 98 | 10-20 " | 24 | " 19 | " 25 | 2,646 | 55 06 | 8,533 | 35 26 | 4,896 | 51 00 |
| O.A.C. No. 21 | 1/27 | 127·5 | 10-20 " | 23½ | " 19 | " 25 | 3,442 | 71 34 | 9,832 | 40 46 | 6,122 | 63 37 |
| Hannchen | 1/27 | 105 | 0·2 | 23 | " 19 | " 25 | 2,835 | 59 03 | ..... | ..... | ..... | ..... |

## TABLE 4.—FLAX AND PEAS

| Variety | Size of Plot | Yield of Plot | Yield per acre, 1920 | Yield per acre, 1920 | Date of Seeding | Date of Harvest | Aggregate yield, 1915-20 | Average yield, 1915-20 | Yield, 1918 | Aggregate yield, 1918 and 1920 | Average yield 2 years, omitting 1919 | Average yield 3 years 1918-1920 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | acres | lbs. | lbs. | bush. lbs. | | | lbs. | bush. lbs. | lbs. | lbs. | bush. lbs. | bush. lbs. |
| Flax, Premost | 1/27 | 53 | 1,431 | 25 31 | May 22 | Sept. 7 | ..... | ..... | 900 | 2,331 | 20 45 | 13 49 |
| Peas, Arthur | 1/27 | 69·53 | 1,877 | 31 17 | " 20 | " 16 | 5,585 | 15 30 | ..... | ..... | ..... | |

NOTE.—Flax not threshed in 1919. Earlier plots frozen out; moderate yield from final seeding only.

# HORTICULTURE

## SEC. 1. INTRODUCTORY

Following a long, hard winter, with over eleven feet of snowfall, the spring of 1920 opened late in the Upper Peace River country. Not until May 10 was the Station hotbed seeded, and the first outdoor sowings of vegetables were made ten or twelve days later. An extreme and quite unusual spring saturation of soil and subsoil was supplemented by an abnormal volume of precipitation throughout the growing season. Nearly all kinds of vegetables, fruits and flowers did well and the north country harvested an ample potato crop, albeit the table quality was distinctly substandard. A great profusion of wild fruits occurred in favoured districts, notably in the valley of the Wapiti river, where many a homesteader's family secured an abundant supply of large, luscious wild raspberries and other fruits. Wild strawberries, black and red currants, gooseberries, cranberries and various other native species contributed variety, while our old standby, the saskatoon, yielded thousands upon thousands of bushels of its excellent fruit to the denizens of the wild and the earth which bore it.

## SEC. II. POTATOES

Approximately one hundred and fifty hundredth-acre plots of potatoes were grown at Beaverlodge in 1920, not counting many rows to compare strains of selected seed. Attention was concentrated upon the matter of sprouts in potatoes—white sprouts versus green sprouts; either versus no sprouts, etc.

### (a) VARIETIES

The eight varieties grown in 1919 were carried through 1920 in triplicate test, save the Wee McGregor, of which seed supplies permitted only duplicate plots. In connection with this variety, it is to be observed that owing to our whole crop of the 1919 plot having been frozen, prior to storage, the seed for 1920 was obtained from a neighbour, who had secured his stock originally from the same source as we had ours, viz., Lacombe. Whilst Wee McGregor had been footing the list for two years at the Station, the neighbour claimed excellent satisfaction from his strain, and in the past season's comparison it showed up better than the other strain had done in the two previous years.

It had been hoped to extend considerably the list of varieties, but the only additional sort of which we succeeded in securing seed was the Early Ohio, and this arrived too late for a proper comparison. It seemed to acquit itself well in the quadruplicate range where conditions afforded a partial comparison, but it was planted later than the other kinds, hence its yield is not given.

As none of the potatoes fully matured, the season was such as to favour the earlier kinds.

A flood after planting slightly marred some of the rows, especially the Early Northern, which, while maintaining its lead in both the three-year and two-year averages, concedes position in the 1920 column to three other varieties, viz., Country Gentleman, Early Rose and Gold Coin. The Country Gentleman did particularly well, not only in the variety test but in other experiments where introduced. The old reliable Early Rose vindicates its claim to favourable attention as a main cropper in a region where the period of growth is never any too long, giving general satisfaction, not only at the Station but elsewhere.

The question is raised whether conditions of storage of the seed supplies and degree of forwardness at planting may not have a good deal to do with the standing of varieties in a given season.

TABLE 1

| Variety | Yield, 1920 | | 3-year average, 1918–20 | | 2-year average 1919–20 | |
|---|---|---|---|---|---|---|
| | Bush. | lbs. | Bush. | lbs. | Bush. | lbs. |
| Country Gentleman | 407 | 40 | 328 | 15 | 405 | 00 |
| Early Rose | 373 | 20 | 313 | 1 | 360 | 55 |
| Gold Coin | 362 | 30 | 315 | 30 | 385 | 15 |
| Early Northern | 360 | 50 | 355 | 58 | 418 | 25 |
| Wee MacGregor | 343 | 20 | 268 | 45 | 342 | 22 |
| Irish Cobbler | 340 | 30 | 278 | 35 | 354 | 10 |
| American Wonder | 335 | 30 | ..... | | 410 | 00 |
| Table Talk | 306 | 40 | 261 | 44 | 326 | 52 |

(b) DATE OF PLANTING

The date-of-planting experiment was carried through 1920, but with unsatisfactory results.

First, the season was so late that no planting could be made until May 20, which was about the time the third or fourth one would ordinarily occur. In the second place, the test was marred by extreme wet weather. Above and to the west of the potato patch was a piece of summer-fallow, soaked for weeks to the "loblolly" point and the edge of the potato patch suffered by seepage. The date-of-planting rows occurred in order from west to east, with an extra or flanking row on either side. The west flanking row yielded ten per cent less crop than the first row to be counted, whereas under ordinary conditions it should have yielded more, being an outside row. On a rise where the flood and seepage had least effect, the first planted rows excelled as usual, but in the "draw" where saturation and wash were most extreme, there were blanks in the rows next the fallow, the injury becoming progressively less toward the east. This will explain why the earliest planting appears this time to have fallen down. Extensive incidental comparisons in connection with other experiments warrant the conclusion that, other things being equal, the earlier dates were again best. As the experiment fell out, we find from rows of equal length the following figures of yield:—

TABLE 2

| Designation | Date of planting | Yield per acre | Yield per acre | |
|---|---|---|---|---|
| | | lbs. | Bush. | lbs. |
| Variety—E. Northern— | | | | |
| West flanking row | May 20.... | 22,448 | 374 | 08 |
| 1st date row | " 20.... | 24,598 | 409 | 58 |
| 2nd " | " 26.... | 30,186 | 503 | 06 |
| 3rd " | June 3.... | 24,120 | 402 | 00 |

(c) SIZE OF SET

Commenced in 1919, this experiment was conducted in duplicate in 1920. In fact, part of it was really in quadruplicate, for there was an experiment within an experiment. Two rows were planted with two-eye sets, having all eyes but one removed; and two rows of the same size set with all eyes left on. Ditto with the three-eye set. For the purpose of the experiment under present consideration, the four rows of the two-eye sets have been averaged together; likewise the four rows of three-eye sets. The variety employed was the Early Northern, sprouted in the light before planting.

This being one of the last potato experiments to be planted and being located where wet weather and fall frosts combined to curtail development, the yields are below the field average and the results less regular than in 1919, though pointing in the main toward the same general conclusions.

The very-small and medium-small potatoes planted whole averaged larger as to seed sample than in the case of the corresponding designations of a year ago and gave very good relative results, though tending, as before, to produce an undue percentage of small tubers in the crop. The effect of removing all but one eye from the larger of the cut sets is dealt with in another section.

TABLE 3.—Size of set test, 1920. Var. E. Northern, sprouted before planting

| Designation | Yield per acre 1920 | Yield per acre 1920 | Yield per acre 2-year agr. | Yield per acre 2-year av. |
|---|---|---|---|---|
| | lbs. | Bush. lbs. | lbs. | Bush. lbs. |
| Very small, planted whole | 16,500 | 275 00 | 37,166 | 309 43 |
| Medium small, planted whole | 17,400 | 290 00 | 39,588 | 329 54 |
| One-eye sets | 12,650 | 210 50 | 29,446 | 245 23 |
| Two-eye sets | 15,400 | 256 40 | 37,411 | 311 45 |
| Three-eye sets | 15,550 | 259 10 | ..... | ..... |

(d) REMOVING VERSUS LEAVING ALL EYES BUT ONE PER SET

In 1919 an interesting little test was conducted in duplicate but on a small scale to see what would be the effect upon earliness and yield of gouging out all the eyes but one from each set. Medium sized whole tubers which had formed tough green sprouts in a light place were chosen. The two rows planted with whole potatoes having all eyes but one gouged out came up earlier, were more forward throughout the season and yielded 30 per cent more crop than the rows where all eyes were left in.

During the past season this matter was followed up with a triplicate test, using three varieties, viz., Early Rose, Early Northern and Gold Coin, the plan being the same as described above. In addition, a modification was introduced incidentally in connection with sets cut to two eyes and three eyes respectively (see section II (c)), making virtually a quintuplicate test. The net result was a reversal of that obtained the previous year. No satisfactory explanation of this is apparent, but the data thus far obtained are presented as a report of progress.

TABLE 4.—WHOLE POTATOES

| Varie | All sprouts left. Yield per acre | All but one out. Yield per acre |
|---|---|---|
| | lbs. | lbs. |
| Gold Coin | 18,000 | 15,500 |
| Early Northern | 19,800 | 15,500 |
| Early Rose | 17,800 | 16,400 |
| | 55,600 | 47,400 |

Average loss in yield per acre from removing eyes—2,733 lbs. or 14·75 per cent.

CUT SETS—EARLY NORTHERN. See sec. II (c)

| | | |
|---|---|---|
| Two-eye sets | 14,100 | 16,700 |
| Three-Eye sets | 16,950 | 14,150 |
| | 31,050 | 30,850 |

Average loss in yield per acre from removing eyes—100 lbs. or 0·64 of 1 per cent. Average loss of quintuplicate test—9·69 per cent.

## (e) POTATO SPROUTS

A considerable amount of work has been done during the past season to determine the value of sprouts, both green and white, on potato sets. In addition to the plots reported upon, much corroborative evidence bearing upon the points indicated has been furnished by incidental tests partially duplicating, triplicating, quadruplicating or even quintuplicating the formal trials. Wherever a corner of space was left over from some experiment it was devoted to a repetition of some part of a regular test, but such partial repetitions, though useful in checking results, are never included in the tabular averages.

The plan of experiment has been particularly thorough. Each plot consisted of a piece of row calculated to make an area of exactly one-hundredth of an acre. Where duplicate or triplicate plots occurred the rows were alternated. Outside rows were never counted as part of an experiment.

### ADVANTAGE OF LEAVING WHITE SPROUTS ON SETS

A duplicate experiment in 1915 resulted in an advantage of 15 per cent in yield from leaving the cellar sprouts on potatoes at planting as compared with breaking them off.

A corresponding experiment in 1919 gave an 18·4 per cent advantage.

In a duplicate trial during the season just closed, the advantage of leaving the sprouts on worked out to 33·8 per cent. Striking as is this result, it has been confirmed in various ways. Wherever the white sprouts have been discarded at planting, the result has been evident in a tardy appearance of tops, a belated growth and a reduced yield. Not only so, but rows planted with white sprouts only (no flesh at all attached) have given a very fair account of themselves. The Station Superintendent in 1920 grew nearly a half-mile row of tolerably good potatoes from sprouts anywhere from four to ten inches long, broken off the tubers in his house cellar where being kept for summer use. The house cellar is rather warm. In the regular root cellar such long sprouts do not develop.

It is to be noted that the planting season of 1920 was exceptionally late, running into the end of May, and the cellar sprouts were longer and more vigorous than usual. Nevertheless, it is evident that he who destroys a white sprout sacrifices an embryo plant and in the Grande Prairie District at least, loses time and energy by so doing.

TABLE 5.—Leaving versus breaking off white cellar sprouts, 1920 results

| Variety | White cellar sprouts left on sets at planting | White cellar sprouts broken off sets at planting |
|---|---|---|
| | lbs. per acre | lbs. per acre |
| Early Rose, 1st range | 16,800 | 11,700 |
| " 2nd range | 20,100 | 12,700 |
| Totals | 36,900 | 24,400 |
| Averages | 18,450 | 12,200 |
| Loss from breaking off white sprouts at planting | | 6,250 |
| %loss, 1920 | | 33·8 |
| %loss, 1919 | | 18·4 |
| %loss, 1915 | | 15·0 |
| Average loss on three years results | | 22·4 |

GREEN SPROUTS VERSUS WHITE SPROUTS VERSUS NO SPROUTS

If the long white cellar sprouts are of so much advantage to the set as the experiment recorded in potato table 5 indicates, would it not be better still to keep the potatoes in cool dark storage till spring and then bring them up for a few weeks before planting and spread them out—a few inches deep, in a light place, where they might form tough green sprouts? Or might it be as well to conserve their vitality by keeping them in a storage where they would not sprout at all until planted? To investigate this point, a uniform lot of Early Northern which had been kept in a cool dark root cellar until April were treated as follows: Part were set aside and left there until needed for planting near the end of May. They developed practically no sprouts before planting and their yield is represented in the first column of the table below. Another portion of the tubers were placed in the house cellar, where they developed quite long white sprouts. A third lot was spread out in a tray in a light, fairly warm upstairs room where fairly long green sprouts developed. Of each lot two rows were planted in a way to afford a very fair test. The green and white sprouts were also compared in a partial triplicate trial which, if included, would have increased somewhat the spread as between these two methods of planting.

TABLE 6.—No sprouts versus white sprouts versus green sprouts

| Variety | No sprouts-tubers kept in cool dark storage till planting time | Sets with white sprouts formed in warm cellar storage | Sets with green sprouts formed in light upstairs room |
|---|---|---|---|
| | lbs. per acre | lbs. per acre | lbs. per acre |
| Early Northern | 15,500 | 18,400 | 21,500 |
| " | 17,900 | 19,200 | 19,500 |
| Totals | 33,400 | 37,600 | 41,000 |
| Averages | 16,700 | 18,800 | 20,500 |

| | | |
|---|---|---|
| Advantage of white sprouts over no sprouts | 2,100 lbs. | —12·5% |
| Advantage of green sprouts over no sprouts | 3,800 " | —22·7% |
| Advantage of green sprouts over white sprouts | 1,700 " | 9·0% |

It does not follow that a similar degree of advantage would be realized in a district where the season was longer, but it is evident that either a green or a white sprout is of advantage in forwarding development.

BREAKING OFF VERSUS LEAVING CELLAR SPROUTS WHEN PUTTING UPSTAIRS TO SPROUT

Supposing one's seed potatoes have developed white sprouts in cellar storage and it is desired to develop green ones by exposing to the light for a few weeks before planting, is it advisable to break off the white sprouts before spreading in the light. Eight parallel hundredth-acre plots were devoted to a quadruplicate test of this point, with results which favour leaving the white sprouts to green up in place of breaking them off, the average disadvantage of discarding the white sprouts being 7·2 per cent. The Early Rose tubers used for this experiment had quite long cellar sprouts when put upstairs in trays.

TABLE 7.—Breaking off versus leaving cellar sprouts when putting upstairs to sprout

| — | Cellar sprouts left on-yield per acre | Cellar sprouts broken off—yield per acre |
|---|---|---|
| | lbs. | lbs. |
| Comparison 1 | 18,000 | 19,600 |
| " 2 | 20,500 | 19,500 |
| " 3 | 23,500 | 19,700 |
| " 4 | 19,500 | 16,800 |
| Averages | 20,375 | 18,900 |

*Advantage of not breaking off cellar sprouts when putting upstairs to form green ones*.... 1,475 lbs.—7·2%

N.B.—The uniformity of the results is broken only by range 1, where running water washed out some of the sets.

TREATING WITH FORMALDEHYDE BEFORE VERSUS AFTER SPROUTING

Where potatoes require treatment with formaldehyde for scab or other diseases and it is desired to sprout them by exposure to the light, is it better to treat before or after sprouting? Eight hundredth-acre sections of parallel rows were devoted to a quadruplicate experiment on this point. It was noticed when cutting the seed at planting that a percentage of the tubers treated before sprouting seemed to have been injured by treatment, for they had exuded a brown gummy juice, were discolored of flesh and had made little or no progress in sprouting. These spoiled potatoes were rejected at planting, which fact may explain why the average results of the test favour treatment before sprouting. As the potatoes were clean, there was no opportunity to compare the two methods as regards efficacy in disease control.

TABLE 8.—TREATING WITH FORMALDEHYDE SOLUTION BEFORE VERSUS AFTER SPROUTING

| — | Treated before sprouting | Treated after sprouting |
|---|---|---|
| Range 1 | 22,800 | 22,500 |
| " 2 | 21,500 | 23,000 |
| " 3 | 24,300 | 19,300 |
| " 4 | 21,500 | 18,500 |
| Totals | 90,100 | 83,300 |
| Averages | 22,525 | 20,825 |

Net advantage of treating before sprouting—1,700 lbs. or 28 bush., 20 lbs. per acre or 8·1%.

(f)—COMPARING SEED FROM CROPS OF VARYING DEGREES OF MATURITY

An attempt to compare mature with immature potatoes as seed was made by planting seven rows with sets representing the product of the previous year's date-of-planting test. In the test referred to the successive dates of planting were a week apart, the last planting having been made seven weeks after the first and the crop being consequently less mature. In the test under present discussion each hundredth-acre row-plot represented a date of planting crop of 1919. Results were irregular and inconclusive. An average of the crop from the three rows representing the more mature seed gave a yield of 16,800 lbs. per acre, while the average of the three rows representing the least mature seed gave 16,660 lbs. per acre—the slight difference being easily attributable to accident.

(g)—FRESH CUT VERSUS SUN-DRIED SETS

Two varieties, viz., Early Northern and American Wonder, were employed for the duplicate test on this point.

TABLE 9

| — | Fresh | Sun-dried |
|---|---|---|
| Early Northern | 19,400 | 15,500 |
| American Wonder (sprouted before cutting) | 21,400 | 17,500 |
| Totals | 40,800 | 33,000 |
| Average | 20,400 | 16,500 |

Disadvantage of drying sets—3,900 pounds or 65 bushels per acre—19 per cent.

(h) DEEP VERSUS SHALLOW PLANTING

The average yield of two rows planted four inches deep was 9,550 pounds per acre and of seven rows planted about two and a half inches, 15,630 pounds—an increase of 63·6 per cent from shallow planting. This may have been partly accidental, for the test was located where washing water introduced an element of irregularity. A more reliable result was obtained from alternate deep and shallow hills planted in a deep furrow opened out for planting trees. The furrow was ploughed about a foot deep. The deep hills were planted near the bottom of this furrow and well covered with earth. The intervening hills were planted on top of a mould of soil drawn into the furrow and lightly covered with earth. In both cases growth was excellent and a large crop was harvested. From an equal number of hills representing each depth of planting the following data were obtained:—

Shallow planting .. 310 lb.
Deep planting .. 270 "
Advantages of shallow over deep, nearly 14·8 per cent.

However, yield is not the only desideratum. The table quality of the deep planted hills was distinctly superior, the percentage of sunburn was decidedly less, the danger of freezing was less and the discoloration of flesh of the red variety used (Early Northern) was rather less from the deep than from the shallow planting. It would seem that a medium course is best.

(i) FACTORS AFFECTING DISCOLORATION OF FLESH OF SOME RED VARIETIES

Considerable work has been under way for the past two seasons to study the question of discoloration of flesh of such red potatoes as Early Rose and Early Northern. It appears to be fairly clear that this tendency is inherent in varying degree and that careful work in hill selection will tend to reduce or control it. Unfortunately the table trials so far concluded have shown that many of the strains selected for freedom from discoloration have proven inferior in cooking quality. Search is proceeding in quest of a strain that will yield well, be free of discoloration, or nearly so, and at the same time be of high quality.

Meantime, the most we are in a position to report regarding cultural control methods is that moderately deep planting and deep early hilling seem to be of some slight advantage in reducing discoloration of flesh and improving cooking quality. The advantage in reducing sunburn is more decisive.

### (j) QUALITY IN POTATOES

The factors affecting cooking quality in potatoes are worthy of careful study. In general, the table quality of the 1920 crop in Grande Prairie was distinctly sub-standard. The season was a wet one throughout, particularly during September, when much growth occurred following and between successive light frosts which singed the tops to a varying degree. Some of the vines were still fairly green when the crop was dug early in October. Though by no means fully mature when taken up, the potatoes were more nearly so than in some other and drier seasons when their quality was much superior, giving rise to the question whether the character of the season in respect to such matters as precipitation and temperature may not have something to do with the question.

There is fairly clear evidence that the nature of the soil also enters in. From a sixteen-rod garden row representing varying soil types four samples were dug and cooked comparatively. Decidedly the best quality was from a black loam on a slight crown which was the driest part of the field. The worst was from a cold-clay type whence sods had once been removed for roofing. Nearly as inferior were the potatoes from a black loam soil occurring in a "draw" where saturation was excessive. Intermediate in quality was the sample from a portion representing a mean between this and the crown above referred to.

### (k) LARGE POTATOES

Some large potatoes occurred in the crop of 1920. An Early Rose weighed 2 pounds 9 1-2 ounces; a couple of Early Northerns, 2 pounds 5 1-2 ounces and 2 pounds 10 ounces respectively.

## FRUITS

### (a) CURRANTS

Fifty-three of the fifty-four currant bushes set out in the spring of 1916 are still living and some of the kinds are bearing abundantly of the very choicest of fruit. Three of the five reds are proving satisfactorily hardy and both of the blacks. The white currants and two of the reds kill back considerably and produce sparingly. A wild black currant under cultivation yielded fruit-like clusters of grapes, though acrid, of course.

From the fifty-three bushes 179½ pounds of currants were picked after a considerable amount was eaten out of hand. None were laid down in the winter of 1919-20.

TABLE 1

RED CURRANTS

| — | New Red Dutch | Cumberland Red 0.492 | Victoria Red | Fay's Prolific | Wilder |
|---|---|---|---|---|---|
| | lbs. | lbs. | lbs. | lbs. | lbs. |
| Aggregate yield— | | | | | |
| 1917–1919 | 30·5 | 39·0 | 27·5 | 0·2 | 0 |
| 1920 | 42·0 | 29·0 | 37·0 | 1·5 | 0 |
| Totals | 72·5 | 68·0 | 64·5 | 1·7 | 0 |

BLACK CURRANTS

| — | Topsy 0·568 | Collin's Prolific 0·565 |
|---|---|---|
| | lbs. | lbs. |
| Aggregate yield— | | |
| 1917–1919 | 18·4 | 14·3 |
| 1920 | 38·0 | 26·0 |
| Totals | 56·4 | 40·3 |

WHITE CURRANTS

| — | Large White 0·551 | White Cherry 0·550 |
|---|---|---|
| | lbs. | lbs. |
| Aggregate yield— | | |
| 1917–1919 | 7·75 | 4·4 |
| 1920 | 1·0 | 5·0 |
| Totals | 8·75 | 9·4 |

### (b) RASPBERRIES

Despite an exceptionally early and deep snow covering and a light penetration of frost, the raspberry canes killed back rather more than usual, due perhaps to a late, sappy growth, stimulated by the abnormally wet autumn of 1919. Nearly all the young bushes transplanted in August, 1919 winter-killed entirely, although previous years' plantings at a corresponding period proved quite successful.

While the 1920 fruit crop was delayed and curtailed by winter injury to the canes, there was quite a fair production in the end, although lingering as usual. The Herbert is the variety principally represented.

### (c) STRAWBERRIES

A variety locally obtained and believed to be the Early Dakota is proving hardy and bearing moderately well. The fruit is good.

Several strains of Everbearings are also being multiplied.

Owing to the sudden setting in of winter and pressure of other work the strawberries were not mulched in the autumn of 1919, and manure spread later on the deep snow missed the row intended for 1920 cropping. Nevertheless, this row came through with practically no evidence of winter injury.

An experiment is being run with the hill system versus the matted row.

### (d) GOOSEBERRIES

The third attempt to establish domesticated gooseberries ended in complete winter-killing of all the young plants in 1919-20.

### (e) APPLES

The apple trees show good root vitality, but nature dwarfs the top growth. Hopes are centred upon the shelter belt being established.

## SHELTER BELTS

With the clearing away of the scrub, winds are found to become more unpleasant and injurious. Though tending to ward off frost they bring a train of evils of their own. To protect homes and stables, shelter-belt planting will be of immense advantage and in these evergreens should have a place, as protection is needed even more in winter than in summer.

In addition to a row of Manitoba maples set out in 1916 and making annual though not unimpeded progress, a short row of native white spruce was established in June, 1919, and all but two of the least likely trees are doing well.

Along the west side of the grounds a hundred Scotch pine seedlings, obtained from the Dominion Nursery Station at Indian Head, were transplanted on June 21, 1920, after a two weeks' delay at the depot. Thanks to very careful attention in planting, some sixty of these survived.

Five hundred broad-leafed species received from the same source were also set out, including green ash, Russian poplar, laurel willow, Manitoba maple and caragana. These were received more promptly and ninety to ninety-five per cent started into growth.

## SEC. IV.—GARDEN VEGETABLES

*Artichokes.—Jerusalem*—From tubers left in ground from previous year, five pounds were dug from a few roots. Evidently they can be grown here. The original planting was made in 1918 and they have since volunteered for two years in succession from tubers left in the ground.

*Asparagus.—Palmetto*—The stand was not good, but there was some production. With more time to cultivate this vegetable, it is possible that good results could be obtained.

*Beans.*—Planted June 10, ground wet. Eight varieties in two rows of eight hills each:—

| Name. | Supplier. |
|---|---|
| Bountiful Green Bush | Gregory |
| Stringless Green Pod | Rennie |
| Wardwell's Kidney Wax | McDonald |
| Hodson's Long Pod | Rennie |
| Refugee | Carter |
| Early Red Valentine | Rennie |
| Fordhook Favourite | Burpee |
| Masterpiece | 0·8955 |

Two rows were planted to compare hills versus drills, using the Masterpiece variety. The wet weather proved unfavourable for a proper test of these. However, from the drills 12 pounds were gathered and 5½ pounds from the hills. The first picking was made on August 18.

Bountiful and Masterpiece gave the best account of themselves in the variety test.

Small pickings were secured before frost came from Bountiful, Early Red Valentine, Wardwell's Wax and Fordhook Favourite. None from Stringless Green Pod, Hodson's Long Pod or Refugee.

*Beets.*—Six varieties compared. Perfect stand in every variety. Yields:—

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Eclipse | 29,040 | lb. | or | 14 | tons | 1,040 | lb per acre |
| Early model | 29,040 | " | | 14 | " | 1,040 | " " |
| Early Wonder | 30,855 | " | | 15 | " | 855 | " " |
| Black Red Ball | 19,602 | " | | 9 | " | 1,602 | " " |
| Detroit Dark Red | 32,307 | " | | 16 | " | 307 | " " |
| Crosby Egyptian | 23,958 | " | | 11 | " | 1,958 | " " |

The Crosby Egyptian shows comparatively low yield.

The Black Red Ball is least in yield and not as fine a shape; also the earth adheres more than to others on account of the rootlets. This was a consideration this past year in the digging.

*Brussels Sprouts.*—Three varieties sown in hotbed May 11 and transplanted June 9: Dalkeith (McDonald), Amager Market (Ewing), Paris Market (Ewing). All three do well here, although the above date of planting was a little too late for best results.

*Cabbage.*—Eight varieties tested. Sown in hot-bed May 11 and transplanted to open June 8 and 9.

Insects did little damage on the leaves and root maggots were not in such evidence as in 1919 and yet ruined a good many plants in many instances in spite of the tar paper discs. It was an unusually good year for the cabbage family and especially for those sown out of doors. In 1919 the out-of-doors sowing was an utter failure; the past summer there was a perfect stand owing to abundance of moisture. From the later varieties much better results could have been obtained had the hotbed been ready earlier.

Extra Danish Ballhead, a winter variety, developed a great many excellent heads; 100 pounds taken October 26.

Delicatesse, red variety, developed a number of good firm heads yet not large; 51 pounds October 26.

Perfection Drumhead Savoy developed fine plants as far as leaves go, but did not head up properly. Only two small heads; 7 pounds in weight secured.

Marblehead Mammoth, only two heads taken; not one real solid head in the row, though some were a foot across.

Improved Brunswick was only a little better, 55 pounds being taken. Fine looking plants but, like the Marblehead Mammoth, failed to harden. About two weeks more would make fine showing. These two apparently not adapted to this climate.

Enkhuizen Glory proved a real success this year. Good size and firm heads; 137 pounds taken early; 91 pounds in test row taken at final gathering. Total crop, 228 pounds.

Copenhagen Market still takes the lead at this Station for size, firmness and earliness; 204½ pounds being taken from the test row.

Early Jersey Wakefield gave 52 pounds from a half row. A fairly good variety but more subject to root maggot, less productive than Copenhagen Market and scarcely so early.

*Cauliflower.*—Sown in hot-bed May 11. Two varieties tested, each produced excellent plants. Test not sufficient to show superiority of one over the other. Varieties: Early Dwarf Erfurt, Early Snowball.

Root maggots made havoc of many plants, in spite of tight fitting tar-paper discs, which, however, appeared to be of advantage. First cauliflower on August 8.

*Carrots.*—Five varieties sown May 22:—

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. Improved Danvers (D. & F.) | 20,328 | lb. or | 10 | tons | 328 | lb. per | acre. |
| 2. Danvers, Kentville | 18,876 | " | 9 | " | 876 | " | " |
| 3. Early Scarlet Horn (D. & F.) | 18,150 | " | 9 | " | 150 | " | " |
| 4. Chantenay (McDonald) | 22,264 | " | 11 | " | 264 | " | " |
| 5. Nantes Early (D. & F.) | 16,456 | " | 8 | " | 456 | " | " |

*Celery.*—Four varieties sown in hotbed May 10, transplanted July 14. This year a far better one for celery than usual in this country, yet, owing to late sowing, we were not able to get the plants blanched before severe frost. Blanching was completed in cellar storage and some very crisp, tender, fine-flavoured stalks resulted. A stream of water flowed among the rows through most of the summer.

Evans' Triumph developed the best plants, though the Winter Queen and Giant Pascal were a good second.

White Plume was handicapped by too much water.

*Citron.*—0·9799, sown in open June 10, 3 hills. 0·9799, sown in shelter June 21, 2 hills. Both failures. No bloom.

*Corn.*—Sixteen varieties sown June 19, eight hills each, ground wet. On September 30 a boiling of immature ears was plucked, chiefly from the following varieties. Howes' Bantam, Pickaninny C.E.F., and Sweet Kloochman. There were some signs of ears on Early Sweet Malcolm and Early Sweet Squaw, but little or none on Extra Early Cory, Wills' Jehu, Country Gentleman, Howling Mob, Golden Tom Thumb, Early Mayflower or Golden Bantam. With earlier seeding, results might have been better.

*Cucumber.*—Complete failure.

*Horse Radish.*—Continued success.

*Kohl Rabi.*—Only one variety sown—Giant Green—and as usual it proved itself well adapted to the locality.

*Peas.*—Twelve varieties were sown May 21, on a good piece of summer-followed land, but from several causes the results recorded were irregular and inconclusive, though good yields were obtained. The earliest pickings of green peas were from Gregory's Surprise and Early Morn, on July 30, seven and six pounds respectively.

Some of the larger yields recorded were from American Wonder, 40½ pounds; Laxtonian (Graham), 31 pounds; Pioneer, 20 pounds; and Little Marvel, 31 pounds. In each case 60 feet of row was cropped for the test, so that the heaviest yield was equivalent to 9,680 pounds, or 4 tons, 1,680 pounds of pods per acre. Picking continued more or less throughout September. Stratagem proved too late to be a dependable cropper.

*Musk Melon and Water Melon.*—Complete failure to bloom.

*Onions.*—One plot was left in ground from previous year. Owing to winter killing the stand was poor, but the specimens harvested were fine, particularly of the Yellow Globe Danvers and Large Red Wethersfield. This seems the only way to secure well-developed and mature onions here.

One row of Multipliers proved a success.

Nine varieties were sown June 10; soil wet. None came to maturity and the results were complicated by wet weather possibly handicapping them, especially Yellow Globe Danvers and White Barletta. Following are weights of rows as taken up, October 20:—

| | | |
|---|---|---|
| Giant Prize | 3½ | lb. ½ row |
| Australian Brown | 2½ | " ½ " |
| Southport White | 7½ | " full row. |
| Ailsa Craig | 10 | " " |
| Yellow Globe Danvers | 7½ | " " |
| Southport Red | 4½ | " " |
| Southport Yellow Globe | 17 | " " |
| White Barletta | 1 | " " |
| Large Red Wethersfield | 17 | " " |

On July 20 eight varieties were sown for 1921. These made good progress before winter set in. Manure for protection was spread on the snow.

*Parsley.*—Two varieties sown June 1: Double Curled, 0·9273; Champion Moss Curled, Ewing & Co. Both excellent. No trouble to raise parsley.

*Parsnips.*—Two varieties sown June 10: Hollow Crown, 0·9335; Intermediate, Vaughan. Seriously handicapped by wet weather, so that results were decidedly poor. A row sown earlier and in a more favourable location gave good results.

*Peppers.*—Two varieties sown in hotbed May 11: Neapolitan, Summerland 944; Harris Early, Summerland 945. Transplanted to shelter June 24; also some in open garden, but plants, while looking healthy, made little growth and no bloom.

*Radish.*—Sown May 24. Five varieties sown, all good. Usually little trouble in raising radish, except that maggots often make trouble.

*Salsify.*—Two varieties sown June 1. Very much better crop than in previous year.

*Spinach.*—Sown May 24. Victoria 8,910. Only one row but the finest yet grown at the Station. An easy vegetable to raise.

*Squash.*—Five varieties sown June 4: Delicious, Golden Hubbard, Hubbard, English Vegetable Marrow, Long White Bush Marrow. The first three were failures. The production from English Vegetable Marrow was not great, but the long White Bush Marrow remains the favourite, yielding some good fruit.

*Swiss Chard.*—One row of the finest yet grown. Beautiful, broad, white stalks.

*Tomatoes.*—Sown in hotbed May 10, transplanted to open July 13. Seven varieties. Yields picked September 10. Five varieties almost nil. Best in field was Red Head (Langdon). Bonny Best (C.E.F.) stood next. So far, the work with the tomato shows comparative failure.

DATE OF PLANTING TEST WITH VEGETABLES

This followed up the experiment of the two previous years to learn the best average date for planting each of the common vegetables. The land chosen had been well summer-fallowed. Some parts suffered a handicap on account of the wet season and soil becoming water soaked, but on the whole it was a favourable year for growth. On account of the late spring there were only three dates of planting instead of seven of previous years. These dates were May 20, May 26 and June 3.

TABLE of Percentage Results, 1920 Crop

| Crop | Date of Planting | | | Remarks |
|---|---|---|---|---|
| | 1st | 2nd | 3rd | |
| | % | % | % | |
| Beans | | | | Poor soil and water soaked. |
| Beets | 100 | 94 | 87 | |
| Cabbage | 96 | 64 | 100 | |
| Cauliflower | 83 | 100 | 36 | |
| Carrots | 99 | 100 | 77 | |
| Corn | | | | Frozen before maturity. |
| Lettuce | | | | 1st picking from 1st date. All good. |
| Mangel | 86 | 83 | 100 | |
| Onion | 100 | 60 | 60 | |
| Parsnip | 98 | 100 | 88 | |
| Parsley | 100 | 50 | 10 | Marred by standing water. |
| Peas | 100 | 100 | 100 | |
| Pumpkin | | | | Failure. |
| Radish | 100 | 100 | 100 | |
| Salsify | 94 | 100 | 19 | |
| Squash | | | | Failure—vines grew well—no yield. |
| Turnip | 84 | 100 | 92 | |

## FLOWERS

As yet time has been so occupied with experiments in the useful that those in the ornamental have received somewhat scant attention. However, for what little attention has been bestowed, results amply repay. It is evident there are great possibilities for the cultivation of flowers in this country. Although the late spring and wet weather seriously interfered with the best results, still, the flowers made a fair showing. Weather conditions made little difference to the perennials such as pansies, California poppies, larkspur and white rocket. These all bloomed gorgeously as ever.

Sweet peas maintained their place as one of the easiest and choicest flowers to grow.

Nasturtiums were a failure on account of wet ground.

Asters, for some reason, did not bloom in their usual excellence.

The beds of calendula, marigolds, jacobea, phlox, godetia, antirrhinum, were attractive.

A bed of petunias revealed the ease and satisfaction with which they can be grown.

# EXPERIMENTAL SUB-STATION, FORT VERMILION, ALBERTA

## REPORT OF THE SUPERINTENDENT, ROBERT JONES

### THE SEASON

April was a cold month, the temperature being well below zero during the first ten days and well below the freezing point on each day during the rest of the month. Snow did not entirely disappear until the 23rd. The first plot of wheat was sown on the 30th, the weather being still quite cold. Young stock could not be turned out to browse until the end of the month, and the feeding period for milch cows extended well into May. The ground did not thaw out sufficiently to do any ploughing during the month. This cold weather extended till May, and on many mornings the ground was frozen so hard that no work could be done on the land until well towards midday. A severe frost occurred on the 21st of May which nipped all grains above ground.

Corn and beans planted on May 11 and 13 were cut down by frost a number of times during the latter part of the month. The first transplanting from the hot-beds was done on May 24.

June also was rather cool and backward, and frost occurred on fifteen nights during the first part of the month. At the close of June the corn and beans which were left after the severe frost referred to above had made fair growth. The grain crops were looking fairly well, and root drops were getting nicely started. It was noted by the end of June that the crop of alfalfa had been badly spring and winter-killed, as were also some of the grass plots. July was warm and fine and growth was rapid. Grain that was just a few inches high at the beginning of the month had by its close reached the height of fully four feet. By the middle of the month many of the annual flowers were in bloom, and garden vegetables had been ready for use most of the month. The potato crop promised well, and roots were coming along nicely. Cabbage were in use by the latter part of the month and weighed some six or seven pounds. Cauliflowers weighed about the same.

Haying commenced on the 2nd of August, the crop in the district being very heavy and of excellent quality. The first plot of wheat of the Prelude variety was cut about the 4th. Harvest was general throughout the district on the 20th, all grain crops being very good, but badly lodged on summerfallow in some places, due to rank growth and high winds.

September, usually the most pleasant month of the year, was the opposite this season, it raining or snowing on twelve different occasions. This delayed the finishing of harvesting operations and threshing as well. No heavy frost occurred until the 17th. It was not until the fine weather of the latter part of October that harvesting and haying operations were completed. The late fall enabled autumn work to be finished in good shape.

During the season two yearling heifers and one bull calf were received from the Indian Head Experimental Farm. It is hoped to make these the foundation of a Dual Purpose Shorthorn herd. Two spring gilts and a spring boar of the Berkshire breed were received from the Experimental Station, Lacombe.

The experimental area was enlarged to twenty-five acres. This has been surrounded with a good fence and adds very much needed space for the quite wide experimental work being carried on.

TABLE of Meteorological Observations taken at Fort Vermilion, Peace River District, Alberta, from April 1, 1920, to March 31, 1921, showing maximum, minimum, and mean temperature, the highest and lowest for each month with date of occurrence, also rainfall, snowfall, and total precipitation.

| Months | Max. | Min. | Range | Mean | Highest | Date | Lowest | Date | Rain-fall | Snow-fall | Total precipita-tion | No. of days preci-pitation | Heaviest in 24 hours | Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | ° | ° | ° | ° | | ° | | | | | | | |
| April | 36·85 | 5·07 | 31·77 | 20·95 | 54·9 | 18 | −38·0 | 2 and 4 | ..... | 1·00 | 0·10 | 1 | 0·10 | 20 |
| May | 55·85 | 27·35 | 28·49 | 41·59 | 79·0 | 8 | 5·0 | 1 | 1·17 | ..... | 1·17 | 6 | 0·66 | 18 |
| June | 65·19 | 33·60 | 31·58 | 49·39 | 78·0 | 30 | 17·0 | 7 | 2·50 | ..... | 2·50 | 9 | 0·72 | 25 |
| July | 78·50 | 43·06 | 35·44 | 60·78 | 91·0 | 9 | 30·0 | 11 | 1·15 | ..... | 1·15 | 6 | 0·41 | 18 |
| August | 71·12 | 38·76 | 32·36 | 54·94 | 88·5 | 7 | 27·5 | 18 | 2·28 | ..... | 2·28 | 4 | 1·09 | 25 |
| September | 57·06 | 28·90 | 28·15 | 42·97 | 77·0 | 2 | 15·0 | 28 | 2·29 | 2·50 | 2·54 | 12 | 1·02 | 25 |
| October | 42·72 | 15·61 | 27·15 | 29·18 | 68·9 | 1 | 3·0 | 20 | 0·51 | 6·25 | 1·13 | 6 | 0·35 | 7 |
| November | 24·82 | − 0·51 | 24·94 | 12·98 | 48·0 | 4 | 29·5 | 25 | ..... | 1·25 | 0·12 | 3 | 0·05 | 22 |
| December | 3·04 | −20·85 | 24·54 | − 8·58 | 24·5 | 4 | 48·9 | 26 | ..... | 5·00 | 0·49 | 6 | 0·30 | 27 |
| January | − 0·30 | −30·22 | 29·92 | −15·26 | 24·0 | 22 | −54·5 | 17 | ..... | 8·00 | 0·80 | 6 | 0·22 | 2 |
| February | 11·98 | −21·25 | 33·23 | − 4·64 | 48·9 | 27 | −53·5 | 19 | ..... | 7·75 | 0·77 | 6 | 0·20 | 2 |
| March | 17·96 | −19·35 | 37·25 | − 0·73 | 47·9 | 31 | −45·0 | 13 | ..... | 0·50 | 0·05 | 1 | 0·05 | 1 |
| | | | | | | | | | 9·90 | 32·25 | 13·10 | 66 | | |

RECORD of Sunshine at Fort Vermilion, Peace River District, Alberta, from April 1, 1920, to March 31, 1921

| Month | No. of days with sunshine | No. of days without sunshine | Total hours sunshine | Average sunshine per day |
|---|---|---|---|---|
| April | 24 | 6 | 193·5 | 6·45 |
| May | 24 | 7 | 193·1 | 6·22 |
| June | 26 | 4 | 229·1 | 7·63 |
| July | 31 | 0 | 325·8 | 10·50 |
| August | 28 | 3 | 286·1 | 9·22 |
| September | 20 | 10 | 143·5 | 4·78 |
| October | ..... | ..... | 113·8 | 3·67 |
| November | 20 | 10 | 74·1 | 2·47 |
| December | 9 | 22 | 32·9 | 1·06 |
| January | 20 | 11 | 79·1 | 2·55 |
| February | 19 | 9 | 98·5 | 3·51 |
| March | 26 | 5 | 169·9 | 5·48 |

SOME Weather Observations taken at Central Experimental Farm, Ottawa, as compared with those taken at Fort Vermilion, Peace River District, Alberta

| — | Mean temperature | Highest temperature | Lowest temperature | Total precipitation | Heaviest in 24 hours | Total hours sunshine | Average sunshine per day |
|---|---|---|---|---|---|---|---|
| | ° | ° | ° | in. | | | |
| April— | | | | | | | |
| Ottawa | 40·20 | 68·0 | 17·9 | 4·22 | 0·85 | 180·2 | 6·00 |
| Fort Vermilion | 20·95 | 54·9 | −38·0 | 0·10 | 0·10 | 193·5 | 6·45 |
| May— | | | | | | | |
| Ottawa | 56·43 | 86·0 | 33·6 | 0·33 | 0·22 | 287·4 | 9·27 |
| Fort Vermilion | 41·59 | 79·0 | 5·9 | 1·17 | 0·66 | 193·1 | 6·22 |
| June— | | | | | | | |
| Ottawa | 66·14 | 91·8 | 43·0 | 3·25 | 0·84 | 251·4 | 8·38 |
| Fort Vermilion | 49·39 | 78·0 | 17·0 | 2·50 | 0·72 | 229·1 | 7·63 |
| July— | | | | | | | |
| Ottawa | 65·69 | 88·7 | 45·0 | 3·53 | 1·05 | 228·6 | 7·37 |
| Fort Vermilion | 60·78 | 91·0 | 30·0 | 1·15 | 0·41 | 325·8 | 10·50 |
| August— | | | | | | | |
| Ottawa | 69·26 | 93·5 | 47·6 | 2·81 | 1·06 | 254·1 | 8·19 |
| Fort Vermilion | 54·94 | 88·5 | 27·5 | 2·28 | 1·09 | 286·1 | 9·22 |
| September— | | | | | | | |
| Ottawa | 61·10 | 86·2 | 31·4 | 4·10 | 0·74 | 225·7 | 7·52 |
| Fort Vermilion | 42·97 | 77·0 | 15·0 | 2·54 | 1·02 | 143·5 | 4·78 |
| October— | | | | | | | |
| Ottawa | 51·34 | 73·0 | 29·0 | 2·82 | 0·94 | 171·9 | 5·54 |
| Fort Vermilion | 29·18 | 68·9 | 3·0 | 1·13 | 0·35 | 113·8 | 3·67 |
| November— | | | | | | | |
| Ottawa | 30·80 | 51·0 | 11·7 | 2·37 | 0·60 | 51·1 | 1·70 |
| Fort Vermilion | 12·98 | 48·0 | −29·5 | 0·12 | 0·05 | 74·1 | 2·47 |
| December— | | | | | | | |
| Ottawa | 21·07 | 40·0 | − 9·0 | 3·75 | 0·82 | 60·0 | 1·93 |
| Fort Vermilion | − 8·58 | 24·5 | −48·9 | 0·49 | 0·30 | 32·9 | 1·06 |
| January— | | | | | | | |
| Ottawa | 16·37 | 42·0 | 22·0 | 1·82 | 0·40 | 125·5 | 4·04 |
| Fort Vermilion | −15·26 | 24·0 | −54·5 | 0·80 | 0·22 | 79·1 | 2·55 |
| February— | | | | | | | |
| Ottawa | 17·87 | 41·0 | − 9·0 | 1·58 | 0·55 | 113·2 | 4·04 |
| Fort Vermilion | − 4·64 | 48·9 | −53·5 | 0·77 | 0·20 | 98·5 | 3·51 |
| March— | | | | | | | |
| Ottawa | 32·08 | 71·0 | − 1·4 | 4·68 | 0·94 | 144·4 | 4·65 |
| Fort Vermilion | − 0·73 | 47·9 | 45·0 | 0·05 | 0·05 | 169·9 | 5·48 |

## EXPERIMENTS WITH CEREALS

Except the oats, these were all sown on plots of one-sixtieth acre each

SPRING WHEAT—TEST OF VARIETIES

| No. | Name | Date of sowing | Date of ripening | No. of days maturing | Weight of straw | Yield of grain per acre | Weight per bush. |
|---|---|---|---|---|---|---|---|
| | | | | | lbs. | bush. lbs. | Lbs. |
| 1 | Red Fife | April 30 | Aug. 21 | 114 | 5,400 | 39 .. | 61·8 |
| 2 | Bishop | May 1 | " 14 | 106 | 4,300 | 38 .. | 63·0 |
| 3 | Huron | " 1 | " 13 | 105 | 4,680 | 32 .. | 62·3 |
| 4 | Marquis | " 1 | " 16 | 108 | 4,740 | 35 .. | 63·3 |
| 5 | Prelude | " 3 | " 4 | 93 | 3,540 | 24 .. | 62·6 |
| 6 | Ruby | " 3 | " 6 | 95 | 3,840 | 28 .. | 63·1 |

OATS—TEST OF VARIETIES

| No. | Name | Date of sowing | Date of ripening | No. of days maturing | Weight of straw | Yield of grain per acre | Weight per bush. |
|---|---|---|---|---|---|---|---|
| | | | | | lbs. | bush. lbs. | lbs. |
| 1 | Liberty | May 6 | Aug. 12 | 98 | 3,600 | 35 10 | 49·5 |
| 2 | Improved Ligowo | " 4 | " 12 | 100 | 5,940 | 66 6 | 36·0 |
| 3 | Banner | " 3 | " 9 | 98 | 4,800 | 63 18 | 37·0 |
| 4 | Daubeney | " 4 | July 30 | 87 | 2,160 | 37 2 | 35·0 |
| 5 | Eighty-Day | " 5 | " 28 | 84 | 2,520 | 38 28 | 33·0 |

Size of plots one-thirtieth acre. The Liberty is a hulless oat and the yield is, therefore, not comparable with those of the hulled varieties.

BARLEY—TEST OF VARIETIES

| No. | Name | Date of sowing | Date of ripening | No. of days maturing | Weight of straw | Yield of grain per acre | Weight per bush. |
|---|---|---|---|---|---|---|---|
| | | | | | lbs. | bush. lbs. | lbs. |
| 1 | Albert | May 8 | July 28 | 81 | 3,420 | 29 18 | 45·7 |
| 2 | Champion | " 7 | Aug. 6 | 91 | 3,900 | 43 46 | 46·1 |
| 3 | Hulless White | " 4 | " 5 | 93 | 3,600 | 30 .. | 60·5 |
| 4 | Manchurian | " 5 | " 3 | 90 | 3,660 | 32 24 | 49·0 |
| 5 | Success | " 6 | " 6 | 92 | 3,960 | 42 24 | 46·5 |
| 6 | Duckbill | " 21 | " 18 | 89 | 4,140 | 46 12 | 53·7 |
| 7 | O.A.C. 21 | " 21 | " 9 | 80 | 4,020 | 40 .. | 46·0 |
| 8 | Black Hulless | " 5 | " 3 | 90 | 3,420 | 31 32 | 60·2 |

NOTE.—Maturing of all varieties was hastened by hot, dry weather in July and August.

## FIELD PEAS

The following varieties were sown on land which was in roots the previous season, and was in a high state of fertility and cultivation. The Alberly Blue and Empire Blue were from seed supplied by Professor G. H. Cutler, of the University of Alberta.

| No. | Name | Date of sowing | Date of ripening | No. of days maturing | Weight of straw | Yield per acre | Weight per bush. |
|---|---|---|---|---|---|---|---|
| | | | | | lbs. | bush. | bs. |
| 1 | Arthur | May 3 | Aug. 7 | 96 | 2,280 | 21 | 65·4 |
| 2 | Prussian Blue | " 4 | " 10 | 98 | 2,100 | 19 | 63·2 |
| 3 | Empire Blue | " 18 | " 12 | 86 | 3,540 | 34 | 65·1 |
| 4 | Alberly Blue | " 18 | " 20 | 94 | 3,600 | 31 | 65·6 |

*Fall Rye.*—A three-acre plot of fall rye was sown on August 20, 1919. The land had been summer-fallowed and kept thoroughly cultivated until time of seeding. No manure had been applied for this crop. The plot was lightly pastured during the autumn of 1919. About five per cent of winter-killing was noted. The crop was rather slow in starting in the spring of 1920 until the latter part of May, after which it made rapid growth. The crop was cut on August 14 and gave a yield of 36 bushels per acre.

*Spring Rye.*—A crop of spring rye was sown on May 4 and was ripe and cut on August 18, the period of growth being 106 days. The yield of straw per acre was 4,140 pounds and of grain 39 bushels and 36 pounds. A lot of four acres of spring rye was sown on rather poor soil on May 20 and was cut on August 28, giving a yield of 30 bushels of fine, plump grain per acre. This goes to prove that rye can be successfully grown in these northern districts where other grains might be a failure, as it seems to be able to withstand the drought and frost better than any of the other cereals.

*Buckwheat.*—The Siberian and Japanese varieties of buckwheat were sown in uniform test plots. These plots were just getting nicely started when they were completely killed by the severe frosts of the early part of June.

### FORAGE CROPS

Although the spring was cool and backward, remaining so until about June 20, favourable weather afterwards, with ample moisture when required, resulted in heavy hay crops and a yield of roots quite up to the average. The hay crop at the Station was cut from July 28 to August 2, giving the following yields:—

Timothy, 2 tons and 900 pounds per acre.

Meadow fescue, 2 tons and 700 pounds per acre.

Western rye, 3 tons and 150 pounds per acre.

Red Top, 2 tons and 400 pounds per acre.

Awnless brome, 3 tons and 300 pounds per acre.

The very light snowfall of the winter of 1920 caused a considerable amount of winter-killing to the crops of alfalfa and clover. These crops were ploughed up and the land was kept in a thorough state of cultivation for re-seeding in the spring of 1921.

### HORTICULTURE

On the whole, the season was quite favourable for the growing of the more hardy varieties of vegetables. Cabbage, cauliflower and celery were sown under glass during the latter part of April, and transplanted to the open ground in the latter part of May. On account of the severe frost which occurred in the beginning of June, the tomato crop was practically a failure. Cabbage and cauliflower suffered to some extent by this frost, but recovered later and made fine, large heads.

Growth was rather slow until June 15, but with ample moisture in the soil and the very warm weather of July and August, the different vegetables made rapid growth and gave fair yields.

*Radish.*—The following were tested with the results noted:—Icicle, sown May 4, in use June 12, quality very fine; French Breakfast, sown May 4, in use June 10, quality good; Scarlet White Tipped, sown May 7, in use June 14, quality very good; Scarlet White Tipped 0-7754 and 57863 C.E.F. seed, in use June 9, quality fine; Scarlet White Tipped 0-8903 and French Breakfast were sown on May 22 and June 24 for summer use. These gave very good results. Iceberg, sown May 3, in use June 15, quality very crisp; Grand Rapids Forcing 0-775, sown May 3, in use June 12, very good; became fine and large by mid-summer; Nonpareil, sown May 3, in use June 17, quality fair; the two following varieties, Salamander and Dreer's All Heart,

were sown on June 24 and were fit for use on July 17 and 28, Dreer's All Heart being in use until the late autumn.

*Turnips.*—Four drills, each 33 feet long, drills 20 inches apart, of the following varieties of table or summer turnips were sown on May 7: Extra Early Purple Top Milan, sown May 7, fit for use July 20, medium in size on that date, harvested on September 23, yield per acre 11 tons and 1,160 pounds; Snowball, sown May 7, fit for use on July 15, quite large on that date, harvested on September 23, yield per acre 13 tons and 700 pounds; Robertson's Golden Ball, sown May 7, fit for use on July 17, of medium size on that date, harvested on September 23, yield per acre 10 tons and 1,360 pounds. These were used for stock feed.

*Table Carrots.*—Plots one-sixtieth of an acre each, drills twenty inches apart, thinned out June 18. In all cases the roots were very large, and yields high; Earliest Short Horn, sown May 6, fit for use July 15, roots of medium size on that date, harvested September 27, yield per acre 19 tons and 1,160 pounds, roots large and smooth, a fair table variety; Chatenay 0-8887, sown May 4, fit for use July 12, roots quite large on that date, harvested September 27, yield per acre 22 tons and 1,400 pounds, roots very large and smooth, a very fine table variety; Danvers Half Long, sown May 7, fit for use July 20, roots of a fair size on that date, harvested September 27, yield per acre 14 tons and 1,500 pounds, roots fairly large and clean, a good table variety; Chantenay, McDonald seed, sown May 3, fit for use July 13, roots of a good size on that date, harvested September 27, yield per acre 16 tons and 1,940 pounds, roots large, a fine table variety.

*Table Beets.*—Test of varieties: Detroit Dark Red 0-8886, sown May 4, fit for use July 17, harvested September 27, yield per acre 14 tons and 200 pounds, roots fairly large and very smooth. Crosby Egyptian, sown May 5, fit for use July 22, of a fair table variety; Chantenay 0-8887, sown May 4, fit for use July 12, roots quite medium size, somewhat rooty; Detroit Dark Centre, sown May 7, fit for use July 20, large, harvested September 27, yield per acre 16 tons and 1,420 pounds, roots very large, fine and smooth.

*Onions.*—The following varieties of onions were sown in uniform test plots of one-sixtieth of an acre, the germination of the seeds being quite timely. The thinning out of plots was done as the onions became fit for use.

Extra Select Large Red Wethersfield, sown May 4, fit for use June 30, harvested September 17, yield per acre, 221 bushels, quite large, of fine quality, fully matured; Giant Prizetaker, sown May 3, fit for use July 12, harvested September 14, yield per acre, 190 bushels, of a fair size, a small percentage of thicknecks; Yellow Globe Danvers, sown May 5, fit for use July 14, harvested September 14, yield per acre 200 bushels, fairly large, a larger percentage of thicknecks than usual; Extra Early Red, sown May 5, fit for use July 15, harvested September 16, yield per acre 145 bushels, medium size, good keepers, fully matured; Early White Barletta, sown May 5, fit for use July 20, harvested September 20, yield per acre 135 bushels, of a medium size, very smooth, fully matured; Red Wethersfield, sown May 8, fit for use July 17, harvested September 17, yield per acre 165 bushels, fair size, fully matured; Globe Danvers, sown May 7, fit for use July 17, harvested September 20, yield per acre, 184 bushels, of a medium size, fair quality; Dutch onion sets, yellow, set out on May 20, in drills 20 inches apart, onions four inches apart in the drills, some were in use on July 16, taken up on September 7, yield per acre 165 bushels, fairly large; Large Red Wethersfield 0-9518 C.E.F. seed, sown May 18, fit for use July 16, harvested September 13, yield per acre 184 bushels, quite large; Extra Early Flat Red, sown May 18, fit for use July 18, harvested September 29, yield per acre 179 bushels, medium size, fully matured; Mammoth Silver King, sown May 18th, fit for use July 24, harvested September 29, yield per acre 168 bushels, of a fair size; Southport Yellow Globe, sown May 18, fit for use July 29, harvested September 29, yield per acre 186 bushels, large

fine quality. A plot of mixed varieties was sown on May 1, for early use. These gave a yield of 216 bushels per acre, when taken up on September 30, and were very large.

*Parsnips.*—Hollow Crown 0-7748-5 C.E.F. seed, germination of seed poor, sown May 4, fit for use August 4, harvested September 23, yield per acre 120 bushels, roots quite small; Hollow Crown, Harris seed, germination of seed fair, sown May 4, fit for use August 2, of a fair size, harvested September 23, yield per acre 135 bushels, roots of a fair size, very smooth; Hollow Crown, Fort Vermillion grown seed from 1919, germination of the seed good, sown May 7, fit for use August 6, harvested September 23, yield per acre 138 bushels, roots of medium size; Hollow Crown 0-9335 seed, germination of seed good, sown May 18, fit for use August 15, harvested September 25, yield per acre 144 bushels, roots fairly large, fine and smooth.

*Spinach, Victoria* 0-8910.—Two drills sown on May 4. Germination of the seed good, fit for use June 7, and remained in use for some considerable time.

*Parsley, Fine Double Curled* 0-8890.—Sown May 4. Seed failed to germinate.

*Salsify, Mammoth Sandwich Island.*—Two drills sown on May 5. Germination of seed very good, fit for use June 28, quite large then, dug on September 23, 28 lbs. taken up from the two drills, fine and large, free from roots.

*Kohl Rabi.*—Two drills each of the following varieties of kohl rabi were sown on May 5, in drills 28 inches apart, germination of the seed being timely. The plants were thinned out to about ten inches apart in the drills on June 26. They were fit for use July 20, and were taken up on September 25. The following was the yield obtained from each variety: White Imperial, 165 pounds, large, a fair yield; Purple Giant, 110 pounds, small, yield medium.

*Peppers.*—Harris' Early No. 941 Summerland seed, sown in the open ground on May 18, germination of seed timely, growth rapid, pods quite large, but green when caught by the severe frost in the latter part of September. These should be sown under glass in early spring and transplanted to the open ground after all danger of frost is past.

*Beans.*—These are usually a rather uncertain crop in this North Land with its usual spring frosts. The severe frost of the latter part of May and the beginning of June thinned out the plants considerably, but not sufficiently to render replanting necessary. The growth of these crops was greatly retarded, however.

Broad Windsor was the only variety that matured sufficiently to be used as seed. The others made good growth during the latter part of the summer, and were fit for table use as green beans on the following dates: Broad Windsor, fit for use August 2; pods very long, fully matured September 20, yield from two drills, 8 pounds; Improved Golden Wax, fit for use August 4, pods of a medium length, a very fine table variety; Davis White Wax, fit for use August 5, pods quite long, a fair table variety; Stringless Green Pod, fit for use August 4, pods very long, an excellent table variety; Refugee, fit for use August 23, a very rank growth, vines heavily laden with pods, pods very long, crisp and tender, fine for table use.

*Wardwell Kidney Wax,* fit for use July 23, an early variety, pods of medium length, partly ripe when cut down by frost in the latter part of September; Masterpiece 0-8955 C.E.F. seed, fit for use August 16, very good growth, pods extra long; Extra Early Red Valentine, fit for use August 11, pods of medium length, partly ripe when cut down by the September frost.

*Garden Peas.*—Nine varieties of garden peas were under test this season. The planting was done between May 3 and 18. Four drills, each 33 feet long, of each variety were sown. Two drills were sown close together, then a space of twenty inches left and two more drills sown close together, the close planting being done as a support as the vines grew up, as no sticks were used.

The germination of the seed in each case was timely. No damage was done to the plants by the spring frosts.

With the ample moisture in the soil, and the warm weather of the early summer, the plants made rapid growth, and came into use somewhat earlier than usual. All fully matured before the autumn frost. The surplus stock of seed will be distributed throughout this district.

The following were the results obtained: Gradus, sown May 3, fit for use June 24, ripe August 9, vine 28 inches, pod 3 inches, average number of peas in pod, 6; quite large, yield of ripe seed, 4 pounds Premium Gem, sown May 4, fit for use July 1, ripe August 9, vines 28 inches, pods 3 inches, average number of peas in pod 6, large, yield of ripe seed, 9 pounds; Thomas Laxton, sown May 5, fit for use July 4, ripe August 3, vines 31 inches, pods 3 inches, number of peas in pods 8, medium size, yield of ripe seed, 13 pounds; American Wonder, sown May 7, fit for use July 7, ripe August 9, vines 26 inches, pods 2½ inches, number of peas in pods 6, quite large, yield of ripe seed, 16 pounds; Improved Stratagem, sown May 3, fit for use June 2, ripe July, vines 16 inches, pods 2½ inches, number in pods 7, fair size, peas of a fine quality, yield of ripe seed, 6 pounds; Henderson's First of All, sown May 3, fit for use June 21, ripe July 28, vines 28 inches, number of peas in pod 6, quite large, yield of ripe seed, 11 pounds; English Wonder, sown May 7, fit for use July 2, ripe August 2, vines 31 inches, pods 3 inches, number of peas in pods 6, very large, yield of ripe seed, 7 pounds; Pioneer, sown May 18, fit for use July 12, ripe August 6, vines 29 inches, pods 3 inches, number of peas in pod 7, large, yield of ripe seed, 5 pounds; Early Morn, sown May 18, fit for use July 15, ripe August 15, vines 26 inches, pods 3 inches, number of peas in pod 8, medium size, yield of ripe seed, 7 pounds. A large plot of mixed varieties was sown on May 2. These were fit for use on June 29; being a mixed lot, they remained in use for a longer period than the other plots.

*Rhubarb.*—Victoria: the plot came through the winter of 1920 in fine condition, and after the mulching was removed in May, the plants got a good start, and were fit for use on June 2. They were quite large on that date, and were in use most of the summer. A large amount was taken away by the settlers who have not as yet started a bed of rhubarb. A good number of roots from this bed have been sent from the Station to the outlying districts.

*Asparagus.*—Columbia: fit for use on June 5, and remained in use until well towards midsummer. It was a fine crop and quite large on that date. Many roots from this bed have been sent away.

*Cabbage and Cauliflowers.*—The following varieties of cabbage and cauliflowers were sown under glass on April 24 and 26. The transplanting to the open ground was done on May 26 and 28, the soil being quite cold even at that date, and other weather conditions were unfavourable.

The plants received a severe set-back from frost after being set out, and again from a very severe frost which occurred on the night of June 7. These frosts greatly retarded the growth of the young plants, but with the warmer weather and timely showers towards the end of June the plants made favourable growth, not coming into use, however, until some considerable time later than usual.

The plants made rapid growth during the latter part of the season, and in most cases became quite large heads. They were taken up on October 1 and 2. Early Jersey Wakefield, for summer use, fit for use July 24, heads small, 1½ pounds, average weight when taken up, 9 pounds; Extra Early Express, a very early variety, for summer use, fit for use July 20, medium size 2 pounds, average weight when taken up, 8 pounds; Danish Ballhead 0-8877, a late variety, for winter use, fit for use August 2, size fair—4 pounds, average weight when taken up 19 pounds, a very fine cabbage and a good keeper; Copenhagen Market, a late variety for winter use, fit for use August 8, size large—5 pounds, average weight when taken up 21 pounds,

very firm and solid, a very good keeper; Round Red Danish, set out May 27, growth slow, fit for use August 18, medium size then, taken up October 3, average weight per head 7 pounds, very firm, a fine variety for pickling.

*Cauliflowers.*—Extra Early Paris Market, set out May 27, fit for use July 20, medium size 2 pounds, taken up October 2, average weight per head 10 pounds, quality good; Extra Early Erfurt, set out May 26, fit for use July 18, size small—1½ pounds, taken up October 2, average weight per head 9½ pounds, very firm and solid, fine flavour and a good keeper.

*Brussels Sprouts.*—Dwarf Paris Market, set out May 28, fit for use September 20, taken up on October 3, weight from ¾ to 1 pound; quite small, very fine. The seasons in this North Land are rather short for the successful growing of Brussels sprouts.

*Celery.*—Only two varieties of celery were under test this season. The seed was sown under glass on April 24, and germination was rather slow. The transplanting to the open ground was done on June 14. The weather conditions were somewhat unfavourable at the time the plants were set out, there being bright sunshine and a strong east wind. On account of the weather being so cold for a number of days prior to the setting out of the plants, the hot-beds had to be kept covered to protect the plants from the severe frost, and the plants had become very tender, and were slow in getting a start after being moved. The plans were set out in trenches 33 feet long, and 7 inches deep. Two inches of manure were placed in the bottom of the trench, and one inch of soil was placed over the manure. The trenches were six feet apart, which left sufficient room to hoe the soil up around the plants as they grew. The plants made very favourable growth during the latter part of the season, and gave fair yields. Golden Self Blanching 0-8884 C.E.F. seed, 108 plants set out on June 14, fit for use on August 19, medium size then; taken up on October 4, weight per dozen heads 13·1 pounds, very fine; Perfected White Plume, 108 plants set out on June 14, fit for use August 23, taken up on October 4, weight per dozen heads 15 pounds, very fine, crisp and tender, stored away in sand for winter use.

*Tomatoes.*—The following varieties of tomatoes were sown under glass on May 24; Alacrity strain 201 A, Alacrity A, Alacrity B, and Bonny Best. The transplanting to the open ground was done on May 27 and 28; 54 plants of each variety were set out, but these plants were completely killed by a frost which occurred on the night of June 1. This loss necessitated replanting, which was done on June 3. These were again cut down by frost on the night of June 6. The frost penetrated through the covers that had been placed over the plants, also through the glass over the hot-beds, and completely killed the few remaining plants that were left in the hot-beds. It was impossible to replant, as no plants were available. However, in some of the gardens throughout this district, a fair crop of green tomatoes was harvested.

*Cucumbers, Citrons, Squash, Melons, and Pumpkins.*—These were planted in the usual way in small boxes, from May 11 to the 13th. These suffered very severely by the June frosts, the plants being thinned out considerably. The plants left seemed weak, and were some considerable time in getting a new start. In all cases growth was quite slow, as the plants seem stunted by these severe setbacks. The results obtained this season were far from satisfactory. A few medium-sized fruits were picked from each variety on September 25, after being touched by the autumn frost.

### INDIAN CORN, TEST OF VARIETIES

Considerable attention was given to the culture of corn this season, all being sweet or garden varieties, no field varieties being available. The land used was that on which a crop of grain had grown the previous season. Twenty wagon-loads of barnyard manure were applied in the autumn of 1919, after the grain crop had been

removed. The land was fall ploughed and left in that condition for the winter. The land was thoroughly cultivated in the spring of 1920 in preparation for the seed, which was planted, in hills three feet apart each way, between May 11 and 18. The usual cultivation was given to the growing crop during the early part of the season.

The past season, especially in its early part, was not favourable to the corn crop. With the severe frosts that were experienced during the latter part of May and the beginning of June, the plots were thinned out considerably, yet the corn grew fairly well, and gave a fair yield of fodder. Only in one case did it reach maturity, but the balance was sufficiently advanced to have made excellent ensilage. The fodder was used in a dry state, and was greatly relished by the cattle. The corn was harvested on September 29, after considerable frost had been experienced. The following were the yields obtained, weighed in the dry state: Golden Bantam, average height 47 inches, in tassel August 20, in silk August 28, in use September 6; condition when cut, soft dough, yield per acre, 7 tons 880 pounds; Early Mayflower, average height 48 inches, in tassel August 18, in silk August 25, in use September 2; condition when cut, firm dough, yield per acre, 8 tons and 1,980 pounds; White Sweet Squaw, average height 72 inches, in tassel July 28, in silk August 16, did not come into use; condition when cut, cobs nicely formed, very green, stalks green, yield per acre, 14 tons and 1,400 pounds; Early Sweet Malcolm, average height 49 inches, in tassel July 30, in silk August 17, not in use, condition when cut, cobs just formed, very green, yield per acre, 8 tons and 280 pounds; Extra Early Cory, average height 66 inches, in tassel August 21, in silk August 30, not fit for use, condition when cut, cobs very large and quite green, very early milk, yield per acre, 10 tons and 700 pounds; Improved Squaw, average length of stalk 52 inches, in tassel August 6, in silk August 20, just coming into use September 20. Condition when cut, early milk, cobs large; yield per acre, 7 tons and 1,880 pounds; Howes Bantam Sweet, seed from the Department of Field Husbandry, University of Alberta, average height 36 inches, in tassel July 25, in silk July 31, fit for use August 27, 47 pounds of fully matured cobs picked on September 16, balance of cobs late dough, yield per acre, 6 tons of very dry fodder when cut on September 29; Golden Giant, average height 49 inches, in tassel August 23, in silk August 31, not in use, cobs just nicely formed; condition when cut, cobs very large, in very early milk, yield per acre, 8 tons and 1,940 pounds of very fine fodder; Early Sweet Kloochman, average height 60 inches, in tassel July 16, in silk August 5, fit for use September 12, condition when cut, late dough, cobs very large and sweet, yield of fodder per acre, 9 tons and 1,600 pounds; Early Sweet Otta, average height 48 inches, in tassel July 31, in silk August 12, in use September 15 just at frost, condition when cut, firm dough, cobs longs, a fine table variety, yield per acre, 7 tons and 1,900 pounds of very fine fodder; Pickaninny C.E.F. seed, average height 36 inches, a very early dwarf variety, in tassel July 23, in silk July 28, in use August 18, condition when cut on September 29, cobs partly ripe, small; yield of very dry fodder, 4 tons and 1,300 pounds per acre; Pocahontas, rather a late variety, average height 51 inches, in tassel August 26, in silk September 1, condition when cut, cobs just nicely formed, very green, yield per acre of very good fodder, 9 tons; Early Fordhook, a very late variety, average height 50 inches, in tassel August 25, in silk September 1, condition when cut, cobs just forming, very long and green, yield per acre, 9 tons and 900 pounds of excellent fodder. In a number of plots of one-thirtieth of an acre each a mixture of corn was sown on May 18, for fodder, in drills two feet apart. These plots were cut on September 29, and gave a yield of from 12 to 14 tons per acre of very fine fodder, quite suitable for ensilage. This fodder was also fed out in the dry state.

### POTATOES UNDER TEST, SEASON OF 1920

The undermentioned varieties of potatoes were planted on May 6 and 8. The larger field plots were planted from May 8 to the 25.

The potatoes were planted on land on which a crop of grains, wheat, oats and barley had been grown the previous season. Fifteen large wagon-loads of well-rotted

barnyard manure per acre were applied in the autumn of 1919, after the grain crop had been removed. The land was thoroughly ploughed after the manure was applied, and left in that condition for the winter. In the spring of 1920 the land was well harrowed over with the drag harrow, the land being then reploughed. This ploughing thoroughly incorporated the fertilizer with the soil, and gave the latter a chance to warm up somewhat before the planting was done. The land was again gone over with the smoothing harrow, the drills being ploughed out very deeply. The seed left whole or cut into quite large sets, was planted ten inches apart in the bottom of these drills. It has been found advisable in this North Land, with its tendency to spring frosts, to use large seed. Then, should the young shoots be cut back by frost, there is still a strong underground root system and sufficient plant food available to enable the young shoots to continue growing.

After the seed was planted, it was covered very lightly, using the hand hoe. At frequent intervals the harrow was run over the plots across the drills, which gave a further covering to the seed. This was done more especially if there seemed to be any danger of frost at night, and thus the plants were kept covered until after all danger of frost was past. The last severe spring frost occurred on the night of June 7. After this date the harrowing was discontinued. The plants were soon above ground and made rapid growth, when the horse cultivator was started. This was run through the plots a number of times. The potatoes were then slightly hilled up with hand hoes, and any weeds taken out from among the plants. The land on which the large field plots of potatoes were planted had been in summer-fallow the previous season, and had been well manured prior to being ploughed, and kept thoroughly cultivated during the summer and autumn.

The past season was quite favourable for the growing of good crops of potatoes. Not only at the Station but throughout the whole district was a very heavy crop harvested.

The following were the varieties planted, dates fit for use and yields obtained: plots one-sixteenth acre each. Rochester Rose, planted May 6, fit for use July 28, taken up on September 20, very large, colour pink, yield per acre 528 bushels; 448 bushels marketable, 80 bushels medium size Early Rose, planted May 7, fit for use July 31, taken up on September 20, a very large percentage of small ones, yield per acre 480 bushels, colour pink, 380 bushels marketable, 100 bushels small; Carman No. 1, planted May 6, fit for use August 14, taken up on September 21, very large, colour white, yield per acre 496 bushels, 400 bushels marketable, 96 bushels would be suitable as seed; Gold Coin, planted May 6, fit for use August 4, taken up on September 21, medium size, colour white, yield per acre 432 bushels, 342 bushels marketable, 90 bushels fit for seed; Irish Cobbler, planted May 6, fit for use August 10, taken up on September 21, quite large, colour white, yield per acre 416 bushels; 381 bushels marketable, 830 bushels of small ones; King Edward, planted May 7, fit for use August 2, taken up on September 29, large, colour russet, yield per acre 464 bushels, 374 bushels marketable, 90 bushels of small ones. A quarter-acre field plot of Early Rose potatoes was planted on May 7, and they were in use on August 2, were harvested on September 22, gave a yield of 360 bushels per acre, and were of medium size. A half-acre plot of Rochester Rose were planted on May 7 and 8, and were in use on August 3. The yield per acre was 495 bushels, and the potatoes were very large. A quarter-acre plot of King Edward potatoes were planted on May 25 and were in use on August 10. They were dug on September 23, and gave a yield of 515 bushels per acre. The potatoes were very large, clean and smooth. All potatoes were free from disease or scab, but the tops in all cases had a very rank growth.

## EXPERIMENTAL SUB-STATION, GROUARD, ALTA.

The winter of 1919-20 was extremely long. It commenced early in October and the severe weather continued until much later than usual into the spring of 1920. For this reason not much preparatory fall work could be done, and the experimental plots were laid out in 1920 on a piece of land which had been in potatoes the former year and which, consequently, had received a certain amount of cultivation during the growing season. Seeding could not be done on the plots before the 21st of May and this was, approximately, the earliest date upon which any seeding took place in this district. Germination was normal, but the constant rains during the entire spring and a great part of the summer almost destroyed the crop. This condition was general throughout the region, but particularly in the neighbourhood of Grouard. It was, indeed, a real disaster, for the prairie from which one generally harvests from twenty to twenty-five tons of hay, did not furnish anything whatever, on account of flooding. The experimental plots on high land, however, were more successful, and the Station was more fortunate than a great number of the farmers nearby, inasmuch as the crops ripened in good season and were gathered and safely housed before the storms and snows of the end of September which caused great losses throughout the country. In short, the results of the experiments were not so favourable as those of the former year, especially as to yield, although the quality of the grain was very good indeed.

Four varieties of wheat were sown, Prelude, Ruby, Huron and Marquis. These were sown on the 22nd of May, and all appeared above ground at about the same time, viz., the 8th of June. Prelude was the earliest maturing, and was cut on August 29, the others being cut during the next ten days in the following order: Ruby, Marquis, Huron.

### BARLEY

Albert, O.A.C. No. 21, and Duckbill were tried, all being sown on May 22, and appearing above ground on June 8. Albert was the first to ripen, and was cut on August 21, O.A.C. No. 21 and the Duckbill were cut during the following week.

### OATS

Three varieties were tried, Daubeney, Banner and Victory, all sown on May 22, and appearing above ground June 8. Daubeney was the earliest to ripen, being cut August 25, and the other varieties were harvested during the week following. It is always possible to seed earlier on the Mission farm than on the farms surrounding, so that usually the crops are better and surer.

### HORTICULTURE

The year was exceptionally good for garden crops, although potatoes in field lots suffered from the excessive rain. In the garden even those varieties of vegetables most susceptible to frost did so well during the extreme heat of July and August that beans, potatoes, cucumbers, citrons, squaw corn, etc., gave excellent results. This being the case, it need hardly be said that the hardier varieties, which as a rule succeed here, did remarkably well. Brussels sprouts and late cabbage were the only two vegetables which did not give a good return.

## EXPERIMENTAL SUB-STATION, FORT SMITH, N.W.T.

Results were mediocre, owing to the earliness of winter in 1919, which prevented preparation of the fields, and to the lack of rain during 1920.

The crops suffered greatly from the drought, and seeding had to be renewed in June for several crops—carrots particularly. Oats germinated twice: in May, fifteen days after seeding, and in July, after the rains and storms of that month. At harvesting time, in September, half of the oats were still green.

Results were better in the vegetable gardens. Prizetaker onion proved greatly superior to the Yellow Globe and Red Wethersfield varieties, some specimens being 12 inches in circumference.

Owing to its earliness, the Copenhagen Market cabbage has been considered the best for the north. Heads vary from 10 to 15 pounds in weight.

Lettuce of the Gem Toronto variety is excellent. Red Chantenay carrots reached 1½ pounds in weight; white Short Improved carrots were 1 pound in weight, and would have been heavier still if there had been time for complete maturity.

Potatoes gave only a medium crop owing to lack of spring rains.

## EXPERIMENTAL SUB-STATION, FORT RESOLUTION, MACKENZIE DISTRICT, N.W.T.

### GENERAL CHARACTER OF SEASON

The past season was exceptionally good, and in certain instances success was even greater than for the previous year, which held the record. Winter was mild and spring early. On May 17, planting of potatoes and seeding were proceeded with, but were finished only about the end of June, owing to rain and snow. June was rainy and favourable to germination. July was exceedingly hot and dry, but the crops did not suffer, owing to the June rains. About mid-August, rain came when most needed, and continued regularly until October, and it was with much difficulty that the excellent crops were harvested.

### HORTICULTURE

#### POTATOES

About 4,000 kilos. of potatoes were sown from May 17 to 25. Germination: June 28 to July 3. First hilling up, July 20, second, August 10. Digging: September 20 to 25. Yield: 31,000 kilos. of fine tubers—slightly more than last year. No rot was noticed as last year; this was perhaps due to wider spacing of the rows. A comparison of the potatoes sown on May 20 with those of neighbours, sown in June, showed that the former had numerous strong stems, while the others had one or two very thin stems. The difference in quality and quantity of the tubers was also very noticeable. It seems fair to conclude, therefore, that here the season is so short that it is necessary to plant the potatoes as soon as possible when the soil is dry enough, without paying any attention to the cold, which is liable to return.

Early Rose potatoes were used almost exclusively for seed. However, as Wee McGregor had given great satisfaction the previous year, about 200 pounds were sown under the same conditions. They gave a good return but not better than the Early Rose. Most of the Wee McGregor, and especially the largest tubers, were hollow, and showed signs of rot. No such defect was noticed on the Early Rose potatoes, which perhaps indicates that the latter variety is the more suitable for this climate and soil.

### CARROTS, PARSNIPS, BEETS, TURNIPS

*Carrots.*—Half Long Chantenay and White Belgian gave the best crops in the vegetable garden.

*Parsnips* were of good size, but much less profitable than carrots.

*Beets* gave the best results ever obtained. Only one variety, Detroit Dark Red, was sown.

*Turnips* succeeded as usual.

### CABBAGE, PEAS, LETTUCE, ONIONS

Satisfactory crops of cabbage, peas and lettuce were obtained. Seed of White Prizetaker onion was sown, and sets were obtained and dried for planting next spring. From an experiment made this summer with onion sets received from Fort Smith, it is hoped to grow onions the size of a man's fist.

## CEREALS

### OATS

Seeding was interrupted by a snowstorm. For fear of delay, seeding was completed upon the snow, the seed being buried with the spring harrow. Germination was uniform, and occurred about June 19. The oats lodged in several spots. Fearing frost, the crop was cut for forage. The heads were beginning to bend under the weight of the grain. The crop remained in the field until October 20, as it was difficult to cure it. Although damaged, the stock preferred it to the natural meadow hay. About 12 tons of this excellent forage were obtained. As an experiment, part of the oats were left standing, to see if they would mature. They remained erect without frosting until September 29. Then 120 kilos. of fine oats, very good for seed were harvested. It is hoped that by sowing somewhat earlier, good oats may be grown here in ordinary years.

### BARLEY

One hundred and fifty kilos. of Success barley were sown, 100 received from Fort Simpson and 50 harvested here last year. For some unknown reason, although of good appearance, the Fort Simpson barley failed to germinate. That harvested here, although of very inferior quality, succeeded well. Sown June 3, germinated June 20, in head by the end of July, it was ripe early in September. As it has not yet been threshed, the exact yield cannot be stated.

## HAY

Seed of western rye, awnless brome, timothy, Japanese millet and alfalfa, received from the Central Experimental Farm, was sown on June 10. Germination was noted on June 26. On June 23, sweet clover and brome grass seed were received and sown the same day. They germinated on July 1. At the close of the season, they were everywhere 30 centimetres high. Rye grass and timothy give entire satisfaction here. It is hoped in a few years to have meadows supplying all the hay needed, although the land is not of the best quality.

## PLANTS AND TREES

The small apple trees, obtained from pips sown eight years ago, after reaching a height of 2 metres were nearly all destroyed by winter-killing, as were the maples and lilacs. The highest stems have dried, while some have perished completely. This is what has occurred at the Providence Mission for a number of years.

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NOTE.—One kilo=2·2046 lb. One metre=39·37 lb. One centimetre=·3937 lb.

# EXPERIMENTAL SUB-STATION FOR THE YUKON, SWEDE CREEK

## REPORT OF JAS. R. FARR

### CROPS

The ten acres under the soil improvement scheme were seeded in 1919 with oats, peas and red clover. The oats and peas were cut for hay, but the red clover, which was to be left and allowed to get the maximum growth and ploughed under for green manure, was entirely winter-killed. This ten acre area was ploughed and seeded in June, 1920, with such seeds as were available—oats, peas, sweet clover and red clover.

The oats and peas gave quite a heavy growth; the red clover very light; the sweet clover was of medium growth. This was all ploughed under during August. In 1921 this will be planted with a hoed crop.

On June 18 and 19 two acres were seeded with rye and buckwheat, and in August this was ploughed down for green manure. The growth obtained was very satisfactory.

The two acres seeded in 1919 with rye and buckwheat was ploughed under for green manure. On May 15, 1920, this was seeded with oats, peas and red clover for hay. In the event of the red clover again being winter-killed, it is planned to substitute sweet and red clover during the early spring. The reason for doing this is that the clover will give sufficient growth in the same season as seeded.

The plots which were seeded in 1919 with alfalfa, western rye grass, red clover and timothy looked very promising in the fall, but the red clover and timothy did not withstand the winter. The western rye grass turned out quite satisfactorily; the Canadian variegated alfalfa gave a growth that was thick enough, but it did not mature sufficiently for seed. If this again stands the winter, it is quite possible that it will mature to seed.

On May 20 one acre each of alfalfa and red clover, and small plots of alfalfa and alsike and white clover were sown on the bench lands. The alfalfa and red clover seeded in the one acre plots were not satisfactory, due to the lack of rain for a long period after seeding. To control the growth of weeds, it was decided to plough these two plots under. Under normal conditions, there is no doubt that very satisfactory results could be obtained from the alfalfa and the red clover. The results from the small plots of alfalfa, alsike and white clover will be determined in the spring.

On May 10 plots of one-fortieth acre each were sown with the following varieties of wheat:—Marquis, Huron and Prelude. These plots were seeded at the rate of one and two-thirds bushels per acre. This was all on fall ploughed bottom ground.

On August 25 the Marquis was harvested. The yield was 75 pounds or 50 bushels per acre.

Huron wheat was harvested on August 28, giving a yield of 90 pounds, or 60 bushels per acre.

The plot of Prelude was harvested on August 5, yielding 52 pounds, or 34⅔ bushels per acre.

On May 13 one plot each of Success and Manchurian barley were sown.

The Success barley was harvested on August 5, and gave a yield of 51 pounds, or 42½ bushels per acre.

On August 9 the Manchurian barley was harvested and a yield obtained of 64 pounds, or 53⅓ bushels per acre.

One plot each of Banner and Victory oats were seeded on May 13.

The harvesting of the Victory oats was done on August 20. The yield was 90 pounds, or 105 bushels and 30 pounds per acre.

Banner oats were harvested on August 26, and the yield obtained was 114 pounds, or 134 bushels and 4 pounds per acre.

A plot of Arthur Field peas was seeded on May 13. These were harvested on August 19. The yield obtained was 32 pounds, or 21⅓ bushels on the basis of an acre.

The oats, peas and barley were on spring-ploughed bottom land, the size of the plots being one-fortieth of an acre each. Two and one-half pounds of seed were used on each plot.

On May 18 a second set of plots of grain was sown on the bench land. This seeding was done at the rate of two and one-half pounds of seed per plot. Owing to the dry season, as mentioned above, this seeding was a complete failure.

## VEGETABLES

Of the three varieties of beans, Detroit Wax, Green Pod and May Queen, 0-8954, all matured for table use and gave a large yield.

*Brussels Sprouts.*—The seeds were planted in the hot-bed and transplanted to open later, but produced nothing.

*Beets.*—Detroit Dark Turnip. This variety did exceptionally well, maturing ready for the market long before frost, with a profitable yield.

*Cabbage.*—Jersey Wakefield and Copenhagen Market both did well, yielding large, solid heads. Extra Early Amager Danish Ballhead 0-9257 did not mature, and produced nothing.

*Carrots.*—Chantenay and Earliest Short Horn. The Shorthorn did equally as well as the Chantenay.

*Cauliflower.*—Early Snowball did not do as well as Dwarf Early Erfort of the previous year.

*Cucumbers, Citron, Pumpkins, Squash and Tomatoes.*—It would appear that these can be grown in this country only under glass.

*Celery.*—Golden Self Blanching, Winter Queen, Giant Pascal. Golden Self Blanching did the best, but all varieties produced extra fine results, probably as good as at any place in the world, both for size and crispness.

*Corn.*—Sweet Malcolm C.E.F., Early Sweet Squaw C.E.F., Kloochman C.E.F. None of these varieties produced ears, but the stalks were suitable for fodder.

*Lettuce.*—Iceberg, Grand Rapids Forcing C.E.F. Both varieties did well, but Grand Rapids Forcing is much the better for early use under glass.

*Onions.*—R. Wethersfield, Extra Early Flat Red, Yellow Globe Danvers 0-9290. Impossible to make a comparison of these varieties, as the season was so dry that there was practically no production.

*Parsley.*—Double Curled 0-9273. This variety did well.

*Parsnips.*—Hollow Crown 0-8888. These were a failure, owing to the dryness of the season.

*Peas.*—Thomas Laxton, Stratagem, Gregory Surprise, English Wonder 0-9384. All these except Gregory Surprise gave a large yield, and were very satisfactory.

*Radish.*—Scarlet Turnip White Tipped Summerland, 0-8903. No report, as the season was dry and there was very small production.

*Salsify.*—Mammoth Sandwich Islands 0-9271. This did not mature fit for table use.

*Turnips.*—Early Snow Ball, Red Top Strap Leaf, Extra Early Purple Top Milan. These varieties gave a large yield but can be used for table only when very young. Canadian Gem gave a large yield and the quality was excellent. They are good keepers.

ENSILAGE

*Sunflowers.*—Mammoth Russian. Some stalks grew to a height of six and one-half feet, fully flowered.

## EXPERIMENTAL SUB-STATION, SALMON ARM, B.C.

### REPORT OF THOS. A. SHARPE

The summer and fall of 1919 were very dry, and the usual fall rains did not occur. The ground froze in this condition, and did not thaw until most of the winter's snow had melted and run off in the spring, so that the land was still very dry when seeding and planting took place in 1920. There were several good showers in May and June, but as these were almost invariably followed by high winds, the crops did not benefit to any considerable extent, the result being very light yields of hay and grain, and especially of all root crops. The crops of tree fruits were also light, and the size and quality of the fruits, especially of apples, were below the usual standard.

In the experimental apple orchard set out in 1911 there were some 102 varieties selected from the large collection on the Experimental Farm at Agassiz, B.C. Some of these varieties have since been winter-killed, and others, although hardy, have proved either unproductive or yielded fruit of poor quality. Their places have been taken by many new varieties, a large number of which were received from the Central Experimental Farm, being the most promising of the seedlings developed by the Horticultural Division there. Some of these have fruited, and show considerable promise; others are almost ready to fruit. Of the original planting, two varieties seem to be sufficiently promising to warrant propagating in sufficient numbers to plant a plot for further test, and in order to distribute a few trees to orchardists in the district. The names of these are Scarlet Pippin and Buckingham. There are at present about seventy varieties of apples under test, in all. Below is given the list of the varieties discarded since the experimental work was commenced on the sub-station, and the reasons therefor.

With pears, forty varieties have been tried, but only a few survived the severe frosts of the winter of 1916-17. Of these, Flemish Beauty, Dr. Guyot and Amajou are the most promising.

Although trees of a number of varieties of plums have been killed, there are a number still remaining that are commercially valuable; but in this district the plum is not of so much importance as are the small fruits, such as loganberries and red raspberries, both of which do well on the uplands and always command a good price.

## List of Apples Discarded at the Experimental Sub-station, Salmon Arm, B.C.

| Name of Variety | Reason for Discarding |
|---|---|
| Alles | Not productive. |
| Amelie | " " |
| American Rambour | " " |
| Baltimore | Poor quality. |
| Baxter | Not productive. |
| Beauty of Bath | Poor quality. |
| Belmont | Tree tender and unproductive. |
| Belle de Avrille | " " " " |
| Ben Hur | Tree tender, winter-killed. |
| Bethlemite | Fruit too small to be of value. |
| Brewington | Not productive, quality poor. |
| Burlington | Poor quality and unproductive. |
| Boyd | Fruit small and poor. |
| Canon Pearmain | Too small for commercial trade. |
| Canada Red | Unproductive. |
| Cranberry | Fruit small and poor. |
| Cornish Aromatic | Unproductive. |
| Cornish Gilliflower | " |
| Champion | Not suitable in this climate. |
| Cullasaga | Very unproductive. |
| Double Bon Pommier | Too tender for this climate. |
| Dery's Baldwin | Unproductive, fruit small. |
| Ferris | " " " |
| Fall Orange | A poor shipper and very short season. |
| Fort Miami | Fruit small, tree unproductive. |
| Giant Geneton | Fruit small and inferior. |
| Hawley | Unproductive and watercores. |
| Higby Sweet | Fruit small, watercores badly. |
| Ira | Not of value as a commercial variety. |
| Jewett's Best | Tree a poor grower and unproductive. |
| Julian | Fruit poor and small. |
| Jersey Sweet | Tree too tender. |
| Josephine | " " " |
| Lord Hindlip | Unproductive. |
| Lord Burleigh | " |
| Lady Sudeley | Very handsome but a poor shipper. |
| Lady Sweet | Unproductive. |
| Leland Spice | Fruit too small. |
| Lady Henniker | Winter-killed. |
| Magnet | Fruit very handsome but too small. |
| Minister | Poor producer and fruit flavourless. |
| Major | Very uneven in size, not profitable. |
| Mammoth Grimes | Not productive. |
| Mother | Fruit poor in quality. |
| Moyeuvre | Tree tender and unproductive. |
| McLellan | Fruit small and undesirable. |
| Norton's Melon | Tree tender and unproductive. |
| Newton Wonder | A very unproductive variety. |
| Picket | Unproductive. |
| Piedmont Pippin | " |
| Porter | Tree tender and fruit uneven. |
| Queen of Pippins | Fruit good but a very shy producer. |
| Red Reinette | " " " " " " |
| Red Gravenstein | Very poor grower and poor producer. |
| Red Stettin | Very poor grower and of no value. |
| Swazie Pomme Gris | Fruit very small. |
| Stanard | Shy bearer. |
| Siegfrid | " " |
| Samogitie | Fruit inferior in quality. |
| Sops of Wine | Fruit too small to be of value. |
| Sutton Beauty | Very shy bearer. |
| Stankryka | Fruit small and inferior. |
| Swaar | Tree tender. |
| Spitzenburg | " " |
| Van Hoy | Very productive but fruit poor. |
| White Pippin | Fruit of little value. |
| White Winter Pearmain | " " " " |
| Wilson Red June | Tree a feeble grower and unproductive. |
| Wellington | Not productive. |
| Yellow Newton Pippin | Winter-killed. |

METEOROLOGICAL RECORD AT SALMON ARM, B.C.

For the Year Ending March 31, 1921

| | Temperature | | Rain | Snow | Sunshine | |
|---|---|---|---|---|---|---|
| | Highest | Lowest | | | H. | M. |
| | | | inches | inches | | |
| April, 1920 | 72 | 16 | 1·42 | 0·5 | 131 | 48 |
| May, 1920 | 81 | 31 | 1·12 | ..... | 206 | |
| June, 1920 | 87 | 39 | 2·84 | ..... | 221 | 54 |
| July, 1920 | 101 | 47 | 0·38 | ..... | 346 | 18 |
| August, 1920 | 94 | 42 | 1·38 | ..... | 278 | 36 |
| September, 1920 | 83 | 39 | 2·63 | ..... | 164 | 06 |
| October, 1920 | 62 | 26 | 2·91 | ..... | 97 | 18 |
| November, 1920 | 52 | 18 | 2·22 | 2·5 | 44 | 30 |
| December, 1920 | 47 | 12 | 0·75 | 20·25 | 23 | 30 |
| January, 1921 | 50 | 7 | ·2 | 26·75 | 42 | 12 |
| February, 1921 | 55 | 1 | ·3 | 19·0 | 83 | 36 |
| March, 1921 | 62 | 12 | ·45 | 3·5 | 121 | 06 |
| Total for year | ..... | ..... | 14·15 | 72·5 | 1,760 | 54 |