

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

More calls for Experiment Station service have been received during the past year than at any time within the memory of the Director. From nearly every important agricultural section of the state have come requests from farmers, orchardists, and stockmen for assistance in their farm operations, and help in the direction desired has, as a rule, involved fundamental agricultural investigation.

The people of the state have indicated a greater appreciation of the economic importance of agricultural investigation. It is well established that a high yield per acre of grains, seed, or forage crops generally is assurance of net profit, that the success of livestock keeping is dependent upon feeding and management and that it is useless to grow field or orchard crops unless there is assurance of adequate protection from pests and diseases. In general, it is recognized that the Experiment Station, in finding new knowledge and discovering new principles governing soils, crops and livestock, has performed and is performing a highly important function for Idaho agriculture.

There has been closer coordination between agricultural investigation and agricultural extension than in former years. The Experiment Station, a fact-finding organization, is a partner with Extension, with its knowledge-disseminating functions. Extension employees assist the Experiment Station by calling the attention of members of the Experiment Station staff to important problems that need study. The Experiment Station furnishes the background of knowledge used by extension workers in their field programs.

The state-wide character of the service of the Experiment Station has become better understood and has received general public approval. In a few states one or two properly located experimental farms may serve the entire state. Idaho, however, is a state with great diversity of soil and climatic conditions. The altitude ranges from little more than 600 feet in the Lewiston Valley to more than 6000 feet in the Teton Basin. Rainfall in regions where farming is practised varies from 8 to 10 inches in the Snake River plain to more than 25 inches in certain non-irrigated farming regions. Under conditions in this state, therefore, it is impossible for a single experimental farm, no matter where located, to render adequate service to farm interests.

The present plan provides five experimental farms and several field stations and points of contact with special experimental problems. The branch station at Sandpoint serves the cutover regions. The central farm at Moscow conducts investigations of interest to a large farming region

in the northern and central part of the state. The irrigated farm at Caldwell is maintained to deal with peculiar soil problems of southwestern Idaho and to serve as the location for important animal feeding and dairy cattle management studies. The irrigated crop station conducted in cooperation with the federal Office of Cereal Crops and Diseases is located at Aberdeen, midway between the Upper Snake and the Lower Snake, and the substation dealing with the problems of the high altitude non-irrigated farm is at Felt in the Teton Basin, at an altitude in excess of 6000 feet. The entomological field station at Parma is maintained there because of easy access to insect problems of both orchard and field crops. It has been found necessary to locate an entomologist at Twin Falls, also, to carry on investigations of the sugar beet leaf hopper. Other points of experimental contact are at Emmett, Lewiston, Ashton, Winchester, and Post Falls.

The coming of new federal funds for the support of research work under the terms of the Purnell Act has brought hope of much greater achievement to the staff of the Idaho station. These funds already have permitted initiation of new lines of investigation that for many years have been requested by farmers of the state.

The first important projects supported with Purnell funds are in agricultural economics and have dealt with markets for Idaho products and with trends of agricultural production. A great deal of statistical data have been accumulated and now are in process of organization for publication. It is anticipated that these initial studies will lead to definite conclusions of value to the farmers of the state. In addition, the investigations will provide a historical background useful in guiding the development of future research projects.

The initial study of home economics problems, dealing with the distribution of time by homemakers, has been completed and a report illustrated with graphs showing the utilization of time both by country women and city women has been published as a bulletin of the station. A similar study is under way dealing with food needs and consumption of the farm family.

The Purnell Fund study of the sugar beet leaf hopper is conducted in cooperation with the Bureau of Entomology, United States Department of Agriculture, the Utah Agricultural Experimental Station, and the Amalgamated Sugar Company. A laboratory with excellent green house facilities is maintained at Twin Falls. A comprehensive survey has been made in Idaho to determine the habitat of the leaf hopper.

Purnell Fund projects other than those mentioned are concerned with influence of dairy sires, alkali land reclamation, irrigation investigations,

alfalfa seed production, eleodes beetle, pasture studies, steer and lamb feeding, and bean diseases.

Purchase of the Aberdeen Substation places the Idaho station in permanent ownership of 76.15 acres of land located midway between the Upper Snake and Lower Snake River basins, and well equipped for experiments in cereal and forage crops production, application of water to soils, plant diseases and other problems of vital concern to farmers of the irrigated districts.

The recently purchased Riley farm of 247 acres, separated from the present holdings only by a highway and by railroad right-of-ways, gives the central station a solid body, except for the highway and railroad right-of-ways, of 600 acres of land, all tillable. The new farm will provide more pasture and hay land, will give additional acreage for increasing promising varieties for distribution to farmers, will provide adequate land for handling the poultry flock, and in other ways will serve the experimental program of the station.

Experimental soils and crops work of special interest to cutover sections in central Idaho is conducted at Winchester. These investigations are without cost to the station except for the expense of supervision. The use of the land, a tract of 10 acres, is donated and all labor costs are met by Miss T. Censky, secretary of the Craig Mountain Lumber Company.

One resignation of a station department head was accepted during the past year, Dr. William M. Gibbs, bacteriologist, resigning to enter upon the study of medicine. The vacancy was filled by election of G. L. A. Ruehle of Michigan State College. Mr. Ruehle has had training in the University of Washington, Cornell University, and Michigan State College, and he comes to Idaho after 15 years of service in bacteriological research in two of the best known American agricultural experiment stations.

Continuity of service has contributed materially to the marked accomplishments in research during the year. Twenty-nine members of the staff, employed in various capacities from assistant to department head or project leader, at the middle of the calendar year had an average tenure of employment in the Idaho Station of six and four-tenths years.

Publications

The bulletins and circulars published during the past two years have been written in popular style and have been in much demand. Investigations of a more fundamental nature have been reported in technical papers and published in various scientific journals.

The list of publications follows:

- 141 Growing Sunflowers for Silage in Idaho, H. W. Hulbert and J. H. Christ.
- 142 Work and Progress of the Agricultural Experiment Station for the Year ended December 31, 1925, E. J. Iddings.
- 143 Alfalfa Seed Production in Southern Idaho, A. E. McClymonds.
- 144 Cream Pools in Idaho, F. W. Atkeson and D. L. Fourt.
- 145 Rate, Date, and Depth of Seeding Winter Wheat under High Altitude Conditions, W. A. Moss.

Circulars.

- 38 Suggestions for Cropping Peat Soils, G. R. McDole.
- 39 Publications Available for Free Distribution.
- 40 Lamb Feeding Experiments, 1925-1926, R. F. Johnson and Others.
- 41 Publications Available for Free Distribution.

Research Bulletins.

- 5 The Relation of the Yield and Protein Content of Wheat to the Nitrogen Content of Soil under Ten Years of Different Systems of Cropping, Ray E. Neidig and Robert S. Snyder.
- 6 False Wireworms Injurious to Dry-Farmed Wheat and a Method of Combatting Them, Claude Wakeland.

Research Papers.

- 39 Surface Tension and Bacterial Growth. *Journal of Bacteriology* 11, 393-1926.
- 40 Drill Calibration and Its Relation to Stand and Yield of Small Grains. *Journal of American Society of Agronomy*, Vol. 17, No. 2, Feb., 1925.
- 41 The Physiological Effect of Feeding Rations of Canadian Field Peas on Growth and Reproduction in Swine. *Journal of Agricultural Research* (Submitted for Publication).
- 42 The Cause of Low Productivity in Recently Cleared Coniferous Timber Lands. *Soil Science* (Submitted for Publication).

Miscellaneous Publications and Technical Papers.

Progress Report on the Relation of Electricity to Agriculture in Idaho. M. R. Lewis.

The Relation of Surface Tension to Bacterial Development.

Effect of Wood and Tree Products on Bacteriological Activities in Soil. II, Study of Forest Soils.

Read before the Western Society of Agronomy, Logan, Utah, 1926.

Optimum Stands—An Essential in Field Pea Investigations.
H. W. Hulbert.

A Tentative Classification of Pisum. J. D. Remsberg.
 Applicability of the Indirect Method of Analysis to Determination of Sodium and Potassium in soil solutions. Ray E. Neidig and Dr. W. B. Bollen—Industrial and Engineering Chemistry.

Mailing List.

Residents of Idaho	16,150
Residents of Other States	4,560
Foreign	185
Total	20,895

Active Projects

All work in the Agricultural Experiment Station is organized on a project basis. Each piece of work in progress at the present time is conducted according to a written plan, a copy of which is on file in the Director's office, and copies are provided for the use of those conducting the work.

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

Agricultural Chemistry

The iodine content of Idaho grown foods in relation to the prevalence of goiter.

Slick spot investigations and peat investigations. (In cooperation with Agronomy).

Feeding experiments: (a) The comparative value of various silages for milk production; (b) Winter rations for young stock in Idaho; (c) Feeds for wintering dairy heifers under practical farm conditions in Idaho. (In cooperation with Dairy Husbandry).

Studies in animal nutrition; (a) The effect of various feeds upon gains made and quality of pork produced; (b) The physiological effect of feeding rations restricted to Canadian field peas on growth and reproduction in swine. (In cooperation with Animal Husbandry).

Leaf roller control studies.
 Chlorosis studies. (In cooperation with Horticulture).

*Alkali Investigations:

1. Tolerance of crops for alkali.
2. Chemical aids to reclamation of alkali soil by drainage.
3. Drainage surveys.
4. Alkali survey.
5. Effect of alkali salts on bacteriological activities of soils. (In cooperation with Bacteriology).

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

Cause of unproductiveness of recently cleared coniferous timber soils, relation of toxicity thereto and corrective measures.

Rotation and fertility investigations at Moscow and Sandpoint. (In cooperation with Agronomy and Sandpoint Substation).

Chemical studies of soil survey samples. (In cooperation with Agronomy).

Agricultural Economics

*Primary markets for Idaho potatoes, cheese, eggs, beef, and mutton, and the extent of competition in these markets represented by the production of other states.

*An economic study of irrigated farming in selected areas of southern Idaho.

A study of the changes that have taken place

in the production of beef cattle in Idaho, and the reasons for these changes.

A study of the changes that have taken place in the production of sheep and wool in Idaho, and the reasons for these changes.

A study of the changes that have taken place in dairying in Idaho, and the reasons for these changes.

*In cooperation with United States Department of Agriculture.

Agricultural Engineering

*Reclamation after drainage as one of the factors underlying the economic use of water in irrigation. (In cooperation with Agricultural Chemistry and Agronomy).

Conditions governing the application of irrigation water as one of the factors underlying the economic use of water in irrigation.

The duty of water as one of the factors underlying the economic use of water in irrigation. (In cooperation with Aberdeen Substation).

Relation of dust to motor operation.

The relation of electricity to agriculture.

Agronomy

Small grain improvement: (a) wheat; (b) oats; (c) barley; (d) rye, emmer, flax and miscellaneous grains. (In cooperation with the substations).

Forage investigations: (a) grasses and legumes for hay and seed; (b) cultural tests with alfalfa; (c) introduction and testing of miscellaneous forage crops; (d) seed production; (e) alfalfa improvement—(1) breeding, (2) hard seed study, (3) identification studies with seedlings.

Field and garden pea investigations: (a) classification studies; (b) cultural experiments; (c) breeding and improvement.

Corn breeding and improvement: (a) cultural experiments; (b) breeding and improvement.

Weed eradication investigations.

Silage crop investigations: (a) cultural tests of corn for silage production.

Tests with commercial fertilizers.

Soil amendments: 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).

*Soil survey: (a) a detailed survey of a designated area each season as funds permit.

*Irrigated soil investigations: (a) correction of alkali and "slick spots." (In cooperation with Caldwell Substation and Agricultural Chemistry).

Timber soil investigations: (a) plots located at Sandpoint Substation. (In cooperation with Sandpoint Substation and Agricultural Chemistry).

Reclamation of overflow lands. (In cooperation with Agricultural Chemistry).

Animal Husbandry

Steer feeding investigations at Caldwell.

Lamb feeding investigations at Caldwell and Aberdeen.

Studies in the growth of wool.

The influence of Canadian field pea rations on quality of pork produced.

Physiological effect of feeding rations restricted to Canadian field peas on growth and

reproduction in swine.

The effect of field pea rations on the skeleton development in swine.

Hogging-off field crops.

Protein supplements with barley and wheat for growing and finishing swine.

Cost of keeping brood sows, developing and finishing the market hog, and breeding gilts.

Bacteriology

Studies in udder infection.

Sterility in the bovine male.

Study of scours in dairy calves.

The isolation and study of nitrifying bacteria.

Legume culture preparation.

Dairy Husbandry

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).

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

*A study of the effects of the use of dairy sires selected from dams of known production

upon the production of offspring.

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 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 management.

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

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

Entomology

Alfalfa weevil: **Control by dusting from an airplane. Breeding and liberation of parasites. Aphids: Control on prunes and apples.

*Beet leaf hopper: Study of distribution and of native host plants. Selection and breeding of disease-resistant strains of sugar beets. Ecology of the disease and of the insect which

transmits it.

Coaling moth: Life cycle studies in southwestern Idaho. Control investigations.

Eleodes beetles: Collecting and classifying all species in the state.

Fruit tree leaf roller: Control experiments under Idaho conditions. (In cooperation with

*In cooperation with United States Department of Agriculture.

**In cooperation with Bureau of Entomology, United States Department of Agriculture.

Agricultural Chemistry).

Oil sprays: Investigations in preparation and use of oil sprays in the control of orchard insects and of their effects upon the trees. (In cooperation with Montana, Washington, California, Oregon, and with the Bureau of Entomology, United States Department of Agriculture.)

Onion thrips: Experiments in control with

poisoned materials applied as a covering to the onion leaves.

Leaf hoppers of Idaho: A systematic study and collecting of species.

Mineola scitulella: Life history studies and control experiments.

San Jose Scale: Control in southern Idaho by use of oil sprays.

*Wireworms: Experiments in control.

Forestry

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

Agricultural possibilities of logged-off lands.
Grazing studies.

Home Economics

*A study of the use of time by farm women.

Horticulture

Potato production experiments.

Experiments in the control of western yellow tomato blight by breeding and selection. (In cooperation with Plant Pathology).

Varietal study and cultural tests in producing head lettuce.

Experiments with various sprays for the control of the leaf roller. (In cooperation with Agricultural Chemistry).

Pruning investigations.

Orchard fertilization tests. (In cooperation with Agronomy).

The testing of new spray materials.

Apple breeding.

Variety testing of fruit trees, small fruits, and vegetables.

A study of bulb culture in Idaho.

**Plant Pathology

Comparison of various treating agents for grain smut control.

Potato seed treatment investigations.

Study of western tomato blight. (In cooperation with Horticulture).

Study of stripe rust of grains and grasses. (In cooperation with the Office of Cereal In-

vestigations, United States Department of Agriculture.)

Mosaic and leaf roll of potatoes.

Soil moisture and soil temperature in relation to bunt infection.

Bean disease investigations.

Poultry Husbandry

The influence of feeds of high vitamin content upon the production and hatching quality of eggs and upon the health of the layers.

The inheritance of weight, shape, color, and texture of shell of eggs in the Single Comb White Leghorns.

The value of certain vegetable protein feeds supplementing sour skimmilk in a ration for laying hens.

The correlation of factors of production and

egg characteristics in the Single Comb White Leghorn.

The comparative value of certain feeds as supplements to peameal for laying hens.

The relation of certain constituents of sour skimmilk to egg production.

The comparative cost of producing baby chicks with different types of incubators.

The influence of humidity on the hatchability of eggs.

**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.

Potato investigations: (a) varietal experiments; (b) tuber-unit potato improvement.

Study of trees with respect to environment.

Lamb feeding investigations.

Duty of water for selected crops.

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; (c) alfalfas and clovers.

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

Sod fertility investigations: (a) to determine effect of sulphur on yield of alfalfa; (b) crop rotations designed to maintain soil fertility and crop yields.

Pure seed distribution: (a) increase and distribution of pure seed of various crops which have been improved.

*In cooperation with Bureau of Entomology, United States Department of Agriculture.

**In cooperation with United States Department of Agriculture.

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; (c) dairy cattle 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 soils of this area; (b) a study of methods to eliminate "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; (d) rate of planting oats.

Fallow and cultural tests with wheat.

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 pro-

duction of grain or forage; (c) effect of sweet clover upon crop yields.

Horticultural investigations: (a) the introduction and testing of apples, pears and plums, and some 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.

Rotation experiments, primarily to discover the value of sweet clover in soil improvement.

Rotation experiments with peas and wheat.

Field and garden pea investigations: (a) to determine the varieties best adapted to dry lands.

Sandpoint Substation

Small grain and field pea investigations: (a) varietal experiments with winter wheat and barley, spring wheat, barley, oats, and field peas; (b) rate and date of planting winter wheat and barley and spring wheat; (c) oat varieties for peat soils; (d) rate and date of planting field peas.

Root crop investigations: (a) tuber-unit potato breeding; (b) comparison of different selections of potatoes; (c) variety test of potatoes; (d) rate and date of planting potatoes; (e) comparison of eye and stem end upon yield of potatoes; (f) comparison of various root crops for forage and seed.

Sheep management: (a) cost of production.

Forage crop investigations: (a) alfalfa and red clover and production; (b) legume variety

test; (c) cultural experiments with alfalfa; (d) vetch variety tests; (e) grass variety test for hay and seed; (f) annual grains and legumes for hay; (g) legume combinations; (h) nurse crop trials.

Silage crop investigations: (a) rate and date of planting sunflowers; (b) variety test of corn; (c) comparison of silage crops.

Soil investigations: (a) use of legumes in building up soil fertility; (b) the value of lime, gypsum, and phosphate as fertilizers; (c) rotation experiment; (d) effect of cultipacking upon yield of grains; (e) effect of continued cropping upon the yield of spring wheat; (f) effect of sweet clover upon nitrogen accumulation and crop yields; (g) fertility problem on peat as relating to grain production.

*In cooperation with United States Department of Agriculture.

Needs

The Agricultural Experiment Station never has had sufficient money to publish its findings promptly. It needs a larger budget for the publication of regular bulletins and circulars as well as for the issuance of popular announcements to make the work of the Station generally known throughout the state.

Some progress has been made during the year in improving the physical equipment on the substation farms. Further provision is needed for improvements. Repairs of buildings and paint are needed at the Sandpoint Substation. Improvements in storage and general farm equipment at the High Altitude Substation have been urged for several years. A laboratory

building for the convenience of our own employees and for the use of visitors from the federal Department of Agriculture should be constructed at the Aberdeen Substation early next year. Each summer several representatives of the Office of Cereal Crops and Diseases and of other divisions of the United States Department of Agriculture visit the substation, some of them spending several weeks there in research. This intensive work having to do with plant breeding, plant disease studies, and other technical problems of agronomy, is seriously handicapped at present by lack of a suitable laboratory for handling many phases of this work.

A machinery shed and additional shelter for animals are needed at the central station and nearly all of the barns and other structures should be painted. It is of the utmost importance that buildings on the central station and on the substations be painted at frequent intervals, both to preserve the buildings and to give them a neat and attractive appearance.

There has not been in former years adequate provision for clerical help. Too much of the written record-keeping and tabulation must be done by the regular members of the research staff. Additional help will expedite compilation and will hasten early issuance of findings of the Experiment Station.

For something like a year negotiations have been conducted with the Bureau of Animal Industry of the United States Department of Agriculture looking toward cooperation with that bureau in the supervision of the sheep breeding station at Dubois, Idaho. The bureau offers to share the direction of this work and to permit the initiation of certain phases of investigation of especial interest to Idaho in consideration of the furnishing of land for the growing of forage crops, especially alfalfa hay. Some tracts of land in the vicinity of Dubois have been inspected. It is hoped during the next few months that a plan of cooperation may be arrived at that will permit the Idaho Experiment Station to participate in the important research in progress at Dubois.

The Experiment Station is organized for fact finding. New knowledge created by it ordinarily yields direct returns to farming interests. Money expended for agricultural research adds to state wealth and promotes general state welfare.

PROGRESS OF INVESTIGATIONAL WORK

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

Agricultural Chemistry

In accord with the policy of previous years, chemical projects have been selected with special reference to problems of state-wide interest. It has been necessary to modify plans from year to year, stressing at times certain lines of investigation more than others.

The work on tolerance of crops for alkali salts has been a major project. Reports have been published on several of the important crops of Idaho. During the past year the work was confined to beans, since beans occupy such an important place in the agricultural program of Idaho, and particularly because they are one of the major crops of irrigated sections. Four crops of beans have been grown on definite mixtures and concentrations of alkali salts and they have been found to be more sensitive to alkali than any of the crops previously studied. It is imperative, therefore, that soils upon which beans are to be successfully grown be kept free from alkali salts by proper irrigation and drainage.

Alkali Survey

From year to year a certain portion of the state is examined for alkali salts. The kind and the amount are carefully ascertained. In some cases it is necessary to check these results from year to year to determine whether there is an accumulation or decrease of alkali. The department has much data on hand which it expects to be of great value in determining the need of drainage. Especial attention has been given this year to new localities, the Little Willow District near Payette and in the Upper Snake River Valley. In addition, work has been continued in Twin Falls, Franklin, and Canyon Counties to check the effectiveness of drainage projects now in operation in these localities.

Chemical Aids to Reclamation

The laboratory studies in progress during the past two years have been completed and a full report will be issued in the near future. The results show that the physical condition by different treatments constitute as important a factor in crop production as does the actual alkali salt content of the soil. Chemicals used in this investigation, which may be called correctives, are sulphur, gypsum, alum, iron sulphate, and sulphuric acid. The results of these laboratory experiments made possible their use on a large scale in field experiments.

Field Studies of Alkali Lands

Material progress has been made in the reclamation program. It has been possible to combine the efforts of the federal and state agencies and to pursue jointly, on a large and intensive scale, field studies on reclama-

tion. The cooperating agencies of the Agricultural Experiment Station are the departments of agricultural chemistry, agricultural engineering, and agronomy. The federal agency is the Bureau of Public Roads of the United States Department of Agriculture. This arrangement made it possible to combine the work, enlarge the experiments, which were already under way at Caldwell by the Idaho Station, and place J. C. Marr, an experienced investigator, in charge of the field investigations. The Bureau of Public Roads meets the expense of Mr. Marr and in addition matches the sum expended by the Idaho Station. A lease of a tract of land near Caldwell has been taken for five years with a provision for extension to cover a total period of 10 years or more.

Much progress has been made in field studies on reclamation of alkali lands. At Banida the shallow tile drainage system installed in 1924 has been very effective in removing salts from the surface soil and in producing material increase in crop growth. The removal of saline salts is developing some alkali and the undesirable structure common to carbonated soils. How extensive the trouble will be and what means will be necessary to counteract this situation is being carefully watched on a six-acre plot.

Slick Spot Investigations

Slick spot investigations on the Caldwell Substation also have been greatly extended. Some of the same general practices are being applied to the slick spots as are used on the alkali tract. A field has been laid out above the Forrest ditch, in the native sage brush on the substation, and a pump installed. Intensive laboratory study is being carried out on the particular strata which seems to cause the slick spots to appear in an effort to discover the theoretical cause of the trouble and possibly remedial treatment.

Yield and Protein Content of Wheat

A progress report has been issued, Research Bulletin No. 5, which reports 10 year results of work on the relation of yield and protein content of wheat to the nitrogen content of the soil. Other reports will be published from time to time. These should become more valuable as the experiments are continued. At the close of 10 years, some of the cropping systems were modified to meet practical conditions as they now exist.

Fertility of Coniferous Timber Soils

This work, which has been in progress for a number of years, is nearing completion. Pot cultures of timber soil show that fertilizers, with the exception of nitrates, have little or no effect. Nitrogenous fertilizers,

altho effecting some increase in crop yield, do not show the anticipated increase of growth. Work now completed indicates that retarded growth is due to the presence of a number of resinous-like bodies which inhibit nitrification and also show toxicity to plant growth in culture solutions. Research of the bacteriological department corroborates this conclusion.

A second phase of the work on animal nutrition, entitled "The Physiological Effect of Feeding Rations of Canadian Field Peas on Growth and Reproduction in Swine", has been completed and will be published.

A third phase, entitled "The Effect of Canadian Field Peas on the Skeleton in Swine," has been completed in cooperation with the animal husbandry department and the mechanical engineering department. The effect of peas, when fed alone and when fed in combination with minerals, with barley and with barley minerals upon the breaking strength and chemical composition of the bones has been determined.

Considerable work has been done in cooperation with the department of dairy husbandry upon the coumarin content of sweet clover. Analyses have been made of the coumarin content at various stages of growth upon both the first and second year crops. Analyses also were made of these same stages of growth for their moisture, fat, ash, crude fiber, protein, and nitrogen-free extract. Several different methods have been tried in the determination of coumarin in sweet clover.

Arsenic Problem

The rules of the federal Bureau of Chemistry with reference to arsenic on apples entering interstate commerce brought requests for aid in making arsenic determinations. Experiments are in progress dealing with various methods of removing arsenic from apples.

Chlorosis of Trees and Shrubs

Considerable time has been spent in the study of chlorosis of trees and shrubs in several sections of Idaho. Marked progress has been made during the past year. It has been definitely established that chlorosis is associated with high calcium carbonate soils and that such soils prevent the proper assimilation of iron in the tree or plant altho an analysis of the soil shows a considerable amount of total iron present. Experiments are now under way to determine whether incorporating iron sulphate in the soil around the trees will be successful. Another method consists in placing iron sulphate in contact with exposed roots of the trees. Much field work is in progress in southern Idaho and the work is being supervised, not only by this department, but also by the departments of agronomy and plant pathology.

Overflow Lands of the Coeur d'Alene

Field and laboratory experiments have indicated that some lands overflowed in the vicinity of the mines of northern Idaho can be reclaimed by addition of limestone. Much progress has been made on this problem.

Cooperative Work

A great deal of cooperative work is in progress with other departments. The department is called upon for much outside analytical work. Whenever such analyses will benefit a considerable number of people or will solve certain local problems, the department makes every effort to meet such requests.

Agricultural Economics

Research work in agricultural economics during the past year may be summarized under four heads as follows:

A preliminary statistical survey of Idaho agriculture; the set-up and approval of several specific projects; concentration of effort on certain of these projects; and, finally, cooperation with the federal and state Departments of Agriculture in the conduct of an economic survey of Idaho agriculture.

The purpose of the preliminary survey was to assemble all the available bibliographical and statistical data which might serve as background material for further research. Five projects were set up and approved: (a) A study of primary markets for Idaho potatoes, eggs, beef and mutton, and the extent of competition in these markets represented by the products of other states, 1914-1924; (b) An economic study of irrigated farming in selected areas of southern Idaho; (c) A study of the changes that have taken place in dairying in Idaho, and the reasons for these changes; (d) A study of the changes that have taken place in beef production in Idaho and the reasons for these changes; (e) A study of the changes that have taken place in the sheep industry in Idaho and the reasons for these changes.

In the first of these projects a study of the primary markets for Idaho potatoes and the extent of competition in these markets represented by the production of other states has already been completed so far as the early potato deal is concerned. Work is continuing on a study of the late potato deal. Some headway also has been made with the study of the markets for Idaho eggs. The Boise reclamation project was selected for the first economic study of irrigated farming and the results of this study are nearly in shape for publication.

Active cooperation with the other agencies involved in the survey of Idaho agriculture has been of considerable help in carrying out the pro-

gram. This survey has been of such a nature as to go hand in hand with the regular research studies of the Experiment Station, thereby tending to secure a maximum of results with a minimum of effort.

With the exception of the first project listed above, the major share of the economic research has been carried on by G. L. Sulerud, assistant economist. C. F. Wells, formerly of the staff of the School of Business Administration, rendered invaluable service in connection with the first project.

Agricultural Engineering

The two most pressing problems facing the irrigation farmers of the state are those of securing a more effective use of the available water supplies and of reclaiming the alkali lands more or less prevalent in most of the irrigated sections. A research assistant has been employed to study the factors underlying the proper application of irrigation water. This project should lead to a better understanding of reasons for the marked difference in the duty of water occurring in various sections of the state and eventually to a much more efficient use of water on those areas now using excessive amounts.

Application of Irrigation Water

The long series of experiments on permeability of the soil conducted under the French Ministry of Agriculture, give much information as to methods which may be employed and the results which may be expected. The reports of these experiments have been summarized and in part translated.

Preliminary studies of the rate of infiltration of water into soils indicate a very definite relation between the depth of water absorbed and the time during which the water stands on the soil surface. This relation appears to be expressed by the formula $D = cT^n$ in which D equals the depth of water infiltrated in feet, T equals the time of infiltration in hours, c equals a coefficient varying from 0.038 to 1.70 and n equals an exponential factor varying from 0.2 to 0.87.

Variations in the rate of infiltration from 0.038 feet per hour to 0.23 feet per hour occurred within a distance of less than 100 feet on the alkali soils of the tract used in the project on reclamation after drainage. Tests on the Palouse silt loam indicated a rate of 1.70 feet per hour.

Reclamation after Drainage

Studies of the effect of various chemical and irrigation treatments on the leaching out of alkali salts from drained lands have been continued at Banida and Caldwell.

At the former location continued improvement was shown in the crops raised. At Caldwell the work was extended to cover more land and a much greater variety of treatments. Casual inspection indicates that planting with sweet clover and repeated leaching will serve to reclaim land that is not extremely impervious and that has satisfactory under-drainage.

Infiltration trials showed that the rate at which the good and bad spots in the soil took up irrigation water varied greatly. It is evident from these results that the rate of leaching in soils of individual plots will be far from uniform.

Relation of Electricity to Agriculture

The survey of the use of electricity on Idaho farms conducted by the staff of the department under the direction of the Idaho Committee on the Relation of Electricity to Agriculture indicates that about 7,000 out of the total of 40,000 farms in the state are supplied with central station electric service. These farms are very largely concentrated in the irrigated sections of the state where the extensive use of electric energy for irrigation pumping has made possible the wide distribution of electric service.

The survey shows that decidedly more energy is used per month on farms served by the commercial power companies than on those served by the mutual companies on the Minidoka project. This is true in spite of the fact that the monthly bills are lower under the mutual company lines than under the commercial lines.

This project has been extended to cover investigations of the cost of operating electrical equipment on the Caldwell substation. The Idaho Power Company has extended its distribution line to the station and equipment is being installed.

Agronomy

A two-inch rainfall in early June combined with a favorable spring for early planting made the 1926 season a successful one for crop production. Peas and spring grains produced better than average yields and forage crop yields were the highest for several seasons. Winter grain, especially, made an excellent yield of good quality. An early freeze lessened to some extent the yield of corn.

Alfalfa Seed Production

Alfalfa seeded in rows and thinned approximately to a plant to each foot within the row yielded at the rate of 301.5 pounds of cleaned seed to the acre. A similar area not thinned yielded only 86 pounds. Last season similar areas clipped and not clipped before allowing seed to set yielded at the rate of 5 to 1 in favor of not clipping.

A successful alfalfa seed crop was obtained for the second consecutive season. Since the success of seed production is determined largely by climatic conditions, it seems improbable that such yields are to be expected every season at the home station. Success in any season, however, depends upon thin stands—not more than one plant to a square foot—and utilization of the first growth.

Grimm alfalfa, seeded in 1912, outyielded the common variety by a little more than half a ton to the acre. Over a four-year period the Grimm has outyielded the common, on an average, only 500 pounds to the acre.

Rate and date of seeding tests with both common and Grimm alfalfa indicate that the best results are secured from 10 pounds early seeding. The crop should be seeded on fall plowed land, thoroly prepared in the spring. The use of a nurse crop cut down the second season's yields considerably. Early varieties of peas made a more desirable nurse crop than any of the small grains.

On the University farm, gypsum applied to 11 strains and varieties of alfalfa gave negative results. Both alfalfa and red clover gave very satisfactory increases when treated with gypsum at Winchester. Sweet clover gave little response. At Winchester red clover has been the high yielding hay crop. Under conditions of that region clover acts as a perennial.

Sweet Clover

White sweet clover outyielded the yellow-flowered biennial sort by about 600 pounds per acre at Moscow and 300 pounds at Winchester. Ordinarily, the difference between the two varieties is considerably more marked. At Moscow, the Arctic strain of white biennial outyielded the ordinary white biennial by a slight margin. Hubam has never produced high yields of forage at Moscow.

Brome and slender wheat grass have proven to be the highest yielding grasses at Moscow over a period of years. Both of these grasses are drought resistant and well adapted to non-irrigated areas for either pasture or hay mixtures.

Flax Gives Low Yields

The 1926 season was the third for the flax variety test. Two years' results have shown very low yields. This season the entire group of varieties, many of which were presumably wilt resistant, were entirely killed by wilt. It seems certain that this crop cannot compete successfully with spring wheat in the Palouse areas.

High Yielding Strains of Peas

Recently added garden pea varieties have produced yields comparable with those of the better field strains. Several of these varieties were in-

troductions from England and the number has been increased from the classification nursery. Among the better yielding garden sorts are American Wonder, Early Washington, Tom Thumb, Hawley's Improved and Sunrise.

Bluebell, White Canada and Early Britain have been found to be the best yielding field varieties over a period of years. In the drier seasons, Kaiser usually outyields most of the field varieties. A special strain of the Bluebell variety has been developed and distributed by the station. This strain has an excellent type of vine, uniform size of seed and high yielding ability.

Drill calibration studies have shown that about four plants per square foot of soil produce maximum yields of peas. Because of the great variation in size of the various varieties, varying amounts of seed must be used to secure the desired stand. Using a Superior drill, Bluebells, properly cleaned and graded, should be seeded at 9 pecks on the oat side of the drill; White Canada requires a drill set of 8 pecks, and Bangalia only 5 pecks. The garden varieties must be seeded at still heavier rates to secure proper stands.

Cereals Produce Excellent Results

Three season's results with Mosida, Ridit and Triplet winter wheat show that seedings made before the middle of October produce the highest yields. Late seeded fall wheat usually will produce higher yields than spring wheat. Early seedings may be made at a little lower rate than late seedings. Six to eight pecks of seed have produced the highest yields when late seeded.

Sixteen varietal trials with winter wheat have been put out with farmers in Power, Kootenai, Lewis, Idaho and Nezperce Counties. The wheats under trial are the better yielding varieties as shown by trials at Moscow. Two new bearded, smut resistant Turkey strains are included in the trials in Power county. Two beardless, smut resistant white wheats are included in the Northern Idaho tests.

Over a period of eight years, Mosida, Triplet, Jenkin, Ridit and Turkey have been the outstanding winter varieties. At Winchester, Fortyfold and Mosida have proven satisfactory. Federation, fall seeded, has produced high yields and is becoming quite commonly grown in many sections. White Odessa, a white grained, awnless, smut resistant variety has shown considerable promise for drier sections. Mosida has always produced high yields in the cut over sections. Several new smut resistant white wheats have shown considerable promise in the nursery trials.

Federation and Red Bobs, an early selection from Marquis, have become

the leading spring wheat varieties. Both are available for distribution to farmers. Jenkin and Little Club also produce satisfactory yields when spring seeded.

Markton, the new smut resistant variety of oats, introduced a few years ago, is the leading variety. Victory, Banner, Abundance and Idamine are all high yielding varieties.

Trebi barley has outyielded all other spring barley varieties over a seven-year period. Winter club has been the outstanding fall seeded variety, but its average yield over the same seven-year period is nearly 8 bushels less than that of Trebi. These results indicate that a high-yielding variety of spring barley is a better crop for the Palouse farmer than fall seeded barley. The only disadvantage of spring barley in the Palouse area is the very short straw, which makes the crop difficult to harvest.

Soils Program Extended to the Farmer

Community, district and finally a tri-county farmer's stump blowing contest under the supervision of the soil technologist was part of the cut over land program for 1926. Efficiency in the use of powder and the demonstration of better tools and improved methods of blowing stumps were the results achieved.

The addition of two tons of lime per acre appears to be the most promising treatment yet found for the reclamation of the overflow lands found along the Coeur d'Alene river.

Field experiments dealing with the reduced yields of alfalfa as found in Twin Falls County have not yet shown definite results. Alfalfa seed yields were increased slightly by the addition of potassium and a combination of phosphorus and potassium salts. Further trials are necessary before recommendations can be made.

The annual soil survey conducted in Idaho in cooperation with the Bureau of Soils was carried on in Bear Lake County. The field work was finished this season.

Grain Laboratory

The Idaho grain laboratory, established this summer by the department, has done considerable work for farmers and dealers.

Animal Husbandry

The Animal Husbandry Department during the year conducted investigations with nine important phases of the livestock industry. These included steer and lamb feeding experiments conducted at the Caldwell and Aberdeen Substation farms to determine the most economical rations for fattening livestock under Idaho feed and market conditions. Important work has been done to determine better and more economical rations for

growing and fattening hogs. The appointment of R. F. Johnson as assistant in livestock feeding investigations has materially strengthened the experimental work at Caldwell and Aberdeen.

Steer Feeding

The steer feeding investigations were continued at the Caldwell Substation with two-year-old steers: (1) to compare corn and barley and (2) to determine the value of corn silage. The lot on corn showed an advantage over the lot on barley, 100 pounds gain being produced on 431 pounds less alfalfa hay and 88 pounds less grain. The gain was greater and the selling price was higher for the corn-fed lot. Twenty-five hundred and ninety-two pounds of corn silage replaced 606 pounds of alfalfa hay and 346 pounds of barley in the production of 100 pounds gain. The gains, however, were less and the cost higher. The selling price as well as the dressing percentage was lower for the silage-fed lot.

Lamb Feeding

The lamb feeding investigations were conducted at the Aberdeen Substation to determine the value of alfalfa screenings and beet pulp in comparison with the check ration of alfalfa hay and barley. It was found that 82 pounds of alfalfa screenings replaced 120 pounds of alfalfa hay and 19 pounds of barley when fed in the amount of about one-fifth of a pound per lamb daily. One pound of beet pulp per lamb daily in addition to barley and alfalfa hay caused 388 pounds of beet pulp to replace 158 pounds of hay and 35 pounds of barley. Two pounds of beet pulp per lamb daily in addition to barley and alfalfa hay caused 752 pounds of beet pulp to replace 228 pounds of hay and 38 pounds of barley.

Rations for Brood Sows

In a study of the influence of Canadian field peas on the vigor and birth weight of pigs, it was found that 63 pigs farrowed by sows getting peas as the only ration weighed 2.073 pounds and were 17.3 percent below normal pigs. Eighty-five pigs farrowed by sows receiving balanced rations weighed 2.498 pounds and were slightly above normal for pigs farrowed by one- and two-year-old sows.

The sows on peas alone farrowed pigs that were 17.6 percent below normal in vigor. The sows receiving the balanced rations farrowed pigs which ranked a little above normal.

Influence of Field Peas on Skeleton

The influence of field pea rations on the development of the skeleton in swine was studied in 32 shotes divided into four lots of eight each and fed as follows: Lot I, cracked peas; Lot II, cracked peas and minerals (steamed bone meal 30 parts, ground limestone 30 parts, common salt 30

parts), Lot III, cracked peas 1 part, rolled barley 2.5 parts; Lot IV, cracked peas 1 part, rolled barley 2.5 parts and minerals. The feed required for each 100 pounds of gain was respectively as follows: 445, 402, 478, and 430. The actual bending load in pounds required to break the right femur in all hogs averaged for Lot I, 555 pounds; Lot II, 634 pounds; Lot III, 569 pounds; and Lot IV, 643 pounds.

Seventeen fall shotes gained from February 13 to March 26 an average of 1.83 pounds per day requiring 442 pounds of a mixture of 6 parts of ground wheat and 1 part of cracked peas for each 100 pounds of gain.

Sixteen fall shotes were divided into two pens of eight each and fed as follows: Lot I, 3 parts cracked peas, 7 pounds ground barley; Lot II, 3 parts cracked peas, 7 parts ground barley and cut alfalfa hay. Lot I required 472 pounds of grain for each 100 pounds gain and Lot II required 437.5 pounds of grain and 25.6 pounds of alfalfa hay. The pigs in Lot I made an average daily gain of 1.08 pounds and those in Lot II made 1.20 pounds each per day.

Bacteriology

Study of Forest Soils

Much of the area of certain counties in Northern Idaho is in timber at present, but is being converted to agricultural use as the timber is removed. The first crop after the removal of the timber is as good as could be expected considering the poor physical condition of the soil, but successive crops for a period of several years are even poorer than the first. These soils are known to the homesteader as "turpentine soils", but the actual inhibiting substance has not been definitely determined. Previous work of this station has shown that wood and tree products exert an inhibiting influence on soil on nitrate and ammonia accumulations.

Nitrogen Fixation

Of 24 representative forest soil samples only five were found to be capable of fixing nitrogen. Four did not contain *Azotobacter* when collected. All of these soils fixed more nitrogen in the presence of calcium carbonate than in its absence. Three of the samples which showed the ability to fix nitrogen when inoculated with *Azotobacter* were from virgin soil, the other two were from fields which had been under cultivation for a period of more than five years.

Effect of Woods and Tree Products

Various tree products, (such as leaves, needles, cones, bark, and sawdust from the trees, common to the timbered soils of the area under

study) were collected and tested for their effect on nitrogen fixation in soil.

One percent cedar leaves stimulated nitrogen fixation, 2 percent retarded it, and 3 percent resulted in an actual loss of total nitrogen. The same may be said for larch needles. White pine needles greatly retarded nitrogen fixation when applied in 1 percent concentration, stimulated it at 2 percent, and resulted in a loss at 3 percent. The results from applications of white fir are inconsistent since 3 percent stimulated and 1 and 2 percent each resulted in a loss. Maple leaves brought about a consistent retarding influence. Yellow pine needles and red fir needles resulted in a stimulation of nitrogen fixation; this is true of the latter especially.

All of the sawdusts stimulated nitrogen fixation when applied in amounts of 1 and 2 percent, while larch, red fir, and white fir stimulated in 3 percent concentration. With the exception of ash, none of the sawdusts brought about a marked inhibition, even in 3 percent applications.

Ammonia and Nitrate Accumulation

Thirty-one of the samples of forest soil were tested for ability to accumulate ammonia from blood, and nitrate from ammonium-sulphate and blood. All soils were capable of accumulating ammonia from blood. Three samples from virgin forest soil were outstandingly low. While ammonia accumulation in these soils may not be regarded as high, it is apparent that blood is decomposed with the accumulation of ammonia. It also is apparent that cropping increases the rate of ammonia accumulation.

Sixteen of the 31 samples were lacking in the ability to form nitrate from ammonium sulphate or blood. They were not benefited in this respect by the addition of calcium carbonate. Fifteen samples were able to form small amounts of nitrate from ammonium sulphate and larger amounts from blood. While this took place in the absence of calcium carbonate, it was greatly stimulated by its presence.

Soils not able to form nitrate were largely those bearing virgin timber, while those which formed nitrate were chiefly soils long under cultivation.

Surface Tension and Bacterial Development

Seven organisms were studied in order to observe their behavior when grown in media of varying surface tension. These organisms consisted of *Escherichia coli*, *Ciplococcus pneumoniae*, *Streptococcus viridans*, *Streptococcus hemolyticus* and four strains of staphylococci. In general there was a marked inhibition of growth during the first 24 hours. This inhibition was in a good many instances largely overcome within three days, but in few cases did the growth equal that in the control tubes. The inhibition was not directly associated with surface tension. In many

instances, the greatest inhibition occurred at the highest surface tension, while the broths of the lowest surface tension gave the maximum development in the reduced surface tension series. This indicates that inhibition was due to the chemical nature of the depressant rather than to the reduced surface tension.

Studies of Udder Infections

In all cases of udder infection studied a high bacterial count has been noted with a predominating flora of streptococci. Two types of culture media have been found to be well suited for the growth of streptococci found in infected udders. One is a liver infusion agar, prepared in a similar manner to any meat infusion agar. The second medium is a dextrose serum agar. Serum sterilized by filtration is added at the rate of 2 c.c. per 10 c.c. of dextrose agar. The reaction of both media is adjusted to a PH of 7.0-7.4.

Colonies develop on these plates in 48 hours time and are fished into other media for further study.

Sterility of Dairy Cattle

It was deemed advisable to attack the sterility problem because of the great financial losses suffered by the breeders of dairy cattle, much of it probably chargeable to the bull. The study has resolved itself into an attempt to differentiate by laboratory means between spermatic fluid from a potent bull and that from a sterile bull. This is desirable in that further study is contemplated which necessitates getting material from animals in all parts of the state and sending it to the laboratory for determining whether or not the animal is sterile. This material in many cases is too old to determine the percentage of motility of the spermatozoa.

The results so far obtained indicate that ice box temperatures are better for maintaining motility than either room temperature or body temperature. This probably is due to restraining bacterial growth which takes place at higher temperatures and no doubt exerts a deleterious effect on the sperm cells. It has been demonstrated that there is a difference in hydrogen ion concentration between the spermatic fluids of the bulls studied.

Considerable work has been done and some progress has been made in devising a staining technique which can be recommended, but the work is still not far enough advanced to permit definite statement.

Legume Cultures

The department of bacteriology during the past year has prepared and distributed cultures for the inoculation of approximately 13,000 acres of legumes. These cultures are prepared on a solid medium in 14-ounce

bottles containing sufficient inoculation for three acres. They are sold to the farmer at 75 cents per bottle, which barely meets the cost of preparation.

Most of the cultures sent out by the station this year were for peas and alfalfa. Cultures for crops such as sweet clover, clover and beans accounted for the balance of the output.

Public Health Work

The department of bacteriology, as a courtesy to the State Department of Public Welfare, takes care of the bacteriological analyses of all waters of questionable purity located in the northern part of the state. During the year 150 samples of water were analyzed.

In addition to the water analysis, various specimens of public health nature are sent in for diagnosis. These are composed of diphtheria swabs, heads for rabies, blood samples for typhoid, smears for gonorrhoea, and sputum for tuberculosis.

Contagious Abortion of Cattle

During the past year several hundred agglutination tests have been made on cattle in all sections of the state. The department cooperates with the state Bureau of Animal Industry in testing samples collected by the bureau.

Bacillary White Diarrhea

During the past few months the department has made agglutination tests on approximately 35,000 fowls from flocks thruout the state. No attempt has been made to compute the percentage of these birds showing a positive reaction.

Dairy Husbandry

During the past year the average production of the dairy herd comprising 27 milking cows was 13,354 pounds of milk and 511 pounds of butterfat. Official testing was continued and some very good records completed. Three state records were broken. The highest record completed was made by a Holstein, Idaho Segis Ormsby Girl, with a production of 23,818.8 pounds of milk and 843.72 pounds of butterfat.

Official Testing

The Department of Dairy Husbandry is charged with the supervision of all official testing in the state. During the year, 139 semi-official tests were conducted. This, together with the official tests represented 763 days of supervision.

Breeding Studies

The breeding studies conducted with the Holstein-Friesian herd is in

cooperation with the Bureau of Dairy Industry, United States Department of Agriculture. The project consists of the continuous use of proven sires to breed cattle that will be pure in their inheritance for high production. Three sires have been used and a fourth has just been added to the herd. There are at present in the herd 26 F1 generation females, 13 F2 generation females, and 2 F3 generation females.

Another dairy cattle breeding project, also in cooperation with the Bureau of Dairy Industry, is an investigation of the results obtained in breeding up farm herds thru cooperative bull associations. This work was started during the past year. One man is devoting his entire time to the project. Some outstanding and fundamental facts already have been assembled and the progress of the work is very satisfactory.

Normal growth studies on dairy cattle are still in progress in connection with the breeding and nutrition studies.

Feeding Investigations

Considerable experimental work has been done in feeding dairy cattle of various ages. Calf feeding investigations consisted of raising three groups of calves on different milk products. One group was raised on skim milk; another on buttermilk curd, a type of semi-solid buttermilk; and another group on "Hi-Lactic milk," a newly patented condensed sour skim milk. Calves were raised successfully on all three milk products.

The investigations on wintering dairy heifers consisted of a comparison of one group on alfalfa hay and 2 pounds of barley per day, another on alfalfa hay and pea straw plus barley, and another on pea straw and barley. The growth and development of the heifers in each group ranked in the order the groups were mentioned. Pea straw may be used for wintering heifers but it is lower in feeding value than alfalfa hay.

Apple Pomace versus Silage

The second year's investigation in comparing apple pomace and corn silage as a feed for dairy cows was conducted. The apple pomace again was found equal pound for pound to corn silage as a succulent feed for milking cows.

Pasture Studies

A new investigation was started on the best-systems of management of irrigated pastures for dairy cows. This project is conducted at the Caldwell Substation. Initial results show that manuring pastures gives considerable added returns as compared to non-manured fields.

Studies in Dairy Manufacture

The experimental work in manufacturing consisted of an investigation on the best methods of manufacture of cheddar cheese from pasteurized

milk. Several different kinds of starters have been used and some conclusive results have been obtained, showing that better quality cheese can be made from pasteurized milk but the kind of starter used governs the flavor obtained. Some work also has been done on the influence of different pasture crops, especially sweet clover, on milk flavors. A program of milk improvement for cheese factories was carried on with three factories in cooperation with the Extension Division. Very satisfactory results were obtained.

Entomology

Aphids

A series of control measures for *Anuraphis cardui* on prunes and *Aphis pomi* on apples were conducted in 1925 and 1926. Complete control of the former aphid was obtained by using a mixture containing $\frac{1}{2}$ percent pure oil and nicotine sulphate (40 percent) at the rate of 1 part to 4265 parts water. With the same materials used against the apple aphid it was determined that the spray was not entirely effective when the nicotine sulfate was used at strengths of less than 1-3200. Sprays containing 2 percent oil were ineffective against *A. cardui* when not used in combination with nicotine, and seven applications of 1 percent oil at 1-day intervals were ineffective in killing the apple aphid. One-half percent oil did not injure prune foliage or fruit but pronounced damage was done by 1 percent oil and severe injury resulted from the use of 2 percent oil.

Beet Leaf Hopper

Cooperating with the Bureau of Entomology, United States Department of Agriculture, investigations of the beat leaf hopper and the curly top disease it causes were begun in 1925 and continued in 1926. A thoro survey of the state has been made to determine the native host plants of the insect, range abundance of hosts and relative abundance of leaf hoppers under varying climatic conditions. The insect has been found in all parts of the state regardless of elevations or proximity of host plants to sugar beets. It appears, however, that they may be found in some communities in injurious numbers only during so-called years of dispersal. Years of dispersal appear to be dependent on climatic conditions. A start has been made in selecting types of beets showing some degree of resistance to the disease. Work of selecting and breeding disease-resistant beets will be continued. Ecology of the disease and of the insect and the probability of forecasting outbreaks are being studied by the Bureau of Entomology and excellent progress has been made to date.

Codling Moth

One year of life cycle studies was completed in southern Idaho in 1926. The chief thing learned was that during certain years there may be a heavy third brood, as was the case this season. Oil sprays used as ovicides gave evidence of being quite effective but more work is needed to determine whether their use is practicable. Eggs laid on oil-sprayed foliage hatched much less freely than when deposited on non-sprayed foliage even when laid a week after oil was applied. A small orchard was kept practically free from codling moth larvae as long as 1 percent oil sprays were applied at 10-day intervals. Repeated use of 1 percent oil sprays caused injury to certain varieties, and more knowledge is needed concerning the effect of certain oils on plants.

Colorado Potato Beetle

An outbreak of the Colorado potato beetle in a commercial field in southern Idaho in 1924 was stamped out, as has been proven by examinations made in 1925 and 1926. Likewise, in 1925 another outbreak was successfully handled in a different locality. Infested fields were persistently patrolled and all forms of the insect were removed by hand picking. In addition, spraying and dusting with arsenicals was resorted to and the soil in spots where insects were found was screened. By screening, several adults and pupae were found that otherwise might have escaped to start a new infestation. The cost of this work has been small and it undoubtedly has delayed injury from the Colorado potato beetle for many years and saved the loss to the grower and the expense for control. Experience indicates that by timely work southern Idaho may be kept free from the pest for many years to come.

Eleodes Beetles

A study of methods of control of eleodes beetles was completed and the results were published in Research Bulletin No. 6. Taxonomic studies of the Eleodes beetles of Idaho will be continued.

Fruit Tree Leaf Roller

Investigations in fruit tree leaf roller control were continued in 1926 and a bulletin setting forth results was published. It was determined that oil sprays containing 7 percent oil were effective in killing the eggs when applied before hatching time and that by their use commercial control can be obtained.

Leafhoppers of Idaho

In connection with the survey work on the beet leafhopper, a taxonomic study is being made of the leafhoppers of Idaho.

New Insects

Three insects not previously known to occur in Idaho, which may

prove to be of economic importance, were discovered this year, *Mincola scitulella* and the bud moth, *Spilonota ocellana*, were discovered injuring prunes and the clover seed midge, *Dasyneura leguminicola* was found to have a rather wide distribution and to be causing loss of seed..

Mincola scitulella has caused loss of prunes as great as 35 percent according to report by the State Department of Agriculture, but loss from the insect in 1926 was slight. Studies in biology and control were undertaken. The bud moth has occasioned some alarm but has not yet caused much injury.

Oil Sprays

A concerted movement between the states of Montana, Washington, Oregon, California and Idaho, and the Bureau of Entomology, United States Department of Agriculture, was undertaken in 1926 to carry on investigations to determine the properties of a good insecticidal oil and to fix the standards for insecticidal oils. The plan also includes the conduct of experiments in the use of oils against certain insects under uniform methods. The work will be cooperative between chemists and entomologists of the above-mentioned agencies.

Onion Thrips

Nicotine, oil and nicotine-oil sprays proved commercially ineffective in controlling onion thrips. Paris green and calcium arsenate in solutions of water and sugar beet molasses each produced definite results and it is planned to carry further the series of experiments.

San Jose Scale

All experiments to date indicate that San Jose scale can be controlled effectively by applying dormant oil sprays of 3 percent content. Winter mortality of the insects was high in 1924-25. By a survey of conditions and by careful microscopic examinations the Experiment Station provided service which enabled orchardists to save many thousands of dollars that otherwise would have been spent for labor and spray materials.

Snowy Tree Cricket

Studies in the control of the snowy tree cricket were completed and results are now in manuscript awaiting publication.

Wireworms

In cooperation with the Bureau of Entomology, United States Department of Agriculture, preliminary tests were conducted in the control of wire worms by use of calcium cyanide. Under field conditions control as high as 90 percent was obtained. This work will be conducted next season on a larger scale.

Forestry

A report entitled "Idaho Forest and Timber Handbook" prepared in cooperation with the United States Forest Service, was completed in 1926 and it is expected that it will be published in 1927. This handbook contains a considerable amount of material directly applicable to the farm.

Last year mention was made of studies that had been conducted in cottonwood wood lots along Wood River near Hailey. The report on these studies was published in the Idaho Forester for 1926.

Reproduction of White Pine

Studies of the reproduction of western white pine on old burns, and studies of the growth and yield of residual western white pine on old logging works were brought to a close in 1926 and reports are now in preparation. These studies will be of direct value to owners of farm woodlots in the white pine belt.

Treatment of Fence Posts

In cooperation with the Animal Husbandry Department of the College of Agriculture, the treatment of fence posts to prolong durability is being continued. It is planned to extend the wood treatment studies to include farm timbers in general.

New Tract for Nursery

Lack of sufficient ground has hampered the forest tree distribution project now carried on in cooperation with the United States Department of Agriculture. Ample grounds for this purpose now have been provided thru the lease of a 27-acre tract near the present nursery site. This newly acquired leasehold will be used primarily to grow planting stock for the establishment of farm woodlots, shelterbelts and windbreaks, the stock to be supplied the farmers at nominal prices. Since all the tract will not be needed at once to grow nursery stock, a part of it will be used meanwhile to demonstrate methods of growing type woodlots and windbreaks.

Horticulture

Apple Breeding Project

An interesting study of the flavor of seedlings is being made in connection with the apple breeding work. For example, in crossing Ben Davis with Jonathan, sweet, mildly sub-acid, sub-acid and sour apples are secured. Of 309 seedlings of the above cross 83 were sweet, 97 mildly sub-acid, 107 sub-acid, and 22 sour. Both parents in this case are listed as sub-acid. A tabulation of the data seems to indicate some correlation between the mean acidity of the progeny of the various crosses and that of the parent varieties. The observations also indicate that the progeny of

a cross exhibit a wide range in acidity regardless of the character of the parents.

Orchard Fertilization

The work in orchard fertilization, begun five years ago, involves the use of various amounts of fertilizers applied to different plots to determine the action of these materials on yield, size, color of fruit and terminal growth. To date, fertilizers have not materially increased the yield altho the nitrate plots show slight gains. There seems to be no appreciable difference in color and general appearance of the fruit in the various plots. The size of the fruit has not been materially affected by fertilizer applications nor has terminal growth been greatly stimulated.

Potato Production

The potato industry in Idaho has made a remarkable development in recent years. Acreage increased from 35,000 acres in 1912 to 68,000 acres in 1925. During the past eight years the crop has contributed approximately 10 percent of the total crop value of Idaho. Realizing the importance of this industry, the horticultural department is attempting to determine the best practices for the non-irrigated farmer to follow in growing commercial potatoes or certified seed.

High summer temperatures limit potato production. An important problem for the Palouse farmer is to determine the time of planting which, on the average, will give him the largest returns per acre. Early plantings at Moscow have given the best average yields for a period of years.

A summary of the annual crop yields for two years is shown in Table I.

TABLE I—Summary of Potato Yields for Different Dates of Planting—2-year Average.

Date of Planting	Variety—Netted Gem.		
	Total yield: bu. per acre:	Percent marketable	Percent certifiable
May 15	229.2	79.9	21.4
June 1	204.6	81.5	22.3
June 15	135.7	76.1	37.6
July 1	91.1	72.7	48.0

There is a spread of 138.1 bushels between the first and last plantings, showing a decided gain per acre in favor of the earlier plantings. Owing to lack of rainfall during the growing season, a much better stand was secured with the early planting than with the late one. There also is a possibility that earlier plantings would be more profitable when growing

seed for certification. When type was considered, 21 percent of the crop, or 48 bushels, from the early planting was eligible for certification, while in the late planting 48 percent, or 44 bushels, was eligible.

Four years' data on distance of planting show that planting the seed in rows 3 feet apart and at 18 inch intervals in the rows produced the largest yields.

Fertilization of Vegetables

The 1926 results with fertilizers seemed to vary without particular reason. This probably was due to a very dry season in the early part. Possibly much of the fertilizer did not become available to the growing crop. Fertilizer tests with tomatoes for 1925 show that the check plot was the best. This might be interpreted, in the case of the plots that received nitrate of soda, as indicating a delayed fruiting of the plants. Some investigators have obtained this result in applying nitrogen. However, most investigators have found that phosphorus tends to hasten fruit-bearing. It seems quite likely that under the special conditions of the dry season, the fertilizers acted as a deterrent on growth by unduly increasing the soil moisture concentration during the early growth of the plants.

Experiments with Cabbage

Several years ago considerable data were collected in testing yields of cabbage when large plants were transplanted to the field and compared to the small ones of the same lot. Some more work on this problem was done the past year. At the time of transplanting to the field the plants were divided into two lots—those designated as "large", being the large, strong, stocky plants, while those designated as "small" were the plants that failed to make a strong, stocky plant, but because of crowding or some inherent weakness were slender or small. The data for both years indicate the wisdom of discarding the weaker plants.

Bulb Experiment

In view of the large interest now manifested in bulb growing in the Northwest, some preliminary work has been done on bulb culture. In order to become familiar with bulb types and varieties a collection of varieties, particularly of narcissus, tulips, and lilies, has been started. Data are being accumulated on the cultural methods best adapted to the various bulbs, to determine the feasibility of commercial bulb culture in Idaho. Pest and disease control will receive some attention especially from the standpoint of the small grower and home gardener.

Plant Pathology

Virus Diseases

An attempt has been made to develop several lots of potatoes as free as possible from all of the various virus diseases. Several of these lots were grown at Lewiston, to test their producing capacity in comparison with certified seed from several localities. Only the early varieties, Bliss Triumph, Irish Cobbler and Idaho Rural, were used. One hundred pounds of each lot were planted and the amount of disease, the weight per hill and the total weight of each lot were secured.

Certain definite conclusions have been drawn from this test. Idaho-certified Irish Cobblers gave higher yields and were much more free from virus disease infection than certified Irish Cobblers secured from Minnesota. None of the lots of seed from Idaho produced more than 1 percent of hills weighing less than 1 pound, while the lot of seed from Minnesota gave 9 percent of plants producing less than 1 pound per hill. A number of lots of Bliss Triumph seed, which has been grown at various points in the state for the last five years and thoroly rogued each year, were included. Two of these lots grown for several years in regions of high altitude and for two years apparently free from any virus disease, when grown at Lewiston this year and when tuber-indexed in the greenhouse, showed a very high percentage of mild mosaic. This evidence as well as other observations made during the last five years has shown that it is impossible to distinguish mild mosaic under the environmental conditions which maintain in many sections of Idaho. In order to be certain that a given lot of seed is free from this disease it will be necessary to tuber-index the seed lot in the greenhouse or to grow a small lot of seed in some section where the signs of the disease will manifest themselves. A much more severe type of mosaic, very similar if not identical with the type called 'rugose mosaic' by certain investigators, is easily detected under all environmental conditions in its advanced stages. Current season or primary signs of the disease are often not recognized but infection coming from infected tubers is easily recognizable.

It has been possible by isolation and constant roguing during the growing season to eliminate practically all the leaf roll infection from a lot of Netted Gems originally having more than 20 percent infection. It took five years of careful work to accomplish this result.

Seed Treatment for Grain Smut Control

Twenty different compounds were tested this year for bunt control in wheat. These treatments included various organic mercury compounds

both as dusts and wet treatments, several other proprietary compounds and the standard formalin, bluestone, and copper carbonate. In general, the results corroborate those secured during the last several years. Several of the compounds gave as good control as the standard treatments. When cost of treating, freedom from seed injury and ease of application were considered, none of them proved as satisfactory as the copper carbonate treatment. Various compounds also were tested for the control of oat smuts. Both hulled and hullless oats were used.

Serious injury resulted when the formaldehyde treatments were applied to hullless oats, but there was little injury and practically complete control when these treatments were applied to hulled oats. Copper carbonate at the rate of three ounces to the bushel this year gave perfect control with hulled oats. This is contrary to the results secured during the previous year's tests. Further trials are necessary with hulled oats. Results indicate that it would be wise to use copper carbonate or one of the other dusts rather than formaldehyde for smut in hullless oats.

Control of Rhizoctonia of Potatoes

Ten different compounds were tested again this year in comparison with the standard corrosive sublimate and hot formalin treatments for control of the rhizoctonia disease of potatoes. The hot formalin treatment when applied to presprinkled seed at the rate of 1 pint to 15 gallons of water at a temperature of 125° F. for four minutes gave the best control of any of the methods tested.

Mosaic and Dry Root Rot of Beans

One hundred and fifteen varieties of beans were tested both at Moscow and at Parma for resistance to dry root rot and mosaic. A rather severe epidemic of dry root rot developed in the plots at both places and a good test was secured of the resistance of these varieties. A number of them appear to be very resistant to the disease.

Mosaic of beans has become a real problem in the state during the last few years. Very fine progress has been made in Twin Falls County in eliminating this disease from some of the better lots of seed of the Great Northern variety. The Department of Plant Pathology aided this year in inspecting and certifying a number of bean fields in Twin Falls County.

It has seemed very desirable to secure advance information regarding the lots of beans which were certified this year and also to secure good seed lots from the bean growing sections in northern Idaho in order to start a campaign for cleaning up the mosaic infection in this region. To accomplish this end, all of the lots of seed which were certified in Twin Falls County and a number of seed lots from northern Idaho are being

tested in the greenhouse this winter for mosaic infection. There are great possibilities for this type of work with beans as well as potatoes and it is very desirable that funds be made available for indexing work of this kind.

Bean seed treatment tests, in cooperation with a number of farmers in Twin Falls County, with semesan and uspulun indicate that there was a small average increase in yield as a result of such treatments. These experiments will be repeated again next year.

Stripe Rust of Grains and Grasses

It was hoped that susceptibility studies with the barleys (a continuation of the 1925 investigations), might be continued, but unforeseen difficulties have prevented. These difficulties are in the nature of the effect of environmental conditions upon infection and sporulation of the fungus. For some time it has been impossible to obtain normal sporulation on our most susceptible hosts, hosts upon which we culture the organism. It seems rather doubtful that these difficulties are due to the organism itself, for a number of new cultures from various localities all react the same when brought into the greenhouse.

Lack of proper equipment has prevented a study of what constitutes optimum conditions for infection and sporulation. However, with the idea in mind of securing such equipment, five double-walled glass cages have been installed and connected with an air-cooling device in such a manner that it has been possible to carry the cultures thru the hot, dry summer months.

Preliminary tests to germinate telia have met with success. Telia collected at Moscow on *Hordeum jubatum* germinated quite readily when first collected. This ability, however, is decreasing as their age increases. The highest percent of germination of these spores was obtained with telia produced on barley in the greenhouse. As is the case with telia on *H. jubatum*, so it is with the telia on barley. The older they become the less becomes their power to germinate.

Miscellaneous Studies

Among the other important lines of work on which it has become necessary to institute investigational work two should be mentioned; Chlorosis studies in Twin Falls County in cooperation with the Agricultural Chemistry and Agronomy Departments and a study of a new and serious wheat disease in Teton and Madison Counties.

Poultry Husbandry

The results obtained in a statistical analysis of the records of White Leghorn pullets for 1924-1925 checked in their entirety with those ob-

SUMMARY—1920-1926
Single Comb White Leghorn Pullets

Feed	Year	YEARLY AVERAGES					Percent of all eggs laid weighing			Notes
		Percent production	Eggs per pullet	Profit over feed cost	Feed cost per pullet	Feed cost per dozen eggs	24-28	22-24	-22	
Sour skim milk	1920-21	47.4	174.9	2.42	2.43	.17	36.8	39.8	23.4	Unlimited sour skim milk no water
	1921-22	34.1	123.9	1.23	1.97	.19	47.9	35.5	18.6	
	1922-23	38.1	139.0	1.89	1.95	.17	43.0	35.0	22.0	
	1923-24	52.2	191.0	2.80	1.82	.11	50.0	35.6	14.4	
	1924-25	58.4	193.0	2.94	2.37	.147	47.9	41.7	10.3	
	1925-26	43.9	160.0	1.58	2.11	.162	44.6	36.8	18.6	
	Six-year averages		45.7	163.6	2.14	2.11	.158	45.0	37.1		17.9
Meatscrap or meatmeal	1920-21	39.8	145.3	1.91	2.03	.17	33.6	43.7	22.7	23% M. S.
	1921-22	28.0	103.0	.99	1.62	.19	26.1	48.0	25.9	23% M. S.
	1922-23	27.0	97.4	.75	1.52	.19	23.0	37.0	40.0	20% M. S.
	1923-24	38.0	139.0	1.74	1.46	.12	30.7	41.8	27.5	20% M. S.
	1924-25	33.4	111.0	1.36	1.66	.179	23.8	46.8	29.4	20% M. S.
	1925-26	26.9	99.0	.86	1.57	.192	23.3	30.2	46.5	20% M. S.
Basal B. ration Six-year averages		32.2	115.8	1.27	1.64	.175	26.7	41.3	32.0	

tained for 1923-1924. Pullets that mature quickly, as indicated by a small number of days to first egg, lay more eggs to March 1 and thruout the year than those that mature slowly. Pullets that take the shortest time before laying weigh less when they start laying than those that take a longer time, and lay smaller eggs when they start to lay, to March 1 and thruout the year. Pullets that lay the largest number of eggs to March 1 also lay the most for the year. The greater the maximum weight of a pullet or hen for the year the heavier the mean egg weight for the year. The maximum body weight is not correlated with the number of eggs laid during the year. No correlation exists between the egg record and the size of eggs laid in either pullets or hens. High producers do not necessarily lay small eggs. Hens that laid best during their pullet year also laid best the second year.

Weight of Egg and Weight and Growth of Chick

A very definite relation was found in studies made during 1925 and 1926 between the weight of eggs set and the weight of chicks hatched. Large eggs hatched out larger chicks than small eggs. The influence of the weight of the eggs set on the weight of the chicks of both sexes was still apparent when the chicks were eight weeks old. Chicks from the larger eggs were largest.

Poultry Feeding

The study of certain animal and vegetable protein feeds for laying hens was brought to a conclusion on September 30, 1926. A few pens started November 1, 1920, have been continued with minor changes from year to year thruout the six-year period. Four years already have been given to the study of feeds high in vitamins for laying hens and the same length of time to the source of value in sour skimmilk. A three-year study of feed supplements to peameal has been concluded. Only two years have been given to testing vegetable protein supplements to sour skimmilk. All the feeding experimental work has been done with single comb White Leghorn pullets.

Sour Skimmilk versus Meatscrap

Over a six-year period, from 1920 to 1926, two pens received the same basal ration and differed only in that one received sour skimmilk in unlimited quantity in addition to the mash, and the other received 20 percent. In every way, the sour skimmilk proved superior to the meatscrap pen. The results show that of all the eggs produced the percentage of eggs weighing 24-28 ounces to the dozen was 28.3 percent higher and the percentage of eggs weighing below 22 ounces per dozen was 14.1 percent lower in the sour skimmilk pen than in the meatscrap meatmeal pen.

Vitamin Feeds for Laying Hens

An experiment was started November 1, 1922, to test the value of certain feeds of high vitamin content for laying hens. The results of four years' work show quite conclusively that the vitamin content of the laying ration is very important. The first two years a basal ration lacking in animal protein feed was used and in the last two years one well balanced except for vitamin content was employed. With both rations medicinal codliver oil added to the scratch feed at the rate of about 2 percent, or one quart per 100 pounds, materially lowered the mortality and increased the production and profits over feed cost. The hatchability was greatly increased when codliver oil was used with a well balanced ration but no beneficial effect resulted when it was used with a ration in which the animal protein was lacking. Lawn clippings when used as green feed were almost as valuable as codliver oil in preventing mortality from vitamin deficiency, in increasing production and profits over feed cost, and in increasing hatchability when used with a well balanced ration from 1924 to 1926.

In a two and one-half year period, dried yeast under the conditions of the experiment did not seem to be required. A one-year trial of orange juice and a six months' trial with lettuce indicated that they both contained sufficient vitamins to prevent Vitamin A deficiency.

VITAMIN FEEDS FOR LAYING HENS

Summary, 1922-1926

SINGLE COMB WHITE LEGHORN PULLETS

Feed	Year	Total mortality	Total No. of eggs	Percent production	Total profit over feed cost	Percent hatchability	Basal ration
Cod-liver oil	1922-23	3	1903	23.2	22.24	—	B
	1923-24	3	1539	17.3	5.06	26	B
	1924-25	2	4861	60.6	73.40	61	A
	1925-26	10	3644	47.2	34.82	57.9	A
	Average	4.5	2987	37.1	33.88	48.3	—
No vitamin feed	1922-23	16	1275	20.4	11.33	—	B
	1923-24	13	970	15.6	7.32	24	B
	1924-25	11	3092	49.1	50.03	26	A
	1925-26	23	1601	30.6	12.38	37.4	A
	Average	15.75	1734	28.9	20.23	29.1	—
Lawn clippings	1924-25	1	4691	57.7	70.86	54	A
	1925-26	10	3960	52.4	47.85	59.6	A
	Average	5.5	4325	55.0	59.35	56.8	—
Dry yeast	May 1-Nov. 1 1923	20	615	21.2	-3.39	—	B
	1923-24	10	1136	15.9	.45	30	B
	1924-25	12	2461	41.1	31.37	38	A
	Average	14	1404	26.1	9.47	34	—
Lettuce	May 1-Nov. 1 1923	1	1355	30.7	11.68	—	B
Orange juice	1923-24	5	1517	18.6	-37.59	18	B
Alfalfa leaves and blossoms	1925-26	10	3550	46.1	36.13	63.4	A

Constituents of Sour Skimmilk

In a four-year test sour skimmilk gave higher production, greater profits and larger size of eggs than any constituent or combination of constituents. Milk curd, which contains most of the proteins of milk gave the second most favorable results, indicating that much of the value of sour skimmilk is in its protein content. Milk curd gave some increased production but only slightly larger eggs than milk casein, the principal protein feed contained in it. The addition of milk albumen to the milk casein did not improve the ration in any way. Milk whey apparently contains some constituents besides milk albumen that are of value in egg production. In earlier investigations, lactic acid and milk salts did not indicate value for egg production.

Vegetable Protein Supplements to Sour Skimmilk

Peameal, beanmeal and alfalfa-meal have been compared with each other and with the basal ration, the mash of which consists of equal parts of wheat bran, shorts, ground oats, and cornmeal, to which is added 4 ounces of salt and 2 pounds of charcoal per 100 pounds. Twenty percent of these vegetable protein feeds were used in a mash. All the pens received unlimited sour skimmilk and no water. Two years' results indicate that these vegetable protein feeds can be used profitably when they do not materially increase the cost of the ration.

Pure Seed

Enforcement of the pure seed law is vested in the seed commissioner, who is appointed by the Director of the Agricultural Experiment Station.

The Idaho seed laboratory is operated both as a commercial laboratory and an inspection laboratory. Farmers submit samples to be graded as a basis on which to sell. Dealers use grades as a basis of buying to some extent, but mainly as a basis for selling. The inspectors collect a few samples during the inspection season but only a few days of the analyst's time are used to check inspection samples. The aim is to give service. The period from January to May is always a rush season.

Field Inspection

In 1926, the seed commissioner and two deputies inspected 136 seed establishments located in 78 towns in 27 counties. The dealers showed splendid cooperation. Only three lots of seed were condemned.

Laboratory Analyses

Laboratory analyses from December 1, 1925, to November 30, 1926, were as follows:

	Samples for purity test	Samples for germination	Moisture test	Total
State seed laboratory, Boise	1968	185	33	2186
Branch laboratory, Moscow	206	62		268
Totals	2174	247	33	2454

Dealers send more samples to the laboratories than farmers do. Of the 1968 samples received at the Boise laboratory 1263 were from dealers, 683 from farmers and 22 from county agents. Practically all of the samples received at the branch laboratory are dealers' samples. Of the 1968 samples submitted in 1926, 1278 met the seed law requirements and 439 were condemned. Others were inspected only, or were questionable.

Service to Farmers and Dealers

The seed laboratories are prepared to render the following services for farmers and seed dealers:

1. Identification of crop and weed seeds.
2. Identification of weeds.
3. Purity and germination tests.
4. Grading of grain samples.
5. Moisture tests on cereals.
6. General information concerning the possibilities of uncleaned and weedy lots of seed.
7. Final checking of sealed, certified Grimm and Cossack alfalfa seed, blended within and without the state.
8. Extension work in the form of personal visits to fields.

Seed Certification

During the past two years the registration of Grimm and Cossack alfalfa fields has been systematized and is now practically on a self-supporting basis. Idaho is the first state to have completely developed a registration system that traces pedigreed seed thru all stages of seeding, harvesting and marketing to the ultimate consumer. The certification, given thru the Agricultural Experiment Station, has been officially accepted by the seed trade and the growers have realized 10 to 15 cents per pound above common alfalfa seed prices. In 1926, 609 growers took advantage of this service and received field inspection certificates on 21,875 acres. In 1926, 831 growers received field inspection certificates on 32,934.8 acres of pedigreed alfalfa. Uniform grades and tags have been adopted by Montana, Utah and Idaho. Idaho grows approximately 75 percent of the pedigreed Grimm alfalfa produced in the United States.

Potato Certification

The field horticulturist received requests for field work on seed potatoes from 230 growers having a total of 2720 acres. One hundred-ninety had stock that met requirements for first inspection, and 161 completed the work. This included 2385 acres, with an estimated production of 402,510 bushels.

A cooperative arrangement was entered into with the state Department of Agriculture to secure the assistance of the department in the final tagging and sealing of bagged potatoes. No potatoes are permitted to be shipped for seed unless marketed in officially tagged and sealed sacks.

Aberdeen Substation

The 1926 growing season was one of the driest ever experienced on the Aberdeen Substation. Irrigation water was short, but by rotating water good crops were produced except in the case of hay. The experimental plots were given preference over all other crops and a normal yield was secured on practically all of them. Very little moisture fell during the spring and the planting was done rapidly, most of it being completed by April. There was enough moisture in the soil to germinate the seed and all the plots came up to a good stand with the exception of barley. It was necessary to irrigate these plots before the plants covered the ground sufficiently to provide shade. During the latter part of the season the barleys made a rapid growth and matured good yields.

Summer Season not Favorable

The weather continued dry during the summer and fall, and farm work was kept well in advance of the season. All of the fall plowing was done early. September 25 a hard freeze occurred, with a minimum temperature of nine above zero. This killed all vegetation, froze the potatoes that were near the surface of the ground, and almost destroyed fall pastures. After this low temperature the weather warmed up and alfalfa and clover started to grow again.

Irrigation water was limited thruout the season but there was sufficient to produce a good crop. The potato crop suffered from lack of late irrigation water, but the dry ground kept many potatoes from freezing on September 25.

Large Cereal Nursery

The cereal nursery this year contained 350 different varieties of oats, 400 varieties of barley, and 300 varieties of wheat. This was one of the largest cereal nurseries ever grown at Aberdeen. The barley and oat classification nurseries again were grown. An oat smut nursery was

maintained to test out the immunity from smut of the markton-victory, markton-idamine and markton-aurora crosses. One hundred progeny from the dicklow-federation and from the dicklow-hard federation crosses were grown on the substation.

Cereal Plots

The wheat plots in 1926 made a lower than average yield. The oat plots made about an average yield, the medium oats, victory and idamine, yielding highest. The late oats, golden rain and crown, usually the highest yielding, did not do so well. Barley yields were a little below the average for the highest yielding varieties. The early varieties gave returns close to the average.

Peas made one of the best crops ever obtained on the substation. The kaiser fell from its high average, but most of the others brought up the average yield. The garden pea plots made exceptionally good yields.

New Clover Is Promising

The clover plots made good average yields of seed, the Idaho red selection giving much the highest due chiefly to its higher resistance to winter kill. Winter killing on these plots during the second year was quite pronounced. Danish red winter-killed 90 percent. Many of the others winter-killed 30 percent to 40 percent, while Idaho red had an estimated winter kill of only 5 percent. This probably explains the plot's better seed yield and its freedom from weeds.

Strain Tests of Potatoes

The strain test of potatoes was continued this year. There were 233 russet growers, 41 rural, 14 early Ohio, 22 cobbler and 20 bliss triumph represented in the strain test. The strains varied more in stands, but the freedom from disease was much more marked than last year.

Lamb Feeding Investigations

The lamb feeding experiments were carried for the second year's feeding trials on the substation with five hundred Rambouillet lambs obtained from Oregon. They were first pastured on the aftermath of the grain fields and were put on feed November 26, 1925. Good gains were obtained on pasture.

The lambs made excellent gains in the feed lots. The beet pulp lot receiving the heaviest feed of beet pulp, made the greatest total and the cheapest gain. The lot receiving alfalfa screenings did not take well to the screenings due to the high percentage of weed seeds. During the latter end of the feeding period the screenings were fed separate from the barley. Gains were much better after this system was started, for the

lambs cleaned up the barley much better and ate what they wanted of the screenings.

The people of the surrounding country are showing much interest in lamb feeding work of the substation, and more feeders are interested in lamb feeding than ever before in this section. There seems to be a place for feeding as a permanent farm enterprise in the upper Snake River region.

Caldwell Substation

Improving the Farmstead

A comprehensive program of improving the farmstead has been conducted at the Caldwell Substation. A new dairy barn planned to meet the climatic and other environmental conditions of southwestern Idaho was erected. This barn has been designed to permit the plans to be used by farmers who are desirous of erecting improved buildings for sheltering their dairy herds. A new machinery shed recently was completed. The roof is supported with trusses that make it unnecessary to use posts except on the exterior wall and the system of doors suspended by rollers makes it possible to enter the shed from any point at either side.

Experiments with Farm Use of Electricity

Recently the distribution lines of the Idaho Power Company have been extended to permit the use of electricity by the superintendent and others who live on the station and to provide for exhaustive experiments with various kinds of equipment for farm use. In all these experiments with electricity for farm power records will be kept of time of operation and current used. Tests will be made of electric power for pumping water, cutting silage, and hay and grinding feed, operating a milking machine, turning a cream separator, heating of water for sterilization, cooling of dairy products, and some installations of household equipment.

Data kept will include the amount of electricity required for different devices, the time required for different operations and where possible the time saved by using electrical equipment. A Fordson tractor and a ten horse power single phase motor were compared while filling silos and data kept on the comparative costs with the two power units.

Slick Spot Soils

Investigations have been continued with "slick spot" soils. This is a long time study, complicated because of the difficulty of isolating various factors involved in soil investigation. Certain "slick spots" located in the sagebrush area above the irrigation canal have been given individual treatment and records will be kept of changes in soil due to the ap-

plication of various amendments and other treatments. To date the application of barnyard manure and the growing of sweet clover upon "slick spots" seem to be the most feasible means of improvement.

Animal Feeding Studies

Animal feeding investigations have been continued according to plans that have been in operation for several years.

Fifty-six steers were fed last year using various combinations of home-grown grains and hays in the fleshing of steers for market. Further reference to steer feeding is found in this report under Animal Husbandry.

Experiments are now under way in the feeding of dairy cattle for milk production. These studies deal with both pasture and barn or dry-lot feeding. An attempt is being made to determine the exact place of silage in the dairy ration and to find the value of various grains when added to rations of either hay alone or of silage and hay. The pasture studies conducted on a comprehensive scale during the summer of 1926 already have yielded significant results. This season has been one of water shortage and it was found on the Caldwell Substation that the application of barnyard manure as a top dressing to blue grass pastures in the spring makes it possible to maintain good pastures with moderate amounts of irrigation water. The top dressed pastures given light irrigation produced more abundant forage than the more heavily irrigated pasture that did not receive the top dressing.

Program Deals With Regional Problems

The Caldwell Substation is located in a region having a large number of important problems of soil fertility, crop production and animal breeding and feeding. The program at Caldwell is arranged to undertake the study of the most important factors having to do with the success of farming in southwestern Idaho.

High Altitude Substation

Season Unfavorable

The season of 1926 was not especially favorable for experimental work at the High Altitude Substation. It was dry, and there were frosts during the growing period. The buckwheat was entirely killed, potatoes were frozen down and peas were seriously damaged. About half a normal crop resulted. One noticeable effect of the frost was on the potato plot tests of different size of seed. The vines from the small seed piece were badly damaged by the frost while the large seed piece or whole potatoes produced vines that were hardier and stood the effects of the frost much better.

Work with Fungus Disease of Wheat

The winter wheats were badly infected with a fungus disease, *Helmenothosporium sativum*. Some varieties in the test plots were almost entirely immune while others were badly damaged. This disease cut the yield quite heavily on all the cultural plots. The High Altitude Substation in cooperation with the station department of plant pathology, is conducting experiments with this fungus growth, using in the test several of the leading winter wheats, to find the varieties that are the most resistant. Soil inoculations were made with the cultures of the fungus to obtain more information on its life history.

Cultural and Crop Rotation Experiments

In the cultural tests with wheat the summer fallow plots are outyielding the plots with winter wheat following winter wheat and the plots with winter wheat stubbled in. The increase in yield on the summer fallow plots over the other plots indicates that it is not profitable to follow winter wheat with winter wheat. If wheat is to follow wheat, it is better to fall plow after removing one crop and plant spring wheat the following year. The substation is working on a set of crop rotations with the hope of finding one that will maintain the fertility of the soil and at the same time produce as much grain over a period of years as the ordinary summer fallow method practiced by most of the wheat farmers and give a pasture or hay crop.

Sweet Clover

Sweet clover is proving quite successful as a dry farm crop, and is used as a leguminous crop in three crop rotation projects on the Substation farm. It is also being used in a cultural test of sweet clover with a grain as a nurse crop. In this test the usual yield of grain is harvested the first year but no crop of sweet clover is harvested. The second year the sweet clover makes a very satisfactory yield of hay or pasture. The ground is plowed after the hay crop is removed and is ready for a grain crop the following year. No sweet clover crop is harvested the first year when a grain crop is used and very little pasture is secured. With peas as a nurse crop, some pasture can be expected the first year. Barley gives the best results as a nurse crop, with wheat and oats the poorest of the grains. Data so far obtained indicate the advisability of planting grain as a nurse crop with sweet clover, either spring or winter.

The yield of the second year crop of sweet clover from the rotation plots for 1926, a dry year, averaged 4241 pounds per acre. The yield of hay from the second year sweet clover plots, seeded with grain as a nurse crop on two-thirds of each plot, made an average of 3410 pounds per acre. No work so far has been done on the livestock-carrying capa-

city of an acre of sweet clover pasture. There occasionally is demand for this kind of information.

Winter Wheat Varieties

The winter wheats in the variety test plots hold about the same position as in 1925, with Kanred, Kharkof and Triplet leading in yield over a period of several years. Three new wheats from the home station, Moscow, have been added to the list within the last two years and they all give promise of becoming leading varieties, both in yield and smut resistance. The smut in 1926 was very bad in the upper Snake country, some fields running as high as 50 percent. This probably was caused by the excess moisture that fell in the fall of 1925, following the seeding of winter wheat. The new wheats were almost 100 percent smut resistant.

Barley, Oats and Spring Wheat

Trebi continues to be the highest yielding spring barley. Victory and idamine oats lead in yield while there is no outstanding variety of spring wheat. The highest yielding spring wheats are late maturing and often do not make milling wheat. Usually they are frozen and are good only for feed. The dicklow and jenkin are highest yielding, but are too late maturing for this section. The marquis, soft federation and bluestem are the next highest in yield.

Seed Potatoes

The seed potato industry is growing rapidly, and each year more farmers are starting the growing of potatoes. There is a demand for seed and many inquiries are received by the substation for seed and for information on the best methods of raising seed potatoes. Some rotation work with sweet clover, potatoes and wheat is under way. Selected strains of potatoes, free from disease, are being grown on the substation farm and some hill selection work is being done. A potato cellar is needed in connection with this work.

In general, the program of the High Altitude Substation is closely coordinated with the needs and requests of farmers for new information. The experimental results have a definite part in agricultural improvement.

Sandpoint Substation

The winter season of 1926 was free from climatic extremes. The growing season was 103 days long.

Winter Wheats

The dry fall of 1925 prevented the germination of much fall wheat but the open winter was very favorable. Jenkin, with 31.5 bushels per

acre, was the best yielding variety. Hybrid 128 was next with 29.3 bushels, triplet third with 20.1 bushels and mosida fourth with 28.86 bushels. Winter club barley yielded 37.2 bushels, gray winter oats 32.7, rosen rye 25.7, black winter emmer 1447.9 pounds, and fall-seeded white Canada field peas 17.3 bushels.

Thirteen varieties of winter grain were tested. A winter wheat nursery of 48 varieties was started the fall of 1926. In the work on date of seeding fall wheat, the August seeding yielded 25.3 bushels, the September seeding 19.9 bushels and the October seeding 16.8 bushels.

Spring Wheats

The highest yielding spring wheat was jenkin with 22.4 bushels. Blue-stem was second with 21.1, and defiance third with 17.7 bushels. Nine varieties were tested. The lowest yield was 10.5 bushels for the hard federation. The March 26 seeding of spring wheat yielded 21.5 bushels, the April 15 seeding 20.7 and the May 6 seeding 21.1.

Oat Varieties

Out of 12 varieties of oats idamine led with 48.4 bushels, early mountain yielded 45.9 bushels and silvermine 45.6 bushels. Gray winter oats yielded 31.1 bushels, the lowest of all. Hulless oats made an average acre yield of 682 pounds. The average of plots of oats seeded March 26 was 42.1 bushels, April 15 43.2 bushels, May 6 31.3 bushels.

Barleys

Eight barley varieties were tested. Hooded was the highest yielding, with 31.5 bushels. Winter club was the highest yielding of the bearded varieties with 29.3 bushels, and for the hulless sorts white hulless led with 1,366 pounds. The March seeding of barley averaged 20.8 bushels, the April seeding 19.31, and the May seeding 17.4.

Field Peas

The dry spring and the hot weather at blooming time lowered the pea yield considerably. Kaiser yielded 13.8 bushels, white Canada 12.0 bushels and bluebell-8257 9.9 bushels. A March 26 planting of field peas yielded 13.6 bushels, an April 15 planting 12.2 bushels and a May 6 planting 7.1 bushels. The highest yields of peas were obtained from the 150 pound rate of seeding.

Flax, Corn, Rye, and Emmer

Flax yielded 2.7 bushels per acre, spring rye 24.1 bushels and spring emmer 1,312 pounds per acre. Thirty-two strains and varieties of corn were tested. The resultant yields were poor. Plantings of corn made April 16 and May 1 looked much more promising than plantings made

on May 15 and June 1. There was no marked difference in yield in plantings of corn, varying from one plant to four plants to the hill.

Experiments With Potatoes

Strain tests were conducted with Idaho rural potatoes from various sources, an early maturing strain from South Idaho producing both the highest yield and the most culls. The green mountain was the highest yielding of the mid-early potatoes, and the Irish cobbler and the bliss triumph the highest for the early varieties. Out of eleven strains developed on the substation those from the early Ohio, Irish cobbler and green mountain were the only selections showing superior yield to bulk selected stock. Idaho rural potatoes planted in hills, in comparison with 800-pound seedings, yielded about the same amount of marketable potatoes. The heavy seeding of netted gem was better than the hill plantings. Whole seed yielded 1,980 pounds more per acre than cut seed. The May 1 and May 15 plantings made higher yields, both being higher than the April 15, June 1, June 15, and July 1 plantings. The 18-inch plantings of potatoes made higher total yields than wider distances, both with cut and whole seed. The hot formaldehyde seed treatment gave better control on rhizoctonia than either bichloride of mercury or ordinary formaldehyde.

Alfalfas and Clovers

Alfalfa varieties yielded more than the other legume varieties tested. Grimm alfalfa made the highest yield of all, 8,941 pounds per acre. Idaho red, a selection made by the Aberdeen Substation, yielded more than ordinary red clover. New seedings were made of the legume variety test and also new work was started on the legume combination experiments. Various legumes planted with nurse crops in 1925 yielded practically as much as when seeded alone. Tests undertaken to thicken the stand of alfalfa proved unsuccessful. Cultivating alfalfa after the first cutting did not materially increase the yield, and resulted in a decrease in the value and appearance of the hay. The average yield of alfalfa from the whole farm was in excess of three tons per acre. The best field yielded 5¼ tons per acre.

Miscellaneous Forage Crops

Fall-seeded vetch did not germinate well, owing to the dry fall period. The highest yielding spring variety was Hairy vetch which made 2,808 pounds per acre. Bitter vetch produced the highest yield of seed.

The grass variety test was reseeded and other work was started on pasturage with various varieties and combinations of grasses. Winter rye and vetch produced the greatest amount of hay for the grain hay com-

bination. The winter wheat and vetch was next best. Tests with alfalfa and red clover for seed production resulted in very low yields. In the case of alfalfa, the bloom did not set well, and red clover fertilization was poor.

Gypsum on alfalfa produced a 100 percent increase above the check plot. Lime showed up favorably when used for the annual legumes. Winter wheat in a rotation with sweet clover produced 38 1-16 bushels per acre.

Seed Distribution

Three acres of land were cleared in the spring of 1926. Fifty-five hundred pounds of jenkin, 1730 pounds of idamine, 600 pounds of kaiser, and 10,460 pounds of mosida were distributed during the current year. Field day was held on June 19, with a large attendance.

DISBURSEMENTS BY DEPARTMENTS

from

STATE APPROPRIATIONS

Jan. 1, 1926 to Dec. 31, 1927

	Adminis.	Ag. Chem.	Agron.	Ag. Econ.	Soil Survey	Bact.	Entom.	Hort.	Plant Path.	Poultry	Total
Salaries	\$.....	\$.....	\$.....	\$.....	\$ 435.53	\$.....	\$3,366.33	\$.....	\$.....	\$1,415.00	\$5,217.19
Help .....	.....	.....	56.40	.....	.....	100.65	67.20	78.00	8.75	134.25	445.25
Travel expense .....	.....	.....	.....	.....	355.24	.....	534.79	.....	.....	.....	890.03
Communication	15.00	.....	.....	.....	.....	.....	24.38	.....	.....	15.08	54.46
Freight & express.....	25.82	26.00	12.87	16.04	.....	.....	64.24	14.69	124.60	81.61	365.87
Light & power.....	.....	.....	.....	.....	.....	.....	11.40	.....	.....	.....	11.40
Laundry .....	.....	.55	.....	.....	.....	1.85	.....	.....	4.55	.....	6.95
Printing & advertising	176.52	223.90	.....	.....	.....	.....	.....	.....	7.80	14.00	422.22
Office supplies	34.38	.....	74.83	.....	.....	50.09	16.50	13.25	16.35	18.00	223.40
Laboratory supplies .....	.....	360.23	48.58	.....	.....	190.76	310.86	67.33	60.49	183.81	1,222.06
Repair to equipment....	4.45	.....	.....	.....	.....	.....	5.15	.....	.....	45.05	54.65
Contingent expense .....	.....	.....	.....	.....	.....	.....	25.50	.....	.....	.....	25.50
Feed stuffs .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	268.25	268.25
Equipment .....	.....	.....	83.00	.....	.....	.....	255.66	.....	.....	85.40	424.06
	\$ 256.17	\$ 610.68	\$ 275.68	\$ 16.04	\$ 790.77	\$ 343.35	\$4,682.34	\$ 173.27	\$ 222.54	\$2,260.45	\$9,631.29

DISBURSEMENTS

Jan. 1, 1926 to Dec. 31, 1927

	Aberdeen	Caldwell	High Altitude	Sandpoint	Total
Salaries	\$ 2,615.00	\$ 1,800.00	\$ 1,500.00	\$ 2,025.00	\$ 7,940.00
Labor	2,320.04	5,437.69	1,042.86	1,773.85	10,574.44
Expense & supplies	1,430.21	5,757.23	459.63	1,718.66	9,365.73
Equipment	1,808.21	1,454.32	16.90	218.00	3,497.43
Totals.....	\$ 8,173.46	\$14,449.24	\$ 3,019.39	\$ 5,735.51	\$31,377.60

LOCAL STATION FUND FUND STATEMENT

Balance Jan. 1, 1926	\$1,931.68	
Receipts Jan. 1, 1926 to Dec. 31, 1926	2,172.13	
	\$4,103.81	
Disbursements Jan. 1, 1926 to Dec. 31, 1926		3,909.43
Balance December 31, 1926		\$ 194.38

Receipts by Departments

Interest on deposits		\$ 331.42
Agronomy Dept.—Sale of garden products		159.94
Bacteriology Dept.—Sale of supplies		5.50
Horticulture Dept.—Sale of garden products		421.61
Poultry Dept.—Sale of poultry products		1,167.21
Plant Pathology Dept.—Sale of garden products		36.45
Miscellaneous—Refund		50.00
Total		\$2,172.13

Disbursements by Departments

	Adminis.	Ag. Chem.	Agron.	Ag. Econ.	Bact.	Hort.	Plant. Path.	Poultry	Total
Help	\$ 15.00				\$ 26.30	\$ 822.54	\$ 152.90		\$1,892.06
Travel expense	29.15		99.70	164.02		334.42	41.07	45.38	713.74
Printing & advertising								16.26	16.26
Contingent expense								24.00	24.00
Laboratory supplies		32.59	41.33		12.75	78.17	64.75	151.52	381.11
Feeding Stuffs						9.36		839.71	849.07
Repair to equipment			12.54						12.54
Equipment		7.50				7.15		6.00	20.65
	\$ 44.15	\$ 111.79	\$ 957.19	\$ 164.02	\$ 39.05	\$1,251.64	\$ 258.72	\$1,082.87	\$3,909.43

FINANCIAL STATEMENT

UNIVERSITY OF IDAHO AGRICULTURAL EXPERIMENT STATION

in account with

FEDERAL APPROPRIATIONS

Dr.		Hatch	Adams	Purnell
To balance from appropriations, 1925-1926.....		None	None	None
Receipts from treasurer of the United States for the year ending June 30, 1926		\$15,000.00	\$15,000.00	\$20,000.00
	Cr.	Abstract		
By salaries	1	\$12,026.28	\$11,193.34	\$ 9,006.90
By labor	2	1,356.49	1,181.97	461.35
By stationery & office supplies	3	.....	.....	65.82
By scientific supplies consumable.....	4	460.63	298.01	117.62
By feeding stuffs	5	61.68	.....	18.19
By sundry supplies	6	211.63	89.01	343.15
By fertilizers	7	.....	.....	.....
By communication service	8	.....	.....	8.50
By travel expense	9	290.01	1,066.12	2,888.08
By transportation of things	10	18.14	13.12	100.87
By publications	11	200.41	.....	288.33
By heat, light & power	12	37.30	2.70	.....
By furniture & fixtures	13	.....	.....	150.30
By library	14	.....	.....	46.61
By scientific equipment	15	87.26	940.28	420.85
By livestock	16	75.00	.....	5,167.00
By tools, machinery & appliances.....	17	175.17	215.45	916.43
By building & land	18	.....	.....	.....
By contingent expense	19	.....	.....	.....
	
Total.....		\$15,000.00	\$15,000.00	\$20,000.00