

UNIVERSITY OF IDAHO
AGRICULTURAL EXPERIMENT STATION

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UNIVERSITY OF IDAHO AGRICULTURAL EXPERIMENT STATION

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*In cooperation with U. S. Department of Agriculture.

REPORT OF THE DIRECTOR

This report of the Idaho Agricultural Experiment Station deals with the progress of investigations conducted during the calendar year of 1921. The financial statement herein contained covers the fiscal year July 1, 1920-June 30, 1921.

During the past three years the work of the Station has been partially re-organized for the purpose of centering the activities of Station employees on the problems of the greatest economic importance to the farmers of Idaho. Much has been accomplished within those projects that have a direct bearing on the success of general farming and fruit growing without reducing the number of projects that classify as research of a fundamental character. Several important investigations that have been under way for several years are nearing completion. The data already at hand constitute a notable addition to the available information regarding Idaho agriculture.

A comprehensive report was published in January, 1921. It has seemed desirable to publish a shorter report on alternate years. Hence, this report will briefly summarize the activities within the various departments of the Agricultural Experiment Station of greatest general interest. The report for the coming year will, in accord with this policy, be more extensive.

There have been relative few resignations during the past year. Increased effectiveness of investigation has resulted from the tendency toward continuity of service.

The barns and storage houses at the Home Station were painted during the summer of 1921. A new tractor shed was constructed for the department of agricultural engineering. An electric motor and silage cutter were purchased and new dairy cow stanchions were added to the equipment of the Sandpoint Substation. A new concrete silo, 12 by 40 feet, was constructed and other improvements made in the feeding plant at the Caldwell Substation. Repairs and alterations made for various departments of the Home Station during the past year have served to improve the facilities for effective investigational work.

THE MAILING LIST

| | |
|---------------------------------|--------|
| Residents of Idaho | 11,600 |
| Residents of other states | 3,000 |
| Foreign | 175 |
| Total | 14,775 |

PUBLICATIONS DURING 1921

Bulletin, Title and Author

| No. | Bulletin, Title and Author | Pages | Copies |
|-----|---|-------|--------|
| 122 | Work and Progress of the Agricultural Experiment Station for the Year Ended December 31, 1921, E. J. Iddings. | 64 | 2,500 |
| 123 | Preliminary Report on Farm Management in Twin Falls and Latah Counties, Byron Hunter. | 12 | 5,000 |
| 124 | The Codlin Moth in the Payette Valley, L. E. Longley. | 28 | 6,000 |
| 125 | Field Peas for Pork Production, R. E. Gongwer. | 8 | 7,500 |

Circular, Title and Author

| | | | |
|----|--|---|--------|
| 16 | Forest and Shade Trees for Planting in Idaho, Including Price List for 1921, F. G. Miller. | 4 | 10,000 |
| 17 | Sugar Beet Top Silage, R. E. Neidig. | 4 | 5,000 |
| 18 | Steer Feeding Experiments 1920-1921, C. W. Hickman, E. F. Rinehart, A. W. Johnson. | 4 | 5,000 |
| 19 | Lamb Feeding Experiments 1920-1921, C. W. Hickman, E. F. Rinehart, A. W. Johnson. | 4 | 5,000 |
| 20 | Publications Available for Free Distribution, E. J. Iddings. | 2 | 15,000 |

Journal of Agricultural Research, Vol. 20, No. 2, 1921, Sunflower Silage Digestion Experiments with Cattle and Sheep, Ray E. Neidig, C. W. Hickman and R. S. Snyder.

Journal of American Chemical Society, Vol. XLIII, No. 4, 1921, Ray E. Neidig and R. S. Snyder.

Soil Science, The Effects of Woods and Tree Products on Bacteriological Activities in Soil: I. Ammonification and Nitrification, William M. Gibbs.

Phytopathology, Vol 11, Page 149, A Modification of the Concentrated Formaldehyde Method of Seed Treatment, C. W. Hungerford.

ACTIVE PROJECTS

The list of active Experiment Station projects follows. All investigations carried on at the substation farms are in cooperation with the various departments of the Home Station:

Agricultural Chemistry

The protein content of wheat, nitrogen content of the soil, when cropped continuously to wheat and when cropped under a definite rotation system.

The power of Idaho soils to retain and establish equilibrium between carbonate and bicarbonate salts as shown by the soil extract.

The influence of available nitrogen upon the protein content and yield of wheat.

Tolerance of crops for alkali.

Sunflower investigations.

(a) The composition of sunflowers at different periods of growth.

(b) The composition of the ash of sunflowers at different periods of growth.

In cooperation with Agronomy
Silage investigations.

- (a) A comparison of different varieties of corn for silage purposes.
- (b) Artichokes as a silage crop.
- (c) The composition of sweet clover and sweet clover silage.

The effects of adding lime, calcium sulphate and sulphur to Idaho soil types.
Timber soil investigations (Sandpoint).
Rotation and fertility investigations (Moscow and Sandpoint).
Slick spot studies (Caldwell).
Chemical analyses of soil survey samples.
Peat investigations.

In cooperation with Dairy Husbandry
The comparative value of various silages for milk production.

Winter rations for young dairy stock in Idaho.

The value of feeding cows during dry-rest period.

Feeds for wintering dairy heifers under practical farm conditions in Idaho.

In cooperation with Bacteriology
Effects of alkali salts on bacteriological activities in soil.

In cooperation with Animal Husbandry
Steer and lamb feeding at Caldwell.

In cooperation with Aberdeen Substation
Sugar beet investigations, variety tests.

Agricultural Engineering

Investigation of the practicability of irrigating certain comparatively level portions of farms in the semi-arid regions.
Design and installation of farm water systems.

A study of the most practical methods for the mechanical distribution of poison dust for combatting the alfalfa weevil.

(In cooperation with Entomology).

Agronomy

Small-grain improvement. (In cooperation with the substations.)

- (a) Wheat.
- (b) Oats.
- (c) Barley.
- (d) Rye, emmer and miscellaneous grains.

Forage investigations.

- (a) Grasses and legumes for hay and seed.
- (b) Cultural tests with sweet clover.
- (c) Breeding and cultural work with soy beans.
- (d) Cultural experiments with sudan grass.
- (e) Orchard grass selection and improvement.

* (f) Introduction and testing of miscellaneous forage crops.

Field and garden pea investigations.

- (a) Classification studies.
- (b) Cultural experiments.
- (c) Breeding and improvement.

Corn breeding and improvement.

- (a) Work at Home Station.
- (b) Work at Aberdeen Substation.
- (c) Work at Caldwell Substation.

* Soil survey.

- (a) A detailed survey of a designated area each season as funds permit.

Silage crop investigations. (In cooperation with Agricultural Chemistry).

- (a) Cultural tests of corn for silage production.

- (b) Cultural experiments with sunflowers.

- (c) Improvement of sunflower silage production by selection and breeding.

- (a) Plots located at University Farm. (In cooperation with Agricultural Chemistry).

- (b) Plots located at Sandpoint Substation. (In cooperation with Sandpoint Substation and Agricultural Chemistry).

- (c) Tests with commercial fertilizers.

Timber-soil investigations.

- (a) Plots located at Sandpoint Substation. (In cooperation with Sandpoint Substation and Agricultural Chemistry).

Irrigated-soil investigations.

- (a) Correction of alkali and "slick spots." (In cooperation with Caldwell Substation and Agricultural Chemistry).

Soil amendments.

- (a) Use of sulphur, lime, gypsum on leguminous crops. (In cooperation with Agricultural Chemistry).

Rotation and fertility investigation.

Peat soils of Idaho. (In cooperation with Agricultural Chemistry).

Animal Husbandry

The growing and use of silage crops other than corn in the feeding of beef cattle and sheep.

Steer-feeding investigations at Caldwell.

Lamb-feeding investigations at Caldwell.

Hogging off field peas.

Different protein supplements with barley and corn for fattening hogs.

Farm sheep management at Caldwell and Sandpoint.

Bacteriology

Effects of wood and forest products on bacteriological activities in soil.

- (a) Ammonification and nitrification.
- (b) Nitrogen fixation.

Legume culture preparation.

Effects of alkali salts on bacteriological activities in soil. (In cooperation with Agricultural Chemistry).

The isolation and study of nitrifying bacteria.

*In cooperation with the U. S. Department of Agriculture.

Dairy Husbandry

Official testing for advanced registry of register of merit in Idaho.

*Inbreeding and line breeding compared with outcrossing as regards its effect upon dairy cattle, their milk and butterfat production, fecundity and general characteristics.

A study of the normal growth of dairy cattle.

Weight of dairy cattle as influenced by pregnancy, age, and methods of handling. A study of the best methods of feeding calves while receiving milk.

The best winter ration for young dairy stock in Idaho. (In cooperation with Agricultural Chemistry).

A study of the value of feeding silage with alfalfa hay for winter-feeding of heifers.

The value of feeding grain to dairy cows during dry-rest period.

The comparative value of various silages for milk production. (In cooperation with Agricultural Chemistry).

A study of the cost of producing milk in Idaho. (In cooperation with Caldwell Substation, Sandpoint Substation, and Farm Management).

A study of the value of feeding grain with hay and silage for milk production. (In cooperation with Caldwell Substation and Sandpoint Substation).

Entomology

A study of clover aphid and methods for its control.

A study of alfalfa weevil with the purpose of developing more effective methods for its control.

Tests of the value of various spreaders for spraying under Idaho conditions.

Studies on the life history and control methods of codling moth.

Studies on the bionomics and control of the plant lice affecting orchard fruits in Idaho.

Bionomics and control of false wire worms injurious to dry land grains.

*Farm Management and Farm Economics

Investigation of farm organization, including cost of crop production studies, in northern Idaho.

Investigation of farm organization, including cost of crop production studies, in irrigated sections of southern Idaho.

Forestry

Experimental tree planting.
Relative durability of Idaho woods.
Studies of farm woodlands.

Agricultural possibilities of logged-off lands.
Grazing studies.

Horticulture

Apple breeding.
Summer versus winter pruning.
Variety testing of fruit trees, small fruits, and vegetables.
Potato-production experiments.
Experiments in seed production.

Experiments in the control of western yellow tomato blight by breeding and selection. (In cooperation with Plant Pathology).
Testing the value of various spreaders for sprays.
Cherry pollination studies.

*Plant Pathology

*Investigation of stripe rust caused by *puccinia glumarum*.

*Investigation of the eelworm disease of clover.

Relation of soil moisture and soil temperature to bunt infection in wheat.

A study of the russet dwarf and calico diseases of the potato.

Investigation of western yellow tomato blight and methods for its control. (In cooperation with Horticulture).

Experiments in the control of the rhizoctonia disease of the potato. (In cooperation with Horticulture).

An investigation of mosaic and leaf-roll of the potato under Idaho conditions.
Experiments with various chemical dusts for the control of bunt in wheat.

Poultry Husbandry

A study of high winter egg production as a factor in the single comb white leghorns.

The comparative value of dry, soaked and sprouted oats for laying hens.

The inheritance of weight, color and texture of shell of eggs in the single comb white leghorn.

The comparative value of proteins from different sources for laying hens.

*In cooperation with U. S. Department of Agriculture.

Zoology

Cytological studies.

- (a) Additional cytological studies of the reproduction cells of the mule.
- (b) Cytological studies of the reproduction cells of cattle.
- (c) Cytological studies of the reproduction cells of sheep.

**Aberdeen Substation*

Small-grain investigations.

- (a) Varietal experiments with wheat, oats, barley.
- (b) Cereal breeding and selection in nursery.

Investigations in field and garden peas, and beans.

- (a) Varietal experiments.
- (b) Value of the various pea varieties as nurse crops for alfalfa.
- (c) Seed-bean investigations.

Silage crop investigations.

- (a) Varietal experiments with corn for silage production.
- (b) Breeding and selection of corn for eastern Idaho.
- (c) Rate of seeding sunflowers as related to yield of silage.

Potato investigations.

- (a) Varietal experiments.
- (b) Tuber-unit potato improvement.

Study of trees with respect to environment.

Seed production.

- (a) Sugar beets; selection and improvement of sugar beets for high sugar content by propagation of mother beets showing highest percentage of sugar.

- (b) Production studies with carrot and parsnip seed growing.

- (a) To determine adaptability of various ornamental trees to higher elevations of eastern Idaho for the improvement of the homestead.

Soil-fertility investigations.

- (a) To determine effect of sulphur on yield of alfalfa.

Pure-seed distribution.

- (a) Increase and distribution of pure seed of various crops which have been improved.

Caldwell Substation

Dairy farm management.

- (a) To encourage the introduction of dairying as a type of farming for this area of the state.
- (b) To determine the best combination of crops to be grown for a dairy herd.
- (c) To determine the proper number of animals to be maintained on an 80-acre unit of land and their proper management.

Farm management.

- (a) To place the remainder of the farm in condition to produce crops for feed or sale.
- (b) To determine the cost of certain crops from the standpoint of man and horse labor expended.

Feeding investigations.

- (a) Steer-feeding investigations.
- (b) Lamb-feeding investigations.

Corn investigations.

- (a) To determine the yielding capacity of introduced varieties as compared with those locally grown for the production of silage.
- (b) Later, a system of corn breeding will be established to produce an improved variety for this section of the state.

Soil investigations.

- (a) To determine the needs of the soils of this area.
- (b) A study of methods of eliminating "slick spots."

High Altitude Substation

Small-grain investigations.

- (a) Variety tests with wheat, oats, barley, and miscellaneous grains under high altitude conditions.
- (b) Rate, date, and depth of seeding winter wheat on dry-land.
- (c) Variety test of cereals for the production of hay.

Field and garden pea investigations.

- (a) To determine the varieties best adapted to dry-lands.

Forage and miscellaneous crop investigations.

- (a) To determine the best varieties of grasses and legumes for the production of forage and the most successful cultural practice.
- (b) The introduction and testing of such crops as flax, buckwheat, sunflowers, corn, etc., for the production of grain or forage.

Horticultural investigations.

- (a) The introduction and testing of apples, pears, and plums and small fruits to determine their winter hardiness and adaptability to high altitudes.
- (b) The planting of ornamental trees and shrubs for the improvement of the homestead.

*In cooperation with the U. S. Department of Agriculture.

Sandpoint Substation

Small-grain investigations.

- (a) Variety tests with wheat, oats and barley.

Field and garden pea investigations.

- (a) Variety tests with standard varieties.

Irrigation experiments.

Irrigation experiments.

- (a) To determine the feasibility of irrigation when used in a comparatively small way supplementary to the non-irrigated farm.

Sheep production.

- (a) To find the value of sheep to the farming system of this region.

Timber-soil investigations.

- (a) To investigate the most efficient method of soil improvement by the growth of legumes.
- (b) To determine the value of lime, gypsum, and sulphur as related to the growth of legumes.
- (c) To investigate the value of commercial fertilizers when applied to crops in a rotation.

Land clearing.

- (a) To determine the cost of and most practical method of clearing land for cultivation.

Dairy-farm management.

PROGRESS OF INVESTIGATIONAL WORK

As has been the practice in former years, a brief summary is made of the work of the various departments and of the substation farms. The summaries presented herewith represent the major projects and deal briefly with the more important achievements of the year.

Agricultural Chemistry

Definite progress has been made by the department of agricultural chemistry in a study of the effect of available nitrogen compounds on the protein of wheat. The results clearly show the part that a liberal supply of available nitrogen in the soil plays in the elaboration of protein in the wheat kernel. The Adams fund project on the tolerance of crops for alkali was actively carried on during the year and dealt with numerous determinations of the sensitiveness of various crops to alkali. Five hundred seventy-five individual sugar analyses were made on beets grown at the Aberdeen Substation in connection with sugar beet improvement investigations. Seven of the most promising varieties were reserved for tests during 1922. A great many determinations were made by the department during the year on soils, feed, fruits and various agricultural crops in connection with projects, the preliminary responsibility for which rested in other departments of the Station.

Agricultural Engineering

The chief activity of the department of agricultural engineering during the past year has been in perfecting a mechanical device for distributing dust poison in the control of alfalfa weevil. Alterations were made in one of the most satisfactory commercial machines now available to cause the dust to settle in a uniform cloud undisturbed by light winds. A report was made during the year on the feasibility of irrigating certain small areas in the Palouse farming section.

Agronomy

Sweet clover cultural tests by the department of agronomy indicate the

desirability of seeding fifteen pounds of good scarified seed per acre to produce the best quality and yield of hay. Most satisfactory stands of sweet clover have been obtained without the use of a nurse crop. Hubam, the annual variety that has recently received a great deal of public attention, does not appear to be adapted to the climatic conditions of north Idaho and is less valuable than the biennial strains. Sudan grass seeded in rows produced three tons of hay per acre, indicating its value as a catch crop. The later dates of planting corn produced higher yields of silage but poorer in quality. The eight-inch spacing of sunflowers produced greater tonnage than the thirty-inch spacing. Extensive greenhouse trails, under complete control, are being made of various treatments for soils representing types from many parts of the state. A new project initiated during the year is concerned with peat soils, which are found to cover considerable areas in some of the northern counties. A soil survey of the Twin Falls area was completed during the summer of 1921.

Animal Husbandry

Sunflower silage has again been used successfully in maintaining the herd of pure bred beef cattle. During the fall and winter of 1920-21, 118 steers and 475 lambs were fed experimentally at the Caldwell Substation, where an extensive feeding plant is provided for investigational work. The steers were divided into ten lots and fed the following rations: Cut alfalfa hay and a heavy allowance of silage; cut alfalfa hay and a light allowance of silage; cut alfalfa hay, barley, and a light allowance of silage; cut alfalfa hay, barley, and a heavy allowance of silage; cut alfalfa hay and a light feed of barley; cut alfalfa hay and a heavy feed of barley; long alfalfa hay; cut alfalfa hay; alfalfa meal and syrup (20 per cent mixture) and alfalfa meal. The results were reported in Experiment Station Circular No. 18.

The lambs were divided into seven lots and fed the following rations: Cut alfalfa hay and barley; cut alfalfa hay, silage and barley; alfalfa meal, silage and barley; long alfalfa hay, silage and barley; long alfalfa hay and barley; alfalfa meal and barley; alfalfa meal and syrup (20 per cent mixture). Experiment Station Circular No. 19 reports in detail the results of this experiment.

Two lots of spring pigs averaging 136 pounds were fed cracked peas compared with tankage as supplements to the basic ration of rolled barley in the economical finishings of hogs for market. The ratio of barley to peas was 3 to 1 and of barley to tankage 91 to 9. The two lots made approximately the same gains.

Bacteriology

It has been found in the investigation of forest soil by the department

of bacteriology that ammonia and nitrate accumulations in the soil are distinctly retarded by applications of sawdust, needles, cones, bark and other tree products. The greatest retardation resulted from the application of cedar sawdust and cedar needles. Maple sawdust, not common to Idaho, was second in order of toxicity. The reduction of ammonia and nitrate accumulation ranged from five to sixty per cent. Nitrogen fixation was greatly decreased by some of the products and practically eliminated by others. The result of this forest soil study indicates that the needles, leaves, cones, and other tree products falling on the soil cause concentration of foreign matter which eventually exerts a toxic action on the beneficial biological activities normally taking place in fertile soil. These investigations are for the purpose of determining the cause of low productivity of timber soil and to discover remedial measures.

The department of bacteriology has entered upon studies of the effect of alkali on bacterial activities in soil to determine the relation of alkali concentration to activities of helpful bacteria.

Dairy Husbandry

The department of dairy husbandry is charged with the official responsibility for Advanced Registry testing. During the year these tests have been conducted as follows: Jerseys, 125; Holsteins, 59; Guernseys, 27; and Ayrshires, 6, an increase of 19.2 per cent as compared with the previous year. Thirty-three breeders have received this service. The official state record for butterfat production has again been broken by an Idaho Station cow, Idaho Violet Posch Ormsby 337275, with a record of 21,379.3 pounds of milk and 805.91 pounds of butterfat. The average production of the College of agriculture herd for the past two years, obtained by crediting every cow with each day she actually produced, was as follows:

| | | |
|------------------------------|-------------------------|------------------|
| 1920....10,816.5 pounds milk | 423.0 pounds butterfat | 3.91% butterfat. |
| 1921....11,429.8 pounds milk | 437.69 pounds butterfat | 3.83% butterfat. |

All animals maintained by the dairy husbandry department are weighed and measured monthly. The inbreeding as compared with outcrossing, and the linebreeding as compared with outcrossing experiments have been continued. Six F¹ and one F² heifers will soon come into milk. New lines of work started during the year are concerned with rations for young dairy stock, feed for wintering dairy heifers, value of feeding dairy cows during the dry-rest period and the comparisons of the feeding value of varicus silages.

Entomology

The major projects in entomology during 1921 were the continuation of life history and methods of control studies on clover aphid, experiments with poison dusts in the control of alfalfa weevil, tests with spreaders for orchard spray materials, life history studies of the codling moth and investigations of the eelworm disease of red clover. In addition, some attention was given by the Station Entomologist to aphids attacking stone fruits, to the cabbage and radish maggot and to other orchard insects. A complete report was prepared covering three years' intensive

study of the clover aphid. This report will be published the coming year. Casein was found to have a high value as a spreader when used with sprays for controlling the codling moth. Such progress was made on all investigations that several manuscripts dealing with problems of considerable economic importance to the state are nearing completion.

Farm Management and Farm Economics

The two farm management studies, one in the Palouse district in cooperation with the Washington State College, and the other in the Twin Falls district in cooperation with the Office of Sugar Beet Investigations, were continued during the year. The fact of special interest in studying the cost of producing various crops, was the wide range between the lowest and the highest cost of production per bushel, or per other unit. The facts collected include the basic acre requirements, such as horse and man hours, seeds, sacks, etc. At any time current costs may be applied to these basic requirements and the cost of production per unit be quickly brought down to date. A part of the information secured in the Twin Falls district deals with the relative profitableness of competing crops. This information, together with the range in cost of production and other data of interest, is being published in bulletin form.

Forestry

During the past year Bulletin 1003, entitled Distillation of Stump Wood and Logging Wastes of Yellow Pine, was published by the U. S. Department of Agriculture in cooperation with the University of Idaho. Studies during the summer of 1921 have provided a mass of data to be used in mapping the logged-off lands of Idaho. A preliminary report has been issued on work aimed at determining the relative durability of commercial Idaho woods under field conditions.

Horticulture

A large number of trees in the apple breeding project fruited during the year. The records taken include data regarding keeping qualities. No seedlings have as yet produced fruit that is greatly superior to existing varieties. Several seedlings under observation have considerable merit, however, for special purposes. One of the Wagener-Ben Davis crosses is at least a month earlier than the Wagener and its season extends beyond the Wagener.

The tomato breeding is directed toward developing strains that are earlier than those now in use in this district and, in addition, are heavier yielders of well-shaped fruit. The best results so far are from certain selections of Earliana.

Studies of vegetable garden seed production indicate a field for that industry in Idaho. Tests of fertilizers for vegetable crops have recently been initiated. A small block of English walnut trees in the experimental orchards have recently come into bearing.

Plant Pathology

That the temperature and moisture content of the soil at seeding time have a very definite effect upon the amount of smut present in the crop at

harvest has been definitely established by the department of plant pathology. The amount of smut infection increased as the amount of moisture increased up to saturation. The highest infection developed at the lowest temperatures. An extended survey of the potato-producing regions of Idaho revealed the fact that mosaic and leaf-roll are very common in the state, and that they are causing each year an increased amount of damage. In the study of calico and russet dwarf disease of the potato, it has been found that the calico disease is apparently transmitted only by means of the diseased tubers while russet-dwarf appears to be carried not only by tubers from diseased hills but evidently also is spread from plant to plant in the field.

Poultry Husbandry

That skim milk is the most profitable source of protein for laying hens is shown by the first year's study of the various sources of protein by the department of poultry husbandry. The skim milk may entirely replace the meat scraps in the rations, and when fed with peas and pea meal it greatly enhances their value. The skim milk gave an excellent profit over feed cost with average production thruout the year of 47.4 per cent for leghorn pullets. The feeding work to date indicates that poultry keepers do not need to go out of the state to secure grains for feeding their poultry.

Zoology

The cytological studies of the reproductive cells of sheep is nearing completion. New work has been started on the reproductive cells of goats. Tissues have been obtained from both horned and hornless goats. The preliminary studies indicate that horns are transmitted as a sex-linked character, the same as in sheep.

Aberdeen Substation

L. C. Aicher, who was for ten years superintendent of the Aberdeen Substation, resigned to become superintendent of the Fort Hays Experiment Station at Hays, Kansas. Mr. Aicher was succeeded by A. E. McClymonds, a graduate of the Kansas State Agricultural College, who had experience in superintending the agronomy farm at Manhattan, Kansas, and was for two years extension agronomist for the Colorado Agricultural College.

There has been a wide call for the bulletins written by Superintendent Aicher dealing with seed production and with potato experiments. Remarkable fine reports have been received from farmers regarding the success had with growing the Idamine oats, selected and developed by the Aberdeen Substation. Common Federation wheat has in recent years out-yielded all other varieties grown on the Substation farm, and is now being increased for field tests in the various counties in the irrigated region.

Caldwell Substation

Early in 1921 twelve acres of the Caldwell Substation were mapped for the purpose of definitely locating the "sick spots." This tract of land

has been set aside for experimental work to determine methods of slick spot elimination. The trials include the use of sweet clover and alfalfa as green manure and the application of various soil amendments.

Several varieties of corn are under test for the purpose of determining those varieties best adapted to the production of silage and those especially adapted for growing mature ear corn. The yields of silage on the basis of harvesting 100 hills of each of the varieties, varied from 8.53 tons to 22.39 tons per acre.

Tests were initiated late in 1921 to test methods of growing out dairy heifers, dividing the Substation yearling heifers into two groups. One lot was fed hay alone, a common practice in the irrigated regions, and the other was fed hay and corn silage. The Substation cows are divided into two groups, one fed hay alone and the other fed hay and corn silage. The steer and lamb feeding investigations are found discussed in this report under animal husbandry.

High Altitude Substation

The variety and cultural tests carried on at the High Altitude Substation yielded valuable information during the year. Triplet yielded highest of the winter wheats followed closely by Hybrid 143. The yield of Triplet was 41 bushels per acre. One wheat under test yielded as low as 9.4 bushels. Trebi again outyielded other barleys. Peas were badly damaged by early frosts of 1921. Rosen rye yielded 29.6 bushels per acre. In the rate of seeding tests an increase of the rate from three to four pecks gave an increased yield of eleven per cent. An additional peck in the rate of seeding above four pecks yielded an increased return of less than five per cent. The dates of seeding tests included seedings at 15-day intervals from July 15th to October 15th. These various seedings gave variations in yield from 17.3 bushels to 38.8 bushels. Seedings of August 15th and September 1st gave the highest yields. Turkey red wheat was used in each of these tests.

Sandpoint Substation

C. W. Raney, superintendent of the Sandpoint Substation, resigned early in 1921, and was succeeded by J. H. Christ. Mr. Christ is a graduate of the University of Idaho College of Agriculture.

Precipitation during the four months from May to August, inclusive, was 3.63 inches less than the ten-year average. The early seeding of sunflowers gave the larger yields. Hill selection of potatoes has been initiated as a new line of work on the Substation farm because of the interest in Bonner and neighboring counties in the growing of seed potatoes. Sweet clover yielded, on a unit of one acre, 6,690 pounds of first-cutting and 910 pounds of second-cutting, or a total acre-yield of three and three-fourths tons. Red clover, in a contiguous acre-plot, yielded 2.1 tons.

Picric acid was successfully used in land clearing. Experiments in the feeding of dairy cattle included trials with roughage alone as compared with roughage and grain in feeding for milk production. The pure bred Shropshire flock now numbers 35 head of registered sheep.

FINANCIAL STATEMENT

University of Idaho Agricultural Experiment Station in account with the
United States Appropriations.

| Dr. | Abstract | Hatch | Adams |
|---|-----------------|-------------|-------------|
| To balance from appropriation 1919-1920..... | | None | None |
| Receipts from the treasurer of the U. S. for the year ending June 30, 1921 | | \$15,000.00 | \$15,000.00 |
| Cr. | Abstract | | |
| By Salaries | 1 | \$10,757.19 | \$10,756.25 |
| By Labor | 2 | 1,884.29 | 1,575.45 |
| By Publications | 3 | | |
| By Postage, Stationery | 4 | 17.86 | 16.10 |
| By Freight, Express | 5 | 67.73 | 325.93 |
| By Heat, Light, Water, Power | 6 | 38.75 | 73.60 |
| By Chemicals, Laboratory Supplies | 7 | 527.41 | 614.86 |
| By Seeds, Plants, Sundry Supplies | 8 | 245.32 | 396.84 |
| By Fertilizers | 9 | | |
| By Feeding Stuffs | 10 | 571.75 | 195.75 |
| By Library | 11 | 10.60 | 6.03 |
| By Tools, Machinery, Appliances | 12 | 119.00 | 453.23 |
| By Furniture, Fixtures | 13 | 84.00 | |
| By Scientific Apparatus, Specimens | 14 | 58.74 | 273.13 |
| By Livestock | 15 | | |
| By Traveling Expenses | 16 | 603.31 | 249.23 |
| By Contingent Expenses | 17 | 5.00 | |
| By Buildings, Lands | 18 | 9.05 | |
| Total..... | | \$15,000.00 | \$15,000.00 |

RECEIPTS ON LOCAL STATION FUND

January 1, 1921-December 31, 1921.

| Source | Amount |
|---|------------|
| Balance on hand, Jan. 1, 1921..... | \$ 793.37 |
| Receipts Jan. 1, 1921-Dec. 31, 1921..... | 2,509.06 |
| Total | \$3,302.43 |
| Expenditure Jan. 1, 1921-Dec. 31, 1921..... | 1,544.26 |
| Balance Dec. 31, 1921 | 1,758.17 |

Receipts by Departments

| | |
|------------------------------|------------|
| Interest and General | \$ 299.74 |
| Horticulture | 943.26 |
| Agronomy | 211.33 |
| Agricultural Chemistry | 10.00 |
| Poultry | 1,024.73 |
| Plant Pathology | 20.00 |
| | \$2,509.06 |

DISBURSEMENTS

| Item | Agr. | | | | Plant | | | Total |
|----------------------------|---------|---------|----------|---------|----------|---------|----------|------------|
| | Adm. | Chem. | Agronomy | Dairy | Hort. | Path. | Poultry | |
| Labor | | | \$105.20 | \$65.00 | \$222.03 | \$16.93 | \$ 45.80 | \$ 454.96 |
| Postage and Staty. | \$14.10 | | 10.60 | | | | 4.50 | 29.20 |
| Freight and Express .. | | | | | 35.79 | | 13.95 | 49.74 |
| Sundry Supplies .. | 27.00 | \$30.90 | 69.34 | | 146.93 | | 32.10 | 306.27 |
| Feed | | | | | 69.92 | | 72.90 | 142.82 |
| Library | | 15.00 | | | | | | 15.00 |
| Tools and Mach. | | | 39.75 | | 124.00 | | 105.20 | 268.95 |
| Fefunds | | | 54.10 | | | | | 54.10 |
| Land Rental. | | | | | 37.50 | | 10.00 | 47.50 |
| Travel | | | | | 107.85 | 22.25 | 45.62 | 175.72 |
| | \$41.10 | \$45.90 | \$278.99 | \$65.00 | \$744.02 | \$39.18 | \$330.07 | \$1,544.26 |

FINANCIAL STATEMENT

The following are the receipts from Substations during the period
Jan. 1, 1921- Dec. 31, 1921.

| | Aberdeen | Caldwell | Sandpoint | High Altitude |
|--|------------|-----------|-----------|---------------|
| Receipts from sale of live- stock, hay, grain, potatoes, milk, etc. | \$1,738.14 | \$ 952.89 | \$997.39 | |

EXPENDITURES OF SUBSTATIONS

Jan. 1, 1921-Dec. 31, 1921

| | Aberdeen | Caldwell | Sandpoint | High Altitude |
|-----------------|------------|-------------|------------|---------------|
| Salaries | \$2,034.86 | \$ 5,340.33 | \$2,710.46 | \$2,045.14 |
| Expense | 882.21 | 4,687.69 | 2,138.90 | 247.18 |
| Labor | | 628.55 | 66.90 | |
| Supplies | 1,780.96 | 3,742.89 | 2,655.00 | 786.50 |
| Equipment | 25.00 | 355.00 | 623.67 | 792.00 |
| | \$4,723.03 | \$14,754.46 | \$8,194.93 | \$3,879.82 |

