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Agricultural Experiment Station

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* By special arrangement.

To the President of the University of Idaho:

This report of the activities of the Experiment Station is for a period during the greater part of which, owing to the resignation of the former Director, my relations to the work have been those of Vice Director and Chemist. Since the full duties and responsibilities of the Director's office are now mine, I wish to preface departmental reports of progress made during the year on various projects with a brief review of conditions under which Experiment Station work is being conducted.

THE EXPERIMENT STATION IN UNIVERSITY ORGANIZATION

Experiment station work throughout the country is commonly regarded as one branch of agricultural college activity—the oldest one—just as extension work is regarded as another—the youngest. Not infrequently one executive supervises the work of college instruction and of experimentation and research and at the same time feels more or less responsible for the proper conduct of extension work. At this institution the position of the Experiment Station and of the Extension Division is possibly unique in that they have recently been placed on a par with the Agricultural College in the University organization. Since this organization became effective during the period under consideration, one or two resultant advantages to the work of the Experiment Station may well be noted.

Our College of Agriculture has shown a remarkably strong growth during the last six or seven years. The recent reorganization of old courses to meet new conditions and the organization of new ones to meet unmistakable demands for specialization by students in this or that field of agricultural activity placed heavy burdens upon those who head the several departments of agricultural instruction. The extension service came into being during the same period and no department of the college has escaped being requisitioned for help in the conduct of extension work. With pressure—real or imagined—brought to bear upon heads of departments for results in class rooms and a satisfactory performance in the extension field, the surmise that in some instances departmental supervision of experimentation and research had grown lax strikes close to the truth. There may be a great deal of truth in the observation that western agriculture could attain a position far in advance of its present one by the simple expedient of a more general adoption of practices based on facts long since established here and elsewhere by experimentation and research, but from the proposition that experimentation and research in western institutions might well be held in abeyance pending the starting of machinery designed to bring about the more general adoption of farm practices much to be desired, I most strongly dissent. All too soon it will be found that instead of a superabundance

of established facts applicable to western farm practice, there will be far too few upon which absolute dependence can be placed. Never was there greater need for well directed activity in the field of agricultural research in western institutions than at present. Organization in itself of course does not insure activity in any particular field but this may be said of ours: It makes possible a clearer differentiation of the fields in which the teacher, the investigator, and the extension worker may find proper expression for their activities. With responsibility for results more squarely placed, the Experiment Station is in a better position than formerly to become aggressive in the conduct of its legitimate work.

It is hardly necessary to state that it is not the intention to plan the creation of an independent organization for the conduct of experiment station work. In station work it might be advisable to place greater emphasis on project and less on departmental activity but there is much to be gained by all concerned through the close association of departmental heads who maintain active interest in teaching and research, of men engaged solely in research, and of those who are concerned primarily with class-room and laboratory instruction. Expression of experiment station activity will, therefore, continue to be given thru departments which are charged with the duty of instruction as well as those of research.

FINANCIAL SUPPORT OF EXPERIMENT STATION WORK

For the conduct of work at the central station, we have the two federal funds, Hatch and Adams, and the Local Station fund which is derived from interest on federal deposits and the sale of products resulting from project work. The federal funds are distributed by budget each year to the several departments. The Bursar's financial statement indicates how the Hatch and Adams funds, amounting to $15,000 each, and the Local Station fund were expended during the period under consideration.

Work which may be described as experimentation is supported with the Hatch and Local Station funds. Work of a more fundamental character—research—is supported with the Adams fund. Definitely outlined work carried on by either fund is spoken of as a project. From departmental reports it is apparent that twenty-three projects were supported during the last year with the Hatch and Local Station funds. There were three in Animal Husbandry, one in Animal Husbandry and Chemistry, one in Chemistry, four in Dairying, six in Farm Crops, five in Horticulture, one in Poultry, and two in Soils. During the same period five projects were supported by the Adams fund, two in Bacteriology, one in Chemistry, one in Horticulture and two in Soils. A project submitted by Botany and Chemistry but carried by other funds during the year was added to the Adams fund list near the close of the year and facilities were provided for taking care of it in the future. Departmental reports indicate the progress made during the year in the conduct of project work.

It is doubtful if the farming interests of the state are aware of

the restrictions placed upon the activity of experiment station men by the fact that the work of the Station is supported entirely by federal funds. The States Relation Service thru its Office of Experiment Stations insists that expenditure of both funds must be in the support of approved projects only. Requests are frequent for this or that service, the giving of which is associated in the public mind with the primary duties of experiment station workers. Many of these requests can and have been very properly referred to the Extension Department but others are of such nature that satisfaction can be given only by the specialist in this or that field. Under present conditions, he is frequently forced to render inadequate service or refuse it altogether thru his inability to incur small but necessary expenses in acquainting himself with field conditions.

PUBLICATIONS

Three bulletins were published during the year and material resulting from the completion of an Adams fund project was put into shape for publication. Notification of the recent action of the State Board of Education in creating a special publication fund was received with great satisfaction, for the Hatch fund which has been carrying the burden of bulletin publication is badly needed in its entirety for the support of investigations. This action on the part of the State Board will permit the Station to publish in its own way hereafter not only results of its completed work but of such timely press and poster bulletins as are designed to keep the application of that work constantly in the public mind. It will make possible too the revising and reprinting of one or two bulletins, the demand for which was unusually heavy, and of such other material as occasion seems to demand. Bulletins as issued have been sent to our regular mailing list and freely in response to requests from whatever source. The mailing list numbers only 7000. Assuming that each bulletin serves a family of five, approximately 35,000 people are being reached by our Experiment Station publications. Working as we are in an agricultural state whose population numbers upwards of 400,000, it is evident that far too few of our State's population are being served in this way. Granting the inadvisability of placing a name on the list without a request to that effect, it would seem necessary to put forth some effort that would bring the work of the Station in permanent form more prominently to the attention of farmers and those interested in farming operations. Plans looking to the accomplishment of that end will be put into effect in the near future. It is worthy of note that during the past year high-school and normal students frequently made request of the Station for the more recently published bulletins. The good work of former students in our College of Agriculture in the newly organized high-school courses in agriculture and of workers in the Extension Department in Boys' and Girls' Clubs is recognized beneath these requests.

THE SUB-STATION AND DEMONSTRATION FARMS

It has proved impossible to serve satisfactorily the varied agri-

cultural interests of the state by investigations conducted at the central station alone. Very wisely has provision been made by legislative appropriation and the contributions of public-spirited citizens for the conduct of such work on sub-station farms as well. Resident superintendents, men of college training and wide practical farm experience, are directly responsible for the execution of work initiated on these farms. They are regarded as members of the experiment station staff.

In co-operation with the Bureau of Plant Industry experiments have been conducted since 1912 on an eighty-acre tract at Aberdeen for the benefit of both dry and irrigation farmers in the upper Snake river valley. This tract is being operated on a twenty-year lease secured by the state from Mr. F. A. Sweet thru the assistance of the Aberdeen commercial club. A very serviceable set of farm buildings was made possible for the tract by the contribution of money and labor by the citizens of Aberdeen and vicinity. For the support of this farm for a period of two years the last Legislature appropriated $5000. This appropriation is being used for the operating expenses of the farm. The salary of the superintendent is met by the Bureau of Plant Industry. Nine of the 80 acres are not available for experimental purposes. Fifteen are under irrigation, and 56 are dry-farmed. Variety tests with wheat, oats, barley, and peas, and cultural tests with the grains, grasses, and root crops are leading lines of work on this farm. The superintendent has annually written a detailed report of the investigations conducted by him. A great deal of valuable information has been given to the public thru his participation in farmers' institutes and other forms of extension work. Preparation is being made for the more general distribution of the results of his investigations in bulletin form.

A combination dry and irrigation farm of 320 acres at Caldwell is intended to serve the interests of farmers in southwest Idaho in much the same manner as the one at Aberdeen has been made to serve farming interests of a similar nature at higher altitudes. Unfortunately it has never been handled with the same intensity of purpose which has characterized the management of the Aberdeen farm. It cannot, therefore, show experimental results at all comparable in value. It is to be hoped that real experimental work can be inaugurated there within the near future. A dairy herd was placed on it during the last year and $2000 were appropriated by the last Legislature for the support of this farm for the succeeding two years.

On a forty-acre farm at Gooding, experiments in the duty of water, time of irrigation, and similar problems have been conducted on alfalfa, small grains, and root crops since 1909 for the benefit of irrigation farmers in that part of the state. In the conduct of work on this farm, we have had the co-operation of the office of Irrigation Investigations of the U. S. Department of Agriculture. That office contributes toward the salary of the superintendent. The state by legislative appropriation finances the other operating expenses. The splendid management and operation of this farm is evident from the character of its superintendent's contribution to experiment station

literature. The State appropriated $4000 for the support of this farm during the present biennium.

At Jerome the State provided a forty-acre irrigated tract and the buildings necessary for the study of problems involved in the production of sugar beets, sugar-beet seed, and potatoes. The actual study of those problems has been conducted for several years under the direct supervision of the Bureau of Plant Industry. The State of course will receive the benefit of whatever information is eventually secured.

At Sandpoint and at Clagstone farms are being developed for the purpose of putting us in a position to answer satisfactorily the many questions raised relative to the soils of the cut- and burned-over areas and to crops adaptable to them. The farm at Clagstone consists of 200 acres. Its development is not at all satisfactory at the present time. It can be made so only by specific appropriation for its management. The farm at Sandpoint consists of 170 acres. It is being developed slowly but along what appear to be perfectly logical lines. It can be made to serve the interests of a large number of farmers in the northern counties. $4800 were appropriated by the Legislature for the conduct of work on this farm during the present biennium. With no specific funds for the support of the Clagstone farm, it has seemed advisable to use a small portion of this appropriation for work at Clagstone. The contributions of firms and private citizens of Sandpoint have made possible for the Sandpoint farm a very serviceable set of farm buildings. They are under construction at the present time.

If to these farms one other representative of the Nezperce and Grangeville sections could be added it is believed that the varied conditions of soil and climate peculiar to the state would be fairly represented in the kind of experimentation which can be conducted profitably on sub-stations.

DEPARTMENTAL REPORTS

Taken one by one the departmental reports which follow indicate primarily the progress being made on project work. As a unit they give a very clear picture of the place occupied by the Experiment Station in University activity. The Station may very properly be regarded as the University organization thru which the fundamental sciences are made to contribute to the agricultural welfare of the State; but the project rather than the department emphasizes the trend of investigation. Varied as is our agriculture, the different interests are fairly represented by some phase of investigation conducted on the central or sub-station farms. A distinct recognition of a claim for service was made during the year by the Department of Botany in placing on the Experiment Station staff an especially well trained plant pathologist. The absence of a report from an economic entomologist emphasizes what has been for several years a distressing situation. In view of the serious inroads by insect pests, which experience teaches that our field, garden, and orchard crops are subject to, the recent action of the State Board in making provision for the services of

one well trained in economic entomological investigations is highly appreciated.

In conclusion, I would like to say that the Experiment Station force recognizes, as must any group of individuals given at all to serious thinking, that the solution of problems relating to the production of farm crops in this far western country is but half the duty the University organization owes the farming interests of the State. The study of marketing problems should be made to contribute to the welfare of all people the institution is intended to serve. It is perhaps questionable whether studies of that nature should become a part of the Experiment Station activities. Nevertheless our Experiment Station workers will welcome the vigorous prosecution of marketing investigations on the part of some division of the University organization. Thru it only can the full benefits of their own activity be realized.

Respectfully submitted,

J. S. JONES, Director.

DEPARTMENT OF ANIMAL HUSBANDRY

The experimental work of the Department of Animal Husbandry may be seen in the following projects and their results as described below:

Station Bulletin No. 74 reports swine-feeding experiments and offers suggestions to farmers regarding breeds and management. Since the publication of this bulletin, four separate winter experiments in swine breeding and maintenance have been carried out. The important question at issue in the greater portion of this work had to do with the methods of growing out and fattening fall litters of pigs. The results in general indicated a higher cost of production as compared with spring litters and the use of such supplements as alfalfa hay, tankage, and cull potatoes was found advisable.

During the past winter a test was carried out with four lots of pigs comparing cooked potatoes, alfalfa hay, and tankage when fed supplementary to a basic grain ration. One of the lots of pigs was carried on warmed feed, another on feed given without warming. Most economical gains were made by the lot getting the alfalfa supplement. The winter was mild and the warming of feed did not pay.

In handling the breeding herd, it has been found practicable to maintain mature brood sows during the summer months on mixed pasture without the use of concentrates of any sort. Winter maintenance with due regard to economy and best results from the brood sow is of even greater importance. A test was made as to the feasibility of substituting cheap supplements for a considerable portion of the grain ration. One lot of sows received a full grain ration. Another lot received one-half allowance of grain and alfalfa whole in a rack. A third lot received the one-half grain ration and cut alfalfa mixed with the grain. A fourth lot ate the same ration as Lot 3 except that the mixture was steamed before feeding. The most satisfactory and economical ration was found to be a limited amount of grain supple-

mented with alfalfa hay fed in a rack.

The time of Assistant Animal Husbandman C. W. Hickman has been taken up largely with experimental work. He has co-operated with the Department of Agricultural Chemistry in the digestion trials with alfalfa hay during the winter and has spent a considerable portion of the summer on swine-feeding problems. Four different lots of hogs from the spring litters of the University herd were handled on various kinds of pasture supplemented with grain. Pastures were of peas and oats, alfalfa, mixed grasses, and clover. The pigs in lots of 20 to 25 were kept on these pastures 56 to 57 days. A longer pasture period was not possible on account of the lack of moisture which caused the pasture to be of little value after the first of August. The peas and oats pasture made a relatively good showing. The mixed pasture was found to be not so valuable. This work is only a beginning for a complete series of tests and, therefore, a detailed report of results so far secured will not be made at this time.

The "hogging off" of peas was tested on land contiguous to the University farm belonging to John Swanson. The field of 4.25 acres was divided into three lots, the average yield of peas being 20 bushels or 1200 pounds per acre. Lot 1 contained 1.32 acres, lot 2, 1.42 acres and lot 3, 1.51 acres. Lot 1 was used for 25 days by 20 pigs averaging 78.5 pounds; lot 2 was used for 38 days by 20 pigs averaging 84.8 pounds; lot 3 was used for 30 days by 15 pigs averaging 54.7 pounds, and for 44 days by 30 pigs averaging 70.8 pounds. Lot 2 was fed, in addition to the peas, rolled barley at the rate of 2 pounds per 100 pounds live weight or a total of 1241 pounds of barley. The barley was valued at $25 per ton and the value of the amount fed was deducted from the value of the peas. A total of 2067 pounds of pork was produced by the peas and the supplemented barley. Figuring pork at $6 per hundred weight, the peas produced, after deducting the value of the barley, $108.51 worth of pork, an average return of $25.53 per acre or $2.13 per 100 pounds of peas in the field.

The use of the barley as a supplement at the rate of 2 pounds per 100 pounds live weight paid for the grain but results did not seem to justify the additional labor.

Up to three or four years ago but little lamb feeding was done in this state. The representatives of the Animal Husbandry Division of this Station felt that the feeding of lambs offered one of the most successful and profitable ways of disposing of the great quantity of alfalfa hay grown in some sections of the state. In order to secure definite information regarding the value of our native grown grains in lamb feeding and to secure accurate data regarding the feasibility of lamb feeding in Idaho, a series of lamb-feeding experiments was inaugurated.

Bulletin No. 77 reports two years of lamb-feeding experiments, both of which demonstrated the advisability of marketing hay thru the lambs, a fact long appreciated in other states with years of experience in lamb feeding. A fact of much greater importance to Idaho

was the discovery that native grains such as wheat, oats and, barley compare very favorably with corn in amount of gain and quality of flesh produced. These experiments and the favorable reports of Bulletin No. 77 paved the way for lamb feeding in many sections of Idaho and feeders in many districts are following closely the detailed suggestions as to procedure given in that bulletin.

Another experiment, that of 1913-1914, was completed after Bulletin No. 77 came from the press. In this work 513 lambs and 220 old ewes were fed. The venture proved a success financially and gave valuable data as to the relative values of corn and barley in finishing lambs for market and also showed the possibility of shortening the grain-feeding period by a preliminary period of feeding with hay alone. When these sheep were marketed, the 733 head filled three double-decked cars, and made one of the largest shipments, so far as the writer is aware, ever prepared by an American experiment station.

There has been carried on for two years experimental work in sheep breeding and management. The University flock now consisting of 75 head was used as a basis for the investigation. Data have been kept as to relative weights of mature sheep, weights of fleeces, weights of lambs at birth, and daily gains of lambs, comparing in all of these things the Southdown, Shropshire, Hampshire, Cotswold, and Rambouillet breeds. In addition, records have been kept of comparative amounts of feed required for winter maintenance of the same breeds. This work has so far yielded some very interesting data that will be of practical value to some of our sheepmen. The following table is compiled from four years' weights of fleeces, two years' records of weights of ewes, weights of lambs at birth, and daily gains of lambs; and a single season record on relative breed maintenance.

	Weight of ewes	Cost daily maintenance per head	Birth-weight of lambs	Lambing percentage	Av. daily gain of lambs	Av. weight of fleece
Southdown	152.0 lbs.	$ .0148	6.8 lbs.	138.5	.39 lbs.	7.7 lbs.
Shropshire	173.0 lbs.	.0195	7.1 lbs.	112.5	.48 lbs.	12.2 lbs
Hampshire	190.0 lbs.	.0222	9.0 lbs.	77.5	.60 lbs.	8.2 lbs.
Cotswold	184.5 lbs.	.0222	6.6 lbs.	125.0	....	17.3 lbs.
Rambouillet	166.5 lbs.	.0148	8.4 lbs.	100.0	.47 lbs.	14.8 lbs.

In this table, one set of figures looks abnormal to a sheep man of experience. The low percentage of lambing for the Hampshire would hardly be credited by a sheep breeder who had much to do with the various breeds. Certain factors, such as particularly bad weather when the Hampshire ewes lambed and some little trouble with the service ram are probably responsible for this low figure for Hampshire prolificacy.

The sheep-management work will be continued to secure further and more conclusive data and it is hoped that further lamb-feeding work may be carried on particularly with tests of cut and ground alfalfa hay.

Co-operative work with the Department of Agricultural Chem-

istry was inaugurated during the winter to test the digestibility of native grown feeds and forage crops. Our texts on feeding farm animals quote figures on the digestibility of all of our well-known feeding stuffs but practically all of the percentages are given for eastern feeds grown under eastern or central state conditions. It is highly desirable for many reasons that a great deal of information be secured on the feeding value and digestibility of western grown feeds and forage crops. The initial work was with wethers fed on alfalfa hay. One test was made with hay from irrigated land near Twin Falls and another with hay grown under conditions such as prevail in the non-irrigated region of north Idaho.

Another piece of work recently initiated has for its purpose the determination of the practicability of siloing crops other than corn for feeding under Idaho conditions. The value of corn silage for feeding nearly all kinds of live stock is now everywhere acknowledged. Many sections of Idaho, however, have such conditions of altitude and temperature that corn-growing has not yet been successful. In those sections there is a desire to know whether wheat, barley, oats, alfalfa, clover, field peas, and many other crops, the production of which is a demonstrated success in those regions, can be satisfactorily siloed. Furthermore, the question is of interest to some communities where corn is grown but yields are not entirely satisfactory.

In order to attempt to solve this problem of such practical and vital importance and interest to the farmers of Idaho, the Animal Husbandry Division in co-operation with the Departments of Agricultural Chemistry, Dairying, and Farm Crops has undertaken a series of experiments with various combinations of cereals and legume crops for the silo. It is planned that the work shall extend over several years and that many different crops and combinations of crops shall be tried. In connection with the siloing of the various crops, digestion trials to determine their relative feeding value will be given a great deal of attention. It is planned this year to divide the beef herd and the dairy herd in such a way that three different kinds of silage crops, one of which will be corn used as a standard, will be fed in both the beef and dairy herds and such records will be kept that definite information will be secured as to the relative values of the other silage crops compared with corn.

The work was initiated this year by the seeding of two mixtures. One mixture consisted of peas and oats seeded at the rate of 60 pounds of Canadian field peas and 40 pounds of Swedish Select oats per acre. The other mixture was of wheat and vetch seeded at the rate of 40 pounds of Sonora Club wheat and 40 pounds of vetch per acre. On one-half of the wheat-vetch land, sand or winter vetch was used and spring vetch was seeded on the other half-plot.

These crops were seeded respectively on April 15 and 16 and cutting was started on July 23 and 24. The crop was harvested 99 days after seeding. The yields were: Peas and oats, 7.4 tons of green forage per acre, vetch and wheat, 7.2 tons of green forage per acre. Yellow dent corn grown this year on sod land produced a

yield of 7.6 tons per acre over an area of eleven acres. In harvesting the vetch and wheat little difference was noted in the relative growth of the two varieties of vetch.

Two concrete silos each ten by twenty-six feet were erected on the University farm near the beef-cattle and horse barn for the purpose of holding crops used in these silage crop investigations. The silo containing peas and oats was opened on August 21 and while still warm was found of mild acid flavor and was relished by cattle. An examination on October 1 indicated that the silage was colored a little darker than average corn silage and had a somewhat stronger odor. It is well liked, however, by both beef and dairy cattle.

All of this work along live-stock lines is planned to meet the demands for information, advice, and guidance that come from our farmers and stockmen. We hope to pursue further the various projects enumerated until more definite and complete data are secured.

Respectfully submitted,

E. J. IDDINGS.

DEPARTMENT OF BACTERIOLOGY

I have the honor to submit the following report for the Department of Bacteriology:

The Adams fund project entitled "Butter, Some of the Factors Concerned in Its Deterioration" carried in co-operation with the Department of Dairy Manufactures was completed early in the year. Analytical and other data resulting from the work have since been put in shape for publication. In this connection it may be well to note some of the conclusions the work justifies:

1. The development of rancidity in butter is independent of the increase in total acidity.

2. Micro-organisms are not capable of producing oiliness, rancidity, fishiness or tallowiness.

3. Light and oxygen are active agents in the splitting of butter fat.

4. Micro-organisms will not develop in pure butter fat and any changes which may be produced by them are due to their action on the nitrogenous substances in butter or the action of enzymes developed in the cream.

Another Adams fund project entitled "Bacteriological Studies of Soils" has been carried on since June, 1910. A number of results made it desirable to summarize the work accomplished up to January of this year. Then to give the project more definite point or objective, it was decided to confine the work to certain types of timber soils. The objective points of the restated project are:

1. The determination of influences that operate upon the biological agents that may be concerned in the production of available soil nitrogen.

2. The determination of the extent to which bacteriological deficiencies may account for low fertility in certain soil types and for dif-

ferences between types and productive capacity.

3. Determination of practical methods of shifting the bacteriological equilibrium in the direction desired and of increasing the physiological efficiency of beneficial groups.

It was felt that procedure along these lines should contribute to a better understanding of conditions under which soil bacteria act and should aid very materially in the solution of our soil fertility problems. During the year a preliminary study of eighty-one samples of our northern acid soils was completed. Our time at present is being devoted to a study of two types of acid soil which are prevalent in certain parts of Kootenai county. In this investigation attention is being given to an estimation of the number of organisms present, the ammonifying, nitrifying, and nitrogen-fixing power and to a study of the cellulose-destroying organisms.

It has been the policy of the Department for some time past to provide the farmers of the state with dependable cultures for the inoculation of legumes at a nominal cost. During the last year we have furnished material for the inoculation of seed sufficient for three thousand one hundred and thirty-nine acres. Considering the prices charged by private firms for such service, this means a net saving to the farmers who purchased it of some $2900.

The Department has been overhauled during the year and facilities for work have been greatly improved.

Respectfully submitted,

JOHN J. PUTNAM.

DEPARTMENT OF CHEMISTRY

The work of the Chemistry Department is somewhat varied in nature. Two projects are being carried with the Hatch and one with the Adams fund. Substantial progress on each was made during the year.

Hatch Fund Work

Early in the year work which has been reported in Bulletin No. 81 was completed. The project of which this work is a part is entitled "A Study of Soils Within the Cut- and Burned-Over Areas of North Idaho." The completed part has added substantially to our knowledge of the characteristic properties of these soils and has provided something tangible upon which to base recommendations for their development. The project, however, is not completed. It was outlined to include a detailed study of the organic matter to be found in the predominating soil types within the above mentioned areas. A green-house study of two very prominent types conducted by me in residence at Cornell University seems to disprove the presence of toxic substances in both notwithstanding the fact that the field performance of one points very strongly to the presence of something of that nature. The laboratory work has not yet produced positive results. It will be renewed upon these and other types during the coming year. As I view it now, the project cannot be completely

rounded out until advantage is taken of an opportunity for conducting plat tests on two types which are not to be found on either one of the north Idaho sub-stations. I hope to make suitable arrangements during the coming winter with private parties for the conduct of plat work on these troublesome types.

Another project conducted in co-operation with the Department of Animal Husbandry has for its object the determination of the actual feeding value of Idaho-grown forage crops by digestion experiments. Sheep are being used. Two series of experiments with alfalfa have been completed. The year's leave of absence granted Mr. Fishburn who has taken the initiative in this work will probably interfere seriously with its progress for the present. It will be pushed as vigorously as possible, however, during his absence and broadened upon his return. This work is noteworthy in that it marks the beginning of animal-nutrition investigations at this Station. Mr. Fishburn is more fully preparing himself for the concentration of his future activities in this field.

Adams Fund Work

Our Adams fund project is "A Study of Factors Which Influence the Protein Content of Wheat."

Soon after coming to the Experiment Station in 1906, my attention was directed to the insistent claim of millers and grainmen that northwestern-grown wheat is low in milling value. The claim challenged attention for it was most insistently made by men of wide experience in the milling industry. The accepted standard of excellence appeared to be the hard spring wheats of Minnesota and the Dakotas or the hard winter wheats of Kansas and Nebraska. A brief investigation was sufficient to establish the fact that altho no small amount of discrimination is exercised by millers in the purchase of milling wheat and that grain is frequently shipped from a distance to give "strength" to that grown locally, no combination of commonly grown wheats in north Idaho at least could approach very closely the accepted standard of excellence. To the suggestion that more strenuous efforts be made to encourage the growing here of the same varieties which characterize the crop in the hard-wheat belt, the answer was, those varieties invariably lose their characteristic hardness when grown in the northwest and then they are but little if any superior in milling value to any number of varieties already commonly grown here. The inference was: In this section some condition or set of conditions prevails which prevents the production of first-class milling wheat. The suggested problem was the finding of those conditions and practical means of overcoming them.

According to Carleton,* the Pacific Coast states and north Idaho constitute the White-Wheat district of the United States. He ventures the opinion that the softness of these wheats is due to a deficiency of soil humus. The same authority assigns south Idaho to the Irrigated Wheat district and states that one great need of wheat growers in that

*The Basis for the Improvement of American Wheat, Bulletin No. 24, U. S. Department of Agriculture.

district is wheat of higher gluten content. Since softness and deficiency in gluten are generally understood as synonymous terms, the millers appeared to have just cause for complaint against the quality of wheat they are compelled to grind. Our geographical location renders competition between our product and that of the northern and middle western states unavoidable. The desirability, therefore, of undertaking an investigation that might eventually be the means of improving the milling value of Northwestern-grown wheat was clearly apparent. Inasmuch, too, as sufficient evidence had been gathered to show that wide variations in quality were common within the districts mentioned, there seemed to be something tangible upon which to base an investigation. It was commenced, therefore, in 1908 under the title previously mentioned.

Quality ascertained by milling tests: The lack of reliable data bearing upon relative values for milling purposes of Idaho-grown wheats or of relative values of any one variety when grown in different localities or sections of the state rendered advisable if not absolutely necessary at the outset of the investigation an examination of Idaho-grown wheats for the determination of their milling values. Bulletin No. 72 and unpublished data of a similar nature covering an additional three years but limited to dry-farmed and irrigated wheats are the results of our department's activity in that direction. This work and that of a like nature in our neighboring states Washington, Utah, and Montana and in California has provided for investigators in this field a fund of extremely valuable information. The comparative rating which should be accorded wheats produced in the so-called Irrigated and White-Wheat districts need not longer be a matter of doubt or one of opinion. The indiscriminate use of the terms "low in gluten," "off in milling value" do these districts great injustice and should be severely condemned. Our best milling wheat will suffer but little in fair competition with that produced in the hard Winter-Wheat and hard Spring-Wheat districts of the middle west and northern states. Our poorest milling wheats are not inferior to the product of the states adjacent to those districts on the east. The attempt to hold up or to increase the protein content of wheat appears to be almost universal. Growers in the so-called Irrigated and White-Wheat districts appear to be in a no more disadvantageous position than those of many other sections in this and other wheat-growing countries.

In this state our best milling wheat comes from the dry-farms of the so-called Irrigated district. Truly irrigated wheat and wheat grown in north Idaho when of the same variety are of practically the same value for milling purposes. Dry-farmed and irrigated lands in this state are of the same nature and both are exceedingly low in organic matter. North Idaho wheat land is much richer in that constituent. In the light of this information, the reason assigned by Carleton for the comparatively low gluten content of Palouse wheat loses much of its force. Nevertheless evidence is accumulating which at this time seems to point to the soil as a powerful factor in determining what shall be the milling value of the wheat it produces.

Fertilization, rotation, cultivation, and irrigation experiments: It was thoroly understood at the beginning of this investigation that it would of necessity be an extremely laborious one and of long duration if gone into for results that count. The work just mentioned is but one phase of the investigation as a whole. Coincident with it has been work of a different character but undertaken primarily to contribute to the much needed information upon which to draw later in the planning of very carefully controlled experiments which it is believed eventually will be found necessary to answer satisfactorily questions relating to the influence of this or that soil and climatic factor upon the elaboration of protein in the wheat plant and its seed.

Since 1908, Turkey Red wheats, which we now designate Idaho, Kansas, and Nebraska strains, have been grown side by side in three localities in this state. A very interesting and valuable record of performance for several years under strikingly different conditions is, therefore, now available for this variety. A similar record of performance but covering a shorter term is also available for Minnesota Bluestem (Minn. 169), and Saskatchewan Fife (Minn. 163). In this work there will be an answer to the charge that wheats of eastern origin rapidly deteriorate in quality when grown in the Northwest.

In rotation with oats and corn and with the application of different kinds of fertilizers, Palouse Bluestem was grown two years and Forty Fold three years on the central station farm to try out the influence of various fertilizers on milling quality. The results were not considered decisive but in the light of subsequent events may prove to be of greater value than they were given when first secured. In some form or other fertilizer experiments will be repeated.

Two years' results with Palouse Bluestem grown in rotation with cultivated crops and in rotation with such legumes as peas and clover are also a matter of record in the department. Results secured in this direction were apparently very decisive. They require verification on a larger scale, however, before a great deal of dependence is placed upon them or they are given much publicity.

Spring and early summer cultivation on the varieties grown on the central and two of the sub-station farms has been made for several years to contribute data which are of unquestionable value in the general investigation.

In so far as I am aware, the contention that under irrigation wheats rapidly deteriorate in milling value had no reliable data to support or condemn it. Securing data upon this point has been, therefore, a very prominent part of the work up to the present time. Since 1910 three varieties have been grown with varying amounts of irrigation water on the Gooding sub-station and since 1913 three strains of another variety have been grown with normal irrigation on the Aberdeen sub-station. The results plainly indicate the harmful effects of over-irrigation but they by no means substantiate the claim that good milling wheat cannot be grown under irrigation. In fact, some of our highest protein wheats for the last two years have come from the Gooding sub-station where satisfactory yields can be ob-

tained only by the liberal use of irrigation water. A study of the production and movement of soil nitrates under irrigation on the Gooding sub-station in connection with the growing of wheat there since 1910 has yielded data which throw a great deal of light on the whole investigation. This study appears to be the one which will determine the character of experiments which will constitute the third stage of the investigation, a stage we hope to enter upon next year.

From what has preceded, it is evident that the work of the department for the year on this project has been a continuation of the work of several preceding years. Work which was undertaken to ascertain the relative milling values of wheats commonly grown within the state constitutes the first stage of the investigation. That has been completed. The growing of different varieties of known origin in different sections of the state, the use of fertilizers, rotation and cultivation experiments, the application of varying amounts of water to varieties of known origin and history, and the study of the formation and movement of soil nitrates under irrigation constitute the second stage of the investigation. It has yielded extremely valuable data; data which seem to emphasize an important relationship between available soil nitrogen and elaborated protein compounds of the mature grain. It is now becoming more feasible to plan in detail the more elaborate experiments the investigation demands before it can be completed. It is our intention to get such experiments under way within the near future.

Urgent requests are frequently made by other departments for analytical work, the completion of which no doubt would be of material advantage to the departments making them. This department is obliged to decline compliance with most of these requests for the reason that compliance with them would result in serious interference with its own project work. If finances would permit, an extra man might well be employed in the department for what might be called miscellaneous analytical work.

J. S. JONES.

DEPARTMENTS OF PLANT PHYSIOLOGY, HORTICULTURE, AND CHEMISTRY

Apple Storage Work

The following is a brief report on the present status of the apple-storage project.

This project was started for two main reasons: (1) Comparatively little is known from the scientific standpoint about the changes which occur during storage and ripening. (2) The question of storage is of very great importance to the marketing phase of the fruit industry of this state. The avenues of attack that immediately suggested themselves were those given by the methods of plant physiology, organic chemistry, and physical chemistry.

The department of Horticulture furnishes the material and ulti-

mately may be guided in its apple breeding work by data resulting from our laboratory investigations. The hope of effective results would appear to lie in the close co-operation of the Departments of Botany, Horticulture, Physical, and Organic Chemistry. Storage facilities have been provided by the departments of Dairying and Horticulture. The plan is to store selected apples wrapped and unwrapped both in ordinary air storage and in cold storage, the latter to serve chiefly as a check on the changes noted in the air-stored fruit. The cold-storage temperature is to be kept as constant as the present equipment will allow. The work during the year has turned out to be largely of a preliminary nature so that no very definite results are as yet available. Matters of technique have given some difficulty. There have been made, however, on three varieties, Jonathans, Rome Beauties, and Wageners, large numbers of determinations of osmotic pressure, acidity, and electric conductance. A few samples have been examined microscopically. No work of a strictly analytical nature has thus far been performed with the exception of that dealing with acidity measurements. Determinations of sugar, starch, enzymes, etc., will eventually be made.

It is the intention to extend the physical tests by including the hydrogen-ion concentration and refractive index of the juices, the idea being to find some sensitive physical method of following the changes during storage and then by modification of storage conditions to ascertain how the fruit is affected. Changes in sugars and starches are to be followed analytically during storage and also changes in enzymes and esters. Some tests are also to be made from material from irrigated plats.

It is expected that the research will in time offer something toward controlling keeping qualities and perhaps even flavor and appearance.

Respectfully submitted,

C. L. VON ENDE.

DEPARTMENT OF DAIRYING

The Experiment Station work of the Department of Dairying has been as follows:

I. The Adams fund project, carried on in co-operation with the Department of Bacteriology to determine causes for the deterioration of butter, has been completed and the material is now ready for publication. For summarized conclusions see report from Department of Bacteriology.

II. Subsequent to the publication of the last annual report, a study of Idaho butter has been made and with suggestions for improvement has been published as Bulletin No. 73. The conclusions warranted by this study may be summarized as follows:

1. Idaho butter, especially ranch butter, has many defects which can be prevented by
   a. Care in preparing cream for churning.
   b. Correct methods of manufacture.

c. Storage at a low temperature between time of making and time of marketing.

d. Shortening the time between churning and marketing.

e. Exercising greater care in selection of storage places.

2. Idaho ranch butter grades on an average of 4.5 points lower than Idaho creamery butter.

3. Acidity of Idaho butter bears a general relationship to quality, high acidity being usually associated with low quality.

4. Under store conditions one-pound prints of butter shrink one-fourth of an ounce in the first seven days. Ranch butter shrinks more than creamery butter and two-pound prints shrink less in proportion to their weight.

III. A series of investigations affecting the management of creameries and cream stations is being vigorously pushed. The work is subdivided as follows:

1. Creamery bookkeeping.
2. Marketing butter during different seasons.
3. Cream stations, their operation and their effect on both quality and quantity.

The investigation on creamery bookkeeping is completed; results will soon be submitted for publication.

IV. Material commonly used for binding and filling in the ice-cream trade is of two kinds, animal and vegetable. A study is being made of the use of each on the quality of manufactured products.

V. The Hatch fund project involves the determination of a basic ration for the most economical feeding of dairy cattle under Northwest conditions. This project has been under way for two years and will be continued for at least two more. Comparisons have been made of barley, wheat, and corn in the grain ration, and of alfalfa, oat hay, and apple pomace with corn silage. The problem this winter will be a comparison of peas and oats, wheat and vetch, and corn as silage feeds. Notes on the feeding of beet pulp as an addition to the grain ration will also be recorded.

Under this same project, work is being conducted on the management of the heifer calf up to the time she is two years of age. Comparisons on growth are being made on calves that are heavy-fed, light-fed, and those given milk substitutes.

VI. The Department of Dairying has also supervision of the production tests made on dairy cows for advanced registration. The different breed associations, the Holstein-Friesian Association, the American Jersey Cattle Club, and the American Guernsey Cattle Club have designated that this work be under control of the Experiment Station. Tests have been made on one Jersey and ten Holstein-Friesian herds and some very creditable records have been made.

Respectfully submitted,

E. V. ELLINGTON.

DEPARTMENT OF FARM CROPS

The experimental work of the Department of Farm Crops has been done upon the following projects:

Canada Field Pea Experiment

Nine varieties of field peas are being grown to determine the variety which yields most heavily for northern Idaho. The Blue Prussian has been the most heavily yielding pea for the last three years.

A cultural experiment is in progress to determine the effect of rate, time, manner of seeding, and of seed-bed preparation on yield. Earliness of seeding is found to be one of the greatest factors influencing yield. The best rate of seeding is from 85 to 100 pounds. The largest yield obtained this year was 44 bushels per acre. This experiment will be continued.

Variety Testing of Small Grains

Many varieties of small grains have been grown for several years for the purpose of determining the heaviest yielding varieties. This experiment will be carried on in the future on a smaller scale as a number of the varieties have not given yields sufficiently satisfactory to warrant their continuance. As new varieties appear from time to time, they will be grown for the purpose of comparing their yields with the older standard varieties.

The following shows some of the results obtained:

Wheat

Winter varieties			Spring varieties		
Variety	5 yr. Avg.	1915 Yield	Variety	5 yr. Avg.	1915 Yield
Red Russian.....	43.6	50.8	Palouse Bluestem	37.7	33.1
Turkey Red.....	39.5	44.9	Marquis		31.7
Little Club.....	.....	41.7	Early Bart.....		35.7
Forty Fold.....	37.5	32.6			

Spring Barley

Variety	3 yr. Avg.	1915 Yield
White Smyrna.....	61.6	84.0
California Feed.....	62.4	66.6
White Winter, spring seeding	72.5	48.5

The average for White Winter, winter seeded, for three years has been 67.6 bushels.

Experiment to Determine the Best Variety or Mixture for Hay Yields

A number of grasses, clovers, alfalfa, and mixtures were seeded this spring for the purpose of obtaining a comparison of their value for yield of hay. This work will be continued over a period of from three to five years.

Alfalfa Experiment

Several different varieties of alfalfa with different rates of seeding were planted this spring. Next year the scope of this experiment

will be increased to cover other important points on the growing of alfalfa in north Idaho.

Testing of New Crops

Sudan grass has been grown at the Station for the first time in an extensive way. Yields at this elevation and latitude so far have not proven satisfactory. Kaffir corn, Milo Maze, and Kowliang did not mature successfully this season.

Experiment for Determining Hardy Varieties of Soy Beans

A number of varieties of Soy beans were furnished this Station by the United States Department of Agriculture to determine the varieties that would mature seed in this region. So far very little seed from any variety has been produced and the growth has been very short.

Potato Experiment

Ten varieties of potatoes are being grown in the variety test. Selection is being carried on with the Rural New Yorker variety, for the purpose of developing a more heavily yielding strain. The variety under the name Mortgage Lifter has proven to be the most heavily yielding variety over a period of three years.

Corn Experiment

Four varieties of corn were grown to determine a desirable early maturing type. Idaho White Dent, a variety resembling Silver King, gives promise of being a desirable variety for north Idaho. Windus White Dent and Thayer's Yellow Dent are small eared varieties that mature well in this section. Minnesota No. 13 proved rather too long in maturing.

Nursery Work

Many varieties of small grain were grown last year on a small scale for identification and increase of seed. This was preparatory work for the improvement of the better varieties which will be taken up this coming year.

Respectfully submitted,

N. S. ROBB.

DEPARTMENT OF HORTICULTURE

The experimental work in Horticulture has progressed along definite lines during the past year. Twelve projects are being carried. The following is an outline of the work in progress:

Apple-Breeding Experiment

Object: The object of the work has been the improvement of existing varieties of apples by breeding. For this improvement, the Ben Davis variety has been taken as a basis, using it as male and female. Crosses have been made with other varieties and from the resulting hybrids those will be selected that give promise of being adapted to conditions here.

The methods of securing cross-pollinated fruits are much the

same as those followed by plant breeders in general. The unopened blossoms are emasculated and pollen from other varieties applied when the pistils are receptive. Usually two emasculated blossoms are left to the cluster. In the fall the pollinated apples are harvested and stored in common storage until Christmas. They are then brought to the laboratory and the seed removed. The seeds from each cross are separated from the fruit, given a serial number, and tied in muslin bags. These bags are placed in two-inch pots, placed in flats, and buried where they are exposed to freezing weather. As a precaution against destruction by mice, the flats have always been covered with screen wire. The later part of February the flats are brought to the greenhouse and the seed germinated. By subjecting the seed to the above conditions, we have been able to get approximately 95 per cent germination. By the middle of May the seedlings are from 10 to 12 inches in height. They are then transplanted to the nursery, in rows three feet apart, trees six inches apart in the row. The second season the seedling trees are transplanted to their permanent places in the orchard, six feet apart each way. The results obtained thus far are as follows:

For 1910. During the spring of 1910 a total of 1175 crosses were made. The seeds taken from the fruit of these crosses produced 146 seedling trees. The parentage of these crosses follows:

Cross			
Female		Male	Trees
Ben Davis	x	Jonathan	64
Ben Davis	x	Spitzenburg	55
Ben Davis	x	Ben Davis	2
Ben Davis	x	Wagener	3
Jonathan	x	Ben Davis	14
Winesap	x	Ben Davis	1
Jonathan	x	Jonathan	1
Wagener	x	Ben Davis	4
Delicious	x	Jonathan	2

For 1911. A total of 3000 crosses was made in the spring of 1911. From the seed of fruits crossed this year, a total of 1920 healthy seedling trees was secured. The crosses made and the number of trees secured from each cross follow:

Cross			
Female		Male	Trees
Jonathan	x	Ben Davis	916
Wagener	x	Ben Davis	280
Ben Davis	x	Jonathan	301
Spitzenburg	x	Ben Davis	121
Ben Davis	x	Spitzenburg	62
Jonathan	x	Jonathan	1
Rome Beauty	x	Ben Davis	2
Ben Davis	x	Wagener	6

For 1912. Due to unfavorable climatic conditions, only 1703 crosses were made. We were very successful in germinating the seed taken from these fruits and the results were that 3065 seedling trees grew. The number of trees from each cross is as follows:

Cross			
Female		Male	Trees
Ben Davis	x	Jonathan	508
Jonathan	x	Ben Davis	1042
Ben Davis	x	Wagener	181
Wagener	x	Ben Davis	551
Jonathan	x	Wagener	175
Wagener	x	Jonathan	485
Jonathan	x	Spitzenburg	57
Spitzenburg	x	Jonathan	66

For 1913. In the spring of this year, 2823 crosses were made. 1470 healthy trees grew from these crosses. The following table shows the number of seedlings secured from each cross.

Cross			
Female		Male	Trees
Jonathan	x	Ben Davis	603
Jonathan	x	Wagener	500
Ben Davis	x	Jonathan	314
Ben Davis	x	Wagener	53

For 1914. During this year, 2527 crosses were made. From this number 4544 healthy seedlings were grown.

Cross			
Female		Male	Trees
Gravenstein	x	Newtown	22
Gravenstein	x	Jonathan	20
Spitzenburg	x	Ben Davis	153
Spitzenburg	x	Rome	28
Spitzenburg	x	Jonathan	80
Spitzenburg	x	Newtown	66
Spitzenburg	x	Wagener	238
Ben Davis	x	Spitzenburg	107
Ben Davis	x	Wagener	23
Ben Davis	x	Rome	147
Ben Davis	x	Newtown	57
Jonathan	x	Spitzenburg	542
Jonathan	x	Wagener	391
Jonathan	x	Newtown	68
Jonathan	x	Rome	42
Jonathan	x	Arkansas Black	147
Wagener	x	Spitzenburg	41
Wagener	x	Rome	818
Rome	x	Ben Davis	241
Rome	x	Spitzenburg	337
Rome	x	Wagener	326
Rome	x	Newtown	631
Arkansas Black	x	Jonathan	5
Newtown	x	Spitzenburg	8
Newtown	x	Wagener	6

For 1915. The object of the work during the spring of 1915 was to secure crosses with varieties that had not been used extensively during previous years. The results obtained are as follows:

Cross			Emasculations	
Female		Male	Number of	Fruits
Rome	x	Newtown	100	10
Rome	x	Gravenstein	90	1
McIntosh	x	Grimes	100	9
McIntosh	x	Wagener	80	4
Wagener	x	Grimes	180	26
Wagener	x	McIntosh	120	7
Wagener	x	Granvenstein	100	2
Gravenstein	x	Wagener	160	52
Grimes	x	Wagener	300	5
Grimes	x	McIntosh	20	2
Ben Davis	x	Grimes	80	59
Ben Davis	x	Newtown	50	30
Spitzenburg	x	Grimes	20	9
Jonathan	x	Newtown	260	101
Jonathan	x	Rome	140	43
Newtown	x	Rome	200	31
Newtown	x	Jonathan	200	69

Summary: To date there are 10,915 hybrid seedlings growing in our orchard and station nursery. The total number of trees secured from each cross is as follows:

Cross			
Female		Male	Trees
Ben Davis	x	Jonathan	1187
Ben Davis	x	Spitzenburg	224
Ben Davis	x	Wagener	266
Ben Davis	x	Rome	147
Ben Davis	x	Newtown	57
Ben Davis	x	Ben Davis	2
Jonathan	x	Ben Davis	2575
Jonathan	x	Wagener	1066
Jonathan	x	Spitzenburg	599
Jonathan	x	Jonathan	3
Jonathan	x	Arkansas Black	147
Jonathan	x	Newtown	68
Jonathan	x	Rome	42
Spitzenburg	x	Ben Davis	274
Spitzenburg	x	Rome	28
Spitzenburg	x	Newtown	66
Spitzenburg	x	Wagener	238
Spitzenburg	x	Jonathan	146
Wagener	x	Ben Davis	835
Wagener	x	Spitzenburg	41
Wagener	x	Rome	818
Wagener	x	Jonathan	485
Rome	x	Ben Davis	243
Rome	x	Spitzenburg	377
Rome	x	Wagener	326
Rome	x	Newtown	631
Arkansas Black	x	Jonathan	5
Newtown	x	Spitzenburg	8
Newtown	x	Wagener	6
Gravenstein	x	Newtown	22
Gravenstein	x	Jonathan	20
Delicious	x	Jonathan	2
Winesap	x	Ben Davis	1

This material will give us a splendid opportunity to study fundamental principles, useful in plant breeding. We are trying to find correlations and are working along the lines recommended by Luther Burbank. He says in a recent communication to us: "In selecting apple seedlings my practice has been first of all to select those which do not mildew—this can be easily done while they are young. This eliminates one of the worst qualities in apple seedlings. Next, I thin out all of the very slender growers with small deeply cut leaves. These always tend back to the wild state. In the next selection, I give preference always to those having large fat round buds, large thick leaves and a stocky growth."

This will enable the plant breeder to discard undesirable seedlings without having to grow each plant through to maturity in order to determine its characters.

Fruit By-Products Investigations

Object: The object of these investigations is to ascertain if fruits and vegetables that ordinarily go to waste can be properly utilized. The canning experiments were closed last year and the results embodied in Bulletin No. 82 of the Station. The evaporation of fruits and vegetables has received attention the past summer and data are being gathered relative to the cost of evaporation, length of time to evaporate, and on methods of preparing dried products for the table.

Pruning Experiment

Object: The purpose of this project is to determine the relative merits of summer versus winter pruning of apple trees as judged by influence on color and yield. The trees that have been used in this experiment were planted in 1905. The results over a four-year period show an increased yield in favor of the summer-pruned trees as follows:

Wageners—Increase in yield 111 per cent.
Grimes Golden—Increase in yield 52.8 per cent.
Jonathans—Increase in yield 2.4 per cent.
Rome Beauty—Increase in yield 1.6 per cent.

Higher colored fruit was also secured in the summer-pruned plats. The results of these studies will be prepared for publication during the coming winter.

Orchard Irrigation

The object of this experiment is (1) to determine the amount of water necessary to mature a crop of apples, (2) to determine the relation of irrigation to the formation of fruit buds, (3) to determine the influence upon the keeping quality of fruit, and (4) to determine the influence of irrigation on the production of fancy and extra-fancy fruit.

The investigations are being carried on in orchards located in the Payette and Twin Falls districts. Owing to the extreme difficulty in securing water when needed, the orchard irrigation experiment in the Payette district will be discontinued at the completion of the work this year. The data which have accumulated, however, during the past three years will be compiled and incorporated in the report when the work is completed at Twin Falls.

Orchard Survey Work

Object: To secure first hand information as to the cost and profit of fruit growing in Canyon county. This data when compiled and published will be of much value to the horticultural interests of the state for it will show what kinds of fruits are being grown and just where in their culture the profit or loss occurs. A house to house canvass is being made and information secured as to the size of the orchard, kind of fruit grown, soil types, systems of planting, drainage conditions, fertilizers, and cover crops used, companion crops, irrigation, pruning methods, past and present condition of trees, kind of sprays used, when spraying applications are made, fungus and insect troubles, yields, cost of production, and prices received.

Small Fruits Experiment

Object: To work out the several problems connected with the testing out of different varieties of small fruits. The following varieties of the different kinds of small fruits are being grown on the horticultural grounds:

1. Grapes—Mission, Moore's Early, Wilder, Worden, Campbell's Early, Concord, Clinton, Early Ohio, Isabella, Vergennes, Lindley, Lucile, Salem, Green Mountain, Niagara, Agawam, Brighton, Catawba, Delaware.
2. Blackberries—Early Harvest, Early King, Eldorado, Erie, Illinois, Perfection, Snyder, Taylor, Wilson.
3. Blackcap Raspberries—Kansas, New American, Golden Queen, Black Pearl, Columbia, Cumberland, Hoosier.
4. Red Raspberries—Cardinal, Cuthbert, Herbert, King, Miller, Shipper's Pride, St. Regis, Thompson Red.

influence upon the keeping quality of fruit, (4) to determine the in-

5. Loganberry—Phenomenal Berry.
6. Dewberries—Austin, Premo, Lucretia.
7. Currants—Cherry, Fay Prolific, London Market, Pomona, Perfection, Red Cross, Victoria, Wilder, Black Naples, Lee's Black, White Grape, White Imperial.
8. Gooseberries—Oregon Champion, Josselyn, Pearl, Chautauqua, Downing, Houghton.

The Use of Lime Sulphur as a Summer Spray for Apple Scab

Object: This project has to do with the securing of information relative to the efficiency of lime sulphur as a spray for apple scab. When a systematized schedule of application was made, excellent results were obtained. One, two, three, and four applications of lime sulphur of known strength were made (1) when the buds began to show pink, (2) when the petals had fallen. (3) four weeks later, and (5) ten weeks after the petals had fallen. The following results were obtained on the Wagener variety during the summer of 1913:

No. of applications	When applications were made	Per cent sound
Check plat	No spray	10
One application	When buds showed pink	59
Two applications	(1) When buds showed pink	
	(2) Petals fall	89
Three applications	(1) Buds show pink	
	(2) Petals fall	
	(3) Four weeks later	95

This project will be closed this fall and the data compiled and published as a station bulletin.

Testing Spray Materials for the Control of San Jose Scale

Object: To determine the relative efficiency of the different brands of spray materials now on the market and used to control the San Jose scale. Six different sprays were applied as recommended by the manufacturers to the growers. The experiments are being conducted in the Lewiston valley in one of the leading commercial orchards. The work has not progressed sufficiently to warrant us in making definite recommendations.

The Oyster Shell Scale

Object: This project has to do with the use of crude-oil emulsions and other sprays for the control of the oyster-shell scale. The scale is very prevalent in many sections of the state and is so persistent that a large number of trees have been killed. The insect is being studied under field and laboratory conditions.

Spraying for Codling Moth

Object: The object of this experiment is to test out the relative merits of one, two, and three applications of arsenicals for controlling the codling moth. Two brands of powdered arsenate of lead have been used in this work during the past two years.

Commercial Onion Culture

Object: To investigate the various problems connected with the production of different varieties of onions on a commercial scale. Thus far valuable information has been secured relative to yield, methods of planting, thinning, cultivating, harvesting, and marketing.

Variety Tests of Vegetables

Object: This project deals with the growing of different varieties, seed production, etc. During the past summer observations were made on the behavior of a number of different varieties of the following kinds of vegetables: Cauliflower, cabbage, beans, beets, muskmelons, onions, turnips, carrots, cress, cucumbers, sweet corn, lettuce, Brussels sprouts, broccoli, parsnips, peas, pumpkins, radishes, squash, spinach, tomatoes.

Respectfully submitted,

C. C. VINCENT.

DEPARTMENT OF POULTRY HUSBANDRY

A prominent part of the work of the Poultry Department during the year has been the testing of rations suitable for heavy egg production. Since the work outlined below has been completed, it appears desirable to include all data obtained even tho a part was secured subsequent to June 30, 1915.

Farm practice generally is to allow fowls to secure their own food or at best to feed them only such grains as are conveniently at hand. That variety in the ration of laying hens can be made to return handsome profits, is perfectly apparent from results of the year's work. It is to be noted that the greater part of a well balanced ration can be compounded from native grown feeds.

November 1st, 1914, three pens of thirty pullets each (White Leghorn) were housed under like conditions and fed the following rations for one year:

Pen No. 1—Grain

15 parts wheat
2 parts oats
2 parts barley
All the grit they would eat.

Pen No. 2—Grain

12 parts wheat
2 parts peas
3 parts oats
2 parts barley
1 part kaffir corn
1½ parts millett
½ parts sunflower seed
1 part buckwheat

Mash

2 parts bran
2 parts shorts
1 parts corn meal
1 part wheat meal
2 parts fish meat meal
1% charcoal

Pen No. 3—Grain

12 parts wheat
2 parts corn
2 parts oats
1 part barley
1 part kaffir corn
1½ parts millet
½ part sunflower seed
1 part buckwheat

Mash for Pen No. 3 same as Pen No. 2.

Pens 2 and 3 were fed all the grit, shell, and granulated bone they would eat. All of the fowls in the experiment were fed green food in some form thruout the year.

Weights of Fowls on Different Dates Expressed in Pounds

Pen	Nov. 1st	Dec. 1st	Jan. 1st	Feb. 1st	Mar. 1st	Apr. 1st	May 1st	June 1st	July 1st	Aug. 1st	Sept. 1st	Oct. 1st	Oct. 31st
1	90½	93	99	101¼	90½	87	72	76½	81	80	79	67	74¾
2	94¼	100¼	108¼	108¾	104	101¾	90	84	90	90½	97½	93½	93¾
3	90½	100½	106¾	105¼	100¾	103	92½	91	95¼	95¼	95	95	95

Table of Egg Production

Pen	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total	Avg.
1	39	29	53	27	155	177	95	61	57	45	1	0	739	24
2	143	165	345	264	471	546	330	289	358	319	180	76	3486	116
3	124	195	188	176	413	585	584	512	434	392	253	82	3938	131

Table of Egg Weights and Percentage

Pen	Under 2 oz.	2 oz.	Over 2 oz.	% under 2 oz.	% 2 oz.	% over 2 oz.
1	493	245	1	66 1-3	33 2-3	
2	192	3172	122	5 1-2	91	3 1-2
3	263	3546	129	6 2-3	90 1-23	3 20-69

Pen No. 1 Consumed:

Wheat	1245	pounds	@	$1.25 per cwt.	$15.55
Oats	166	pounds	@	1.00 per cwt.	1.66
Barley	166	pounds	@	1.00 per cwt.	1.66
Grit	56¼	pounds	@	.95 per cwt.	.49

Pen No. 2 Consumed:

Peas	148	pounds	@	1.50 per cwt.	2.22
Wheat	889	pounds	@	$1.25 per cwt.	$11.11
Oats	222	pounds	@	1.00 per cwt.	2.22
Barley	148	pounds	@	1.00 per cwt.	1.48
Kaffir corn	74	pounds	@	2.25 per cwt.	1.66
Millet	100	pounds	@	2.50 per cwt.	2.25
Sunflower seed	37	pounds	@	4.00 per cwt.	1.48
Buckwheat	74	pounds	@	2.00 per cwt.	1.48
Grit	41	pounds	@	.95 per cwt.	.39
Shell	61	pounds	@	1.30 per cwt.	.79
Granulated bone	56	pounds	@	2.75 per cwt.	1.54
Mash	414½	pounds	@	2.00 per cwt.	8.29

Pen No. 3 Consumed:

Wheat	881	pounds	@	$1.25 per cwt.	$11.01
Corn	147	pounds	@	1.40 per cwt.	2.06
Oats	220	pounds	@	1.00 per cwt.	2.20
Barley	147	pounds	@	1.00 per cwt.	1.47
Kaffir corn	73	pounds	@	2.25 per cwt.	1.64
Millet	100	pounds	@	2.50 per cwt.	2.50
Sunflower seed	36	pounds	@	4.00 per cwt.	1.44
Buckwheat	73	pounds	@	2.00 per cwt.	1.46
Grit	28¾	pounds	@	.95 per cwt.	.27
Shell	56	pounds	@	1.30 per cwt.	.73
Granulated bone	36	pounds	@	2.75 per cwt.	.99
Mash	372¾	pounds	@	2.00 per cwt.	7.45

Prices are figured on the average basis for this section of the country.

The grain ration was fed at the rate of about eight quarts per day per 100 fowls and the mash in open hoppers.

Total Cost, Exclusive of Labor, and Income:

Pen	Cost	Income	Profit	Loss
1	$19.36	$18.45		$ .91
2	34.91	87.15	$52.24	
3	33.22	97.20	63.98	

Respectfully submitted,

PREN MOORE.

DEPARTMENT OF SOILS

The work of the Department of Soils has been carried on under four projects during the past year—two under the Hatch fund and two under the Adams fund.

One of the Hatch fund projects—Crop Rotations for Palouse Soils—has been carried on at the Central Station. In this experiment, 63 plats of one-tenth acre each, are being used. The effect of different rotations and of the application of manure and artificial fertilizers on the productive capacity of the soil, are to be determined. Eight systems of cropping are under investigation. The fertilizers are added in such manner as will test the influence of each element of plant food likely to become a limiting factor in fertility, singly and in various combinations. As the experiment has been running only two years, no positive conclusions are possible at this time from results secured from different rotations. There appears to be necessity for nitrogenous fertilization, for the average yield of plats without nitrogenous fertilizers this year was 25 bushels of wheat per acre, and the average yield of nitrogen-fertilized plats, 32.7 bushels per acre.

A Rotation and Soil Corrective experiment has been started on the Sandpoint Sub-Station. Lime in three forms—ground limestone, air-slaked lime, and gypsum—has been tried. Very little effect of any one of them can be observed at this time. Four different systems of crop rotation are being used. They are: wheat, oats, and peas; wheat, winter barley, and clover and timothy, two years; wheat, potatoes, oats, and peas; and wheat, corn, oats, and peas.

Just here it should be pointed out that the soil upon which this experiment is being conducted is not at all representative of our timber soils. It is one of the few alluvial soils that we have within the timbered section. Our timber soils are generally of residual formation but a considerable portion is the result of a glacier action.

An experiment upon which little has been done during the last year is that which seeks to determine the toxicity of dihydroxy stearic acid and of uvitonic acid upon wheat plants growing in soil. This experiment was practically finished more than a year ago but, owing to the pressure of other matters, the acids used had not been analyzed. The analyses have now been completed and publication of the results will be made shortly.

The Duty of Water project is supported with the Adams fund. It has been carried on in the proposed manner and some interesting data have been obtained. We are not satisfied that we have obtained the closest possible approach to field conditions in each place where the experiment has been conducted. The work, therefore, will be carried into the next year.

In the Colloidal Investigations of Soils, also supported with the Adams fund, progress has been made. Chemical and mechanical analyses of ten different soils are practically complete and some of the proposed work upon the absorption of dyes has been accomplished. The results of the experiments in absorption have so far been contrary to what was expected; the "slick" spot" soil in every case showing a

higher absorptive power than the non-slick soil. In this work, it has been necessary to spend no little time in the development of applicable methods of procedure.

Respectfully submitted,

P. P. PETERSON.

ABERDEEN SUB-STATION

The 1915 work of the Aberdeen station is largely a continuation of work started in 1913. A few new features have been added and will be mentioned in their proper order. This has been the driest year in the history of this part of the state and both irrigated and dry-land crops suffered accordingly. Dry-land crops suffered most as the precipitation last fall was very deficient. There was very little after May 15 and what little occurred proved to be of no value to the crops. The snow in the mountains although very small lasted until well along in the summer but failed at the critical time or just when the later crops required water to make maximum yields. Shortness of water, however, has been the means of showing a great many farmers that they can get along with much less than they formerly deemed absolutely necessary. To play safe, the superintendent irrigated all land early in the spring before planting. To this action may be attributed our very good yields on irrigated land this year. A few farmers followed the example and profited thereby. This year has demonstrated very clearly that successful dry farming must take the summer-fallow system into proper consideration. Our best results came from the summer fallow in every instance.

The station work is divided into two main groups, dry-farm projects and irrigated projects.

Dry-Farm Projects

The dry-farm projects are divided into three groups and embrace rotation, cultural, and cropping experiments.

Rotation: This work was begun in the fall of 1913 and consists of 29 different crop rotations. It requires the use of 111 one-tenth acres plats and a total of ten crops. Rotation cycles vary from two to six years.

The rotation which gives most promise for this section at this time is alternate fallowing and cropping. Rotations, however, must be conducted for several years before thoroly reliable information can be secured. Our three years' results are merely indicative of what may be expected. The work will be continued as outlined for a much longer time. Next year dry land which has been in alfalfa for three years will be plowed up and given over to rotations which will be outlined next spring. This work may have considerable bearing on future dry-farm practice and will be watched with interest.

Soils on this farm vary to such an extent that soil-moisture work has been abandoned. Work carefully done for two years failed to show any conclusive results.

Cultural experiments: This work includes time of planting, depth of planting, rate of planting, method of planting, time of har-

rowing, time of plowing, depth of plowing, method of seed-bed preparation, and time of harvesting experiments. Some excellent information along these lines is being secured but these experiments, like the rotation experiments just mentioned, must be conducted over a term of years to be conclusive. At this time our results indicate: (1) That the proper time to sow winter wheat in this section is between the 15th of August and the 15th of September provided soil-moisture conditions to a depth of at least two or three inches are right. (2) That three to three and a half pecks is the right amount of seed to use per acre. (3) That two and a half to three inches (depending somewhat on soil moisture) is the proper depth at which to plant. (4) That spring harrowing is not advisable. (5) That seven inches is sufficiently deep for plowing. (6) That thoro tillage of the summer fallow is necessary to insure a good seed bed. (7) That there is an advantage in single drilling over cross drilling or broad casting. (8) That it is advisable to permit of at least a slight hardening of the kernel before harvesting.

Cropping experiments: Various crops are being grown on the dry farm for the purpose of enabling us to recommend certain special crops of seed or forage value which will assist in bringing about greater diversification in present dry-farm practice. Of course the rotation work mentioned above will help bring about the same result.

The most extensive cropping experiments include the varietal testing of winter and spring cereals, potato products and varietal tests, alfalfa hay and seed production, and cropping experiments with sweet clover, field peas, brome and orchard grass, Sudan grass, millet, and feterita. The results from the cereal variety-testing work warrant the recommendation of Turkey Red winter wheat for the dry farms in this section of the state. All winter-wheat variety work has been cut down to the best of the Crimean groups with the single exception of Gold Coin. To overcome lack of uniformity in soil conditions the tests are now conducted in triplicate on one-fortieth acre plats. A special phase of the cereal work is the growing of Kansas, Nebraska, and Idaho strains of Turkey Red wheat side by side in normal planting and also in rows twenty-one inches apart. This work is being done in co-operation with the Department of Agricultural Chemistry. It has for its purpose the discovery of reasons for differences in the protein content of wheats grown under dry-farm and irrigated conditions.

Results of the potato work warrant the recommendation of Early Rose, Early Ohio, and Bliss Triumph for early stock and the Pearl for the late crop. Cut seed has been giving a better size and quality of tuber than whole seed.

Alfalfa, sweet clover, and peas give considerable promise and it is believed their behavior on this station warrants the recommendation that they be more generally grown by dry farmers. Alfalfa has produced a good yield of seed when planted in rows on dry land. Rows not less than forty-two inches apart are recommended for best results. The Grimm variety is recommended because of its hardiness. Bottom

land will yield a good return in seed if handled properly. White sweet clover heretofore considered a pest by most people is proving to be a good cover and feed crop in the east and seed is in great demand. Good clover seed of this plant can be produced on our dry farms when grown in rows. The crop, therefore, is a promising one for the dry farmer. Field peas have yielded as high as twenty-six bushels of threshed seed per acre when planted on summer-fallow land. At fifteen bushels per acre, the crop would be a profitable one for either seed or hog feeding.

Irrigation Projects

The irrigation work consists largely of cropping experiments. It includes the varietal testing of cereals, varietal testing of field and garden peas for seed production, experiments with alfalfa for hay and seed production, varietal and cultural experiments with potatoes, corn silage and seed production, sugar-beet experiments, and experiments with pasture grass mixtures.

Cereal Work: The cereal work consists largely of varietal testing and selection for improvement of the better types. At the present time we feel justified in recommending for irrigated south Idaho: Defiance, Dicklow, and White Bluestem wheats for spring planting. Swedish Select and White Bonanza oats, Beldi and Sandrel for feed barleys, and Hanna and Chevalier for brewing barleys. In addition to the plat work with cereals, a cereal nursery has been conducted for two years. At present it consists of 800 varieties and strains of cereals planted with 200 seeds per row sixteen and one-half feet in length. The number of varieties is rapidly increasing. Nursery work is all hand work and of a highly specialized nature. It will lead to plant-breeding work next year. Recommended varieties have been grown for increase on the station and already considerable quantities of seed have been distributed to farmers thruout the southern part of the state.

Field and Garden Peas: The seed-pea business and the growing of field peas for hog feed is rapidly taking on large proportions in the state. This station has not given the garden-pea seed industry much attention until this year but it has given a great deal of attention to field peas. Results of work done with twenty-two varieties of field peas warrant the recommendation of Amraoti, Wellwood, Lima, and Kaiser for further distribution. Seed of the first and last named varieties is now on hand for distribution.

Alfalfa and Clover Seed: South Idaho is climatically adapted to the alfalfa-seed and clover-seed business. The dry, warm (not hot) sunshiny weather with very light rainfall during the summer months is highly desirable for the best seed production and the quality of seed produced in Idaho is sufficient evidence of an excellent climate for the industry. Much attention has been given to the production of alfalfa seed at this station and considerable seed has been produced. More work remains to be done but there is a large field for this industry which can be made to bring millions of dollars into the state. New seeding of clover for seed production has been made and next year will be the first of importance with this crop at the Station. Farmers are

already getting in touch with the station on alfalfa-seed and clover-seed production and a large acreage will be planted next year.

Alfalfa for Hay Production: Rate of seeding and cultural tests having for their object increased hay production have been concluded and results will be forthcoming in our next report. In this connection, it may be said that ten or twelve pounds of seed per acre have been found ample to insure a good stand and a good quality of hay. Cultivation in the early spring is beneficial and either the disc harrow, rotary spiked-tooth harrow, or the alfalfa cultivator may be used.

Potato Cultural and Varietal Work: This line of work has been in progress since the beginning of work at this station. Some very good information is now at hand bearing on size of seed piece and distance in row to plant, method of irrigation to follow, and on varieties to be most highly recommended. We have found the better yielding varieties of the early types to be Early Rose, Early Ohio, and Irish Cobbler; of the later types, the Idaho Rural, Netted Gem, and Pearl. The Pearl, however, seems to be very susceptible to some of the prevalent diseases. The tuber-unit method of potato improvement is now well under way at this station. More than 700 individual plants are the result of this year's work. The work will increase from year to year but it is believed that the results obtained will make the effort entirely worth while.

Corn for Seed and Silage: Corn has been grown on the farm for four years and only once was seed sufficiently matured to insure germination the following year. The period free from frost in this section is not long enough for corn-seed production, but an excellent quality of silage can ordinarily be produced. Yields as high as twelve and one-half tons per acre have been secured. This ought to be an encouragement to the widening of the dairy industry.

Pasture Grass Mixtures: Pasture-grass mixtures have been grown for three years. The work was undertaken primarily to stimulate the planting of pasture grasses by dairymen, for every year many cows bloat and die from eating green alfalfa. As a result of the experiments in this direction, a great deal of grass is now being planted for pasture purposes.

Sugar Beets: This is the first year sugar beets have been grown to any extent in this section. It has been found necessary to improve the land by turning under alfalfa before a satisfactory tonnage can be secured. The crop, however, is well established. It is the intention to send in samples to Washington for the determination of their sugar content.

Other Activities

Weather records have been kept since the station was started. The Station now reports weather conditions to the Boise office of the Weather Bureau and to the office of Bio-physical Investigations of the Department of Agriculture at Washington. Precipitation and frost records are supplied local people and railroads upon request.

At the request of the Extension Department the superintendent has lectured at thirteen movable schools and institutes thruout

the state giving a total of thirty-three lectures on various topics applying directly to the farming industry. A detailed report of activities in this direction has been furnished the Director of Agricultural Extension.

Many farmers in trouble one way or another either stop in for information or send word for help. Short trips are always taken upon request if time is available. Long trips are taken only on Sundays and holidays. It has been the policy to lend a helping hand wherever possible. Farmers generally in this section have proved to be friends of the Station and have frequently given us help when asked for it.

Future Plans

Plans for next year include the continuation of all experiments now under way. Certain ones, however, may be modified to facilitate work and to insure more satisfactory results. A closer study of the possibilities of alfalfa-seed and clover-seed production will be made. Plant-breeding work with cereals will probably be commenced. Varietal work with peas and cereals will be cut down to include the best varieties. This will give us more space for increase-work of the crops which are now doing well and thereby a greater amount of seed for distribution.

Varietal work on potatoes will be enlarged and more definitely organized. Seed stock of the better varieties will be increased to permit of the distribution of seed to farmers. All of the old alfalfa will be plowed up this fall. New seeding of alfalfa for seed production was made this summer. A very excellent stand was secured.

Respectfully submitted,

L. C. AICHER.

CALDWELL SUB-STATION AND DEMONSTRATION FARM

This report covers the work of the Caldwell sub-station and demonstration farm between November 1, 1914, and December 1, 1915, or from the time the farm came under my direction to the present.

My first visit to this farm was made near the end of October, 1914. Practically all the fall work was completed; the corn was in the shock altho unhusked; all other crops were harvested and either in the bin or stack. The pasturage on the alfalfa land had been sold to sheep herders and approximately 1800 sheep were on the farm. Inquiry at this time showed no definite system of development in practice. But one hundred and twenty of the three hundred and twenty acres of the farm were being used. The cropping of these had been conducted each season with but a single season in mind. It was perfectly apparent that a scheme of regular development should be adopted, a system of cropping planned, and the improvement of the farm placed on an organized basis. The first matters requiring attention were the purchase of a dairy herd and provision for its care. Two months only remained in which the two thousand dollar appropriation for this purpose could be used.

Securing the Dairy Herd

The assistance of the Field Animal Husbandman and two nearby

county agriculturists was asked in the location, within a one hundred mile radius of Caldwell, of young dairy stock. By the middle of November a sufficient number of animals had been located. On the 28th of that month six herds were visited in Canyon and Ada counties. From one of them five excellent grade Holstein heifers were secured. December 8 purchase was made of six grade heifers and on December 15 of four more. Later in the month additions to the herd were made in the shape of a pure bred heifer and a pure bred bull. The herd then consisted of fifteen grade heifers, one pure bred heifer and one pure bred bull, all of the Holstein breed. All animals were under three years of age and ten of the heifers were safely in calf.

While these animals were being secured, a contract was let for the erection of a dairy barn 80x16 feet, shed plan. Yards and pasture fencing had also been provided.

The following statement covers the expenditure of the two thousand dollar appropriation. Sixty-five per cent was applied to the purchase of stock and thirty-six to equipment.

STATEMENT

	Herd: 16 Heifers and 1 Bull			War. No.
12-16-14	5 heifers, bought of J. M. Flack.....		$345.00	29107
2-6-15	6 heifers, bought of H. F. Irwin.....		375.00	29601
2-6-15	4 heifers, Floyd Cairns.....		265.00	29603
2-6-15	1 bull, pure-bred, bought of H. R. Boomer		200.00	29602
2-6-15	1 heifer, pure-bred, bought of J. S. Hulbert		100.00	29604
	Total for herd.....		$1285.00	
2-6-15	Binford Lumber Co., barn lumber.....	$165.00		29611
2-6-15	B. R. Hart, carpenter.....	80.00		29606
2-6-15	Binford Lumber Co., cement and posts for corral	110.80		29610
2-6-15	Boyes Hdw. Co., hinges, nails, etc.....	11.80		29608
2-6-15	Idaho Implement & Grain Co., 24 stanchions	36.00		29609
2-6-15	A. W. Duncan, window bars, etc.....	14.15		29607
2-6-15	W. P. Funsten, labor—leveling and hauling	23.00		29605
2-6-15	O. D. Center, purchasing stock and supervision of barn.....	23.35		29612
12-16-14	O. D. Center, purchasing stock.....	8.60		29106
12-16-14	H. W. Hochbaum, purchasing stock...	4.50		29105
4-26-15	O. D. Center for C. B. Holt, care of bull	30.00		29826
4-26-15	L. W. Hawk concrete work.....	150.00		29825
4-2-15	C. B. Hampson, leveling, hauling, etc...	43.25		29808
6-19-15	Binford Lbr. Co., posts for pasture fence	5.75	706.20	29848
	Total		$1991.20	
12-6-15	Postage by Francis Jenkins.....		$ 8.80	
			$2000.00	

Not all of the animals purchased were bred, five being too young. During the summer, ten heifers have calved, six dropping heifer calves, four, bull calves. Five of the heifer calves, including one pure bred Holstein of exceptional ancestry, are being raised. The sixth, small and inferior, when two days old was traded for a fine sow pig. The bull calves have been sold as veal. One of the heifers purchased has proved sterile. She is being fattened and will be sold as soon as

ready for market. Four of the heifers had freshened by July 1st. At that time, a No. 15 De Laval cream separator was purchased under the following conditions. Price $95, to be delivered and placed by agent, payment to be made by turning in monthly cream check, no interest. The separator was secured July 1st and the following cream checks have been turned in as per agreement: July $4.41, August $18.17, September $26.88, October $39.72, November $37.57. The separator has been paid for and a balance of $31.75 placed to the credit of the farm.

The cows were placed in mixed grass pasture, fields 7 and 8, on May 2. As may be seen on the accompanying blue print, the pasture was divided and each half pastured separately, stock remaining 10 days in each half. During these 10 days the alternate half was irrigated, and left undisturbed. The cows were weighed when turned into the pasture, the aggregate weight being 13,635 pounds. They were again weighed on October 29, at the close of the grazing season, and their aggregate weight was 17,535 pounds. An increase of 3900 pounds. In addition to this growth produced, the pasture supported three additional animals, not weighed at all, a milk cow and a heifer of Mr. Hampson's and a service bull secured from a neighbor.

At present there are ten heifers in milk, five yet to freshen and one barren. Five fine heifer calves have been added to the herd, one heifer calf disposed of, and four grade bull calves sold for veal. All are in excellent thrifty condition. All have gained in size and weight. They were tested November 18 for tuburculosis; no reactors.

Since July 1, the 10 heifers in milk have produced approximately 22,540 pounds of milk which contained 512 pounds butter fat. This has brought an average of 24.6 cents per pound at the Caldwell creamery, or a total of $128.19.

A condensed statement of herd follows:

Number in herd	17 head
Placed on pasture	May 2
Number days on pasture	189
Weight of 17 head on May 2	13,635 lbs.
Weight of 17 head on October 29	17,535 lbs.
Gain while on pasture	3,900 lbs.
Greatest gain any individual	445 lbs.
Least gain any individual	50 lbs.
Number calves dropped	10
Number calves raised	5
Number calves sold	5
Number pounds milk—approx	22,540 lbs.
Number pounds butter fat	512 lbs.
Value butter fat	$128.19
Value separator milk (@ 20c)	40.36
Value calves sold	47.20
Values calves raised	200.00
Value increase in weight herd @ 6c	234.00
Money value produced since May 2	$649.75
Approximate value of herd, exclusive of above	$1,965.00

HOGS

In May it was thought advisable to secure some pigs to consume surplus of separator milk and to use in a "hogging off" demonstration. Accordingly 20 pigs, total weight 610 pounds, were purchased at a cost of $56.00. An acre of alfalfa (field 3) was fenced off as pasture for them and they were turned into this on May 18. In addition to these 20 pigs, eight others, weighing 480 pounds, were placed with them, making a total of 28 pigs in the pasture, and to be used in the demonstration.

On June 9 there were cut from this acre of alfalfa pasture 1640 pounds cured alfalfa hay and on Sept. 8th, 640 pounds cured alfalfa—total 2280 pounds. From May 18 until August 27 the 28 pigs consumed in addition to pasture and other feeds later noted, 450 pounds wheat, 750 pounds corn, 574 pounds barley, 100 pounds shorts, and 100 pounds tankage or a total of 1974 pounds.

On July 1 the acre of peas (field 1) was so nearly ripe that instructions were given to turn pigs into same within a week. Instructions were given to weigh pigs prior to placing in peas. Unfortunately they were allowed to run in peas four days before weighing. On July 12 they weighed 20 red—1320 pounds, 8 black 795 pounds or a total of 2115 pounds. It required 24 days for the pigs to clean the acre of peas. During this time too, they had the range of the acre of pasture as formerly. They were reweighed August 2; 20 red weighing 1680 pounds, the 8 black 860 pounds, total 2540 pounds—gain 425 pounds or $25.50 per acre for peas.

The acre of peas and wheat was now ready and the pigs were turned into same. They cleaned the field in twenty-seven days. This mixture kept the pigs busy longer than the peas alone, and there was sufficient wheat shattered and left in the ground to make a mat of green later in the season. They also gleaned over the pea field and had the run of the alfalfa pasture during this period. Upon finishing the pea-wheat mixture, the pigs were again weighed; 20 red 2240 pounds, 8 black 1046 pounds, total 3286 pounds. Gain from pea-wheat mixture 746 pounds or $44.76 per acre. Doubtless the pigs secured considerable additional feed from the pea acre over which they travelled to and from the pea-wheat acre, since the gain made seems extraordinarily large compared to that from peas alone.

On August 27 the pigs were turned into an acre of corn, estimated yield 15 to 18 bushels. They travelled over and rooted in the pea, pea-wheat, alfalfa pasture, and corn acre during the following 30 days. The corn acre was completely cleaned on September 27. The pigs were again weighed, showing 20 red at 2625 pounds, and 8 black 1250 pounds. A total of 3875 pounds; a gain of 589 pounds or $35.34 per acre. From September 28 to November 1 the hogs had the run of fields 1, 2, 3, 5, and 6. During this time they were fed snapped corn, a little more than one-third of field 4 being fed in this way.

On November 1, six gilts, three red and three black, were selected from the lot for breeding. The entire 28 however were weighed on the same date. 20 red 3520 pounds, 8 black 1565 pounds, total weight

5085 pounds. A gain of 1210 pounds in the month on the snapped corn. A return of but $29.04 per acre and more than double the work. The 22 pigs still on feed were then turned into the standing corn on field 4, approximately 5 acres estimated at 18 bushels per acre. They also had the barley stubble to run over, altho they scarcely roamed over this at all after the first two or three days. They were in this field of corn 30 days. They practically finished it by November 28. The pigs were marketed on December 2 and the brood sows turned in to complete the cleaning. Even with the extremely low price for hogs there is ample evidence of the value and practicability of this demonstration, as shown by summarized statement.

Number of pigs in drove	28
Pigs placed on acre alfalfa pasture	May 18
Numbers days on pasture—approx	100
Hay cut from pasture, 2280 pounds, worth	$ 6.84
Grain fed while on pasture	1,974 lbs.
Weight pigs when placed on pasture	1,090 lbs.
Gain in weight while on pasture	1,025 lbs.
Weight of pigs when turned into acre peas	2,115 lbs.
On acre peas July 8 to August 2	24 days
Weight when acre peas finished	2,540 lbs.
Gain while on acre peas	425 lbs.
On acre peas-wheat mixture	27 days
Weight when acre peas-wheat finished	3,286 lbs.
Gain while on peas-wheat	746 lbs.
On acre corn (ranged over preceding plats)	30 days
Weight when acre corn finished	3,875 lbs.
Gain while on corn (and range)	589 lbs.
Ranged over alfalfa fields and farm and fed snapped corn (3 A.)	32 days
Number pigs turned into standing corn	22
Weight of entire lot when divided	5,085 lbs.
Weight of pigs in standing corn	3,580 lbs.
Value acre of pasture (pork 6c) cost of grain deducted	$54.48
Value acre peas (pork 6c)	25.50
Value acre peas-wheat mixture (pork 6c)	44.76
Value acre corn, hogged off (pork 6c)	35.34
Value corn per acre, snapped (pork 6c)	24.20
Weight of 22 head, December 2	4,930 lbs.
Gain in 30 days	1,350 lbs.
Gain per animal	61¼ lbs.
Gain per animal per day on last field	2.04 lbs.

And best of all—thru all the season—"The Hog did the Work."

GENERAL FARM CROP

An examination of the accompanying farm plat shows the general farm arrangement and crops produced the past season.

Field 1

Field 1 and one acre of field 3 were employed for crops in the hogging-off work, already given.

Field 2

One acre of field 2 was seeded with grass mixture, timothy, red top, orchard, Kentucky blue, alsike, and white clover for calf pasture and bull paddock. Stand secured excellent. Used as pasture all the latter part of the summer.

The acre of half sugar beets gave a yield of 14 tons 750 pounds; the acre of carrots a trifle over 7 tons. Those roots will do much to make up for the lack of silage for the dairy cows. The acre of seed peas was not a success; partially thru the selection of a light seeding variety and partially because the late seeding was unfavorable. However there are 178 pounds of cleaned seed on hand, for sale, or for next season's planting.

Field 3, 5, 9, 12

It is impossible to give any figures on the amount of hay produced from fields 3, 5, 9, and 12, except as a total of all cuttings. Three cuttings were made from each field and a total of approximately 175 tons of exceptionally fine hay is on hand. As 75 tons would give more than 50 pounds per day per animal for the winter period, and since we have 22 tons of roots to supplement this, we have a surplus of 100 tons of hay to sell.

Field 6

Field 6 was cut for seed and we have hulled therefrom 350 pounds uncleaned alsike. As the plan for the farm includes clover with all small grain seeded each year some portion of this will be used on the farm.

Field 4

The 7 acres of barley yielded 40 bushels per acre. The 8 acres of corn yielded seed for next year as well as feed for the pigs as already noted.

Fields 8, 9

The pastures, fields 8 and 9, have already been mentioned under dairy herd. Nothing has yet been done to field 10 because of lack of funds. The dry land crops on field 11 were a failure in so far as material produced is concerned. They were not failures in toto since they showed how this field may be handled to secure returns.

General Improvements

A few general improvements on the farm have been made. 1. The farm has been platted, blue printed, and a system of rotation and development started. 2. The dairy herd and hogs have been added as new interests and sources of revenue. 3. The dairy barn, altho a cheap barn as far as first cost is concerned, is a distinct addition to the farm. 4. About 240 rods of new fencing have been built. Same is woven wire bottom topped with barb wire, thus making a hog, sheep and cattle-tight fence. Splendid corral fencing with woven wire gates were also built. 5. The two and one-half acres in the extreme southeast corner of the farm, formerly overgrown with weeds, have been cleaned off, leveled and will be seeded to pasture mixture early next spring. The fence between fields 7 and 8 will be extended clear across Phyllis Canal to road and thus allow cattle to get water from ditch in both pastures. 6. The lateral ditch which formerly cut off about one-half acre from this 2½ acres already spoken of, has been taken around the corner at the side of the public highway. The ditch has been filled and the one-half acre is ready for seed. 7. The old house at the southeast corner of the farm has been moved to the site of the

other buildings. Part of it has been converted into a pump and milk house and the remainder can be made into an office and men's house. 8. A cement water tank 16x4x3 feet has been made near the dairy barn and provides an ample supply of clean, cool water for the stock both winter and summer. 9. The horse barn has been turned around to face the dairy barn and moved about 20 feet further south to place it on a line with the other buildings. 10. A pressure water system has been installed; this provides water for the house and milk house and automatically fills the stock tank when the supply diminishes to certain point. The pressure system, exclusive of labor, which was all done by our own men, cost as follows:

For 400 gal. pressure tank, air pump, pressure gauge, etc	$50.00
Pipe 1 in. and 1¼ in. (approx. 250 ft.)	29.75
T's angles, valves, faucets	10.00
Total cost	$89.75

As soon as spring weather permits, it is planned to place a concrete floor in the milk house and rearrange same to better adapt it to the use designed.

Respectfully submitted,

O. D. CENTER.

GOODING SUB-STATION

During the past year this station has been operated under the same conditions that have prevailed heretofore. The work of the station may be divided into irrigation investigations and general crop tests.

Irrigation Investigations

Results of Duty-of-Water experiments with spring wheat, winter barley, and potatoes agree very well with those of preceding years and lend support to a previously expressed belief that the real economic duty of water under conditions similar to ours is considerably higher than is popularly supposed.

In connection with the work on spring wheat, the Department of Chemistry is following closely the influence of varying amounts of irrigation water on the production and movement of soil nitrates and the elaboration of protein compounds in the grain.

In place of the regular Duty-of-Water experiments with alfalfa, spring barley, and oats, experiments have been conducted on the relative value of applications of different sizes in the irrigation of these three crops. This work is designed to ascertain the proper size of stream that should be used in ordinary irrigation practice and it should prove to be of particular value in the readjustment of the system of water distribution that must come to many of our irrigation projects.

The work on irrigation of potatoes and spring wheat at different stages of growth was continued. In these experiments the different stages of plant development are taken into account and the desirability of giving or withholding water at various stages of growth is to be determined. Results obtained this year agree very well with those of

preceding years. In the case of potatoes, irrigation water ordinarily should be withheld until the tubers begin to form. In the case of spring wheat, the length of straw can be controlled by controlling the soil-moisture content at the first jointing stage and the weight of grain depends very largely upon the soil-moisture content at the soft-dough stage.

The corrugation method of applying irrigation water to alfalfa has proved best for compact tight soils that do not take water readily.

At the beginning of this season's work an experiment was planned to determine the effect of varying amounts of water on alfalfa seed production. While this work will have to be continued for a number of years the results already obtained indicate that this line of experimentation will yield valuable information for producers of alfalfa seed.

General Crop Tests

Varietal tests have been conducted with barley, oats, wheat, clovers, grasses, field peas, beans, stock beets, and carrots. In this work new varieties are secured wherever possible and are grown to determine their value for the irrigated lands of south Idaho. We have been particularly successful in introducing and developing new varieties of barley, oats, and field peas.

Experiments with pastures have been continued; they include a comparison of different mixtures of grasses, grazing tests with dairy cows and with beef animals, and a study of various phases of pasture management under irrigation. In this work we have proved that the irrigated lands of our section can be cropped very profitably with certain grass mixtures. A great many farmers thruout the irrigated sections of the state have followed this work and are making use of our suggestions with excellent results.

A pasture experiment with pigs was begun this season. It includes a test with alfalfa pasture and a comparison of field peas alone and a mixture of field peas and wheat for "hogging-off." Like other experiments this one should be continued but results already obtained are valuable and will be used by the hog farmers in this section. The work should be somewhat enlarged and made to include other crops.

This is the second season in our experiment on whole-seed and cut-seed potatoes. Results of the two years' work agree and go to indicate that the planting of whole-seed potatoes is not advisable and certainly should not be recommended to irrigation farmers.

We have continued the experiment with corn. Its object is the production of a new variety of dent corn that will mature under our conditions. This work is progressing very favorably; in spite of a rather unfavorable season we have secured a large amount of well matured seed.

The experiment to determine the proper time to clip red clover in order to avoid damage from Chalcis Fly in the seed was continued. This should prove to be of value to the large and increasing clover-seed business in irrigated Idaho.

An extensive home garden was grown in which forty varieties of garden vegetables were tested and cultural methods studied.

In addition to the experimental work, we have devoted as much land as possible to the increase of a few pure varieties of grain that have shown a particularly good performance record in varietal tests. Seed from increase plats has been sold to good farmers at two cents per pound, f. o. b. Gooding. This season we have supplied twenty-four farmers representing all parts of irrigated Idaho. These men have received an average of 100 pounds each. This work has been and will continue to be very effective in increasing the yields of grain over the state. In the case of a new variety of barley, several farmers have secured over 100 bushels from the 100 pounds of seed the first year. One farmer secured 100 pounds of seed barley from the station in the spring of 1914 and this fall (1915) has 3000 bushels of clean, pure seed.

Our co-operation agreement with the U. S. Weather Bureau is still in effect and we are keeping daily meteorological records.

Respectfully submitted,

J. S. WELCH.

JEROME SUB-STATION

The following is a report of the activities of the Jerome Station in potato disease and improvement investigations for the season of 1915.

A shortage of irrigation water thru the potato-growing season caused a partial failure of the potato crop on the entire tract and seriously interfered with the experiments conducted by the station. Out of one hundred seedlings planted this season, we have harvested a number which give excellent promise. Some fifty named varieties were also grown; of these the most worthy of note are the Netted Gem, Peoples, Idaho Rurals, White Peachblow, Rural New Yorker, and Red Peachblow.

Tuber-Unit Investigations

Five hundred units of various varieties were grown with very good success with the exception of very late maturing kinds. On the whole this work shows very plainly that tubers of marketable size selected from the bins cannot be relied upon to produce a high percentage of uniform healthy plants. Another year we expect to show a marked difference in yields from hill-selected seed as against bin-selected seed.

Storage Investigations

In our storage work only three varieties were used, viz., Idaho Rurals, Netted Gems, and Peoples. The experiment consisted of storage of potatoes in trays and sacks during the winter and selection of seed from these lots for planting. This year a greater yield was obtained from seed selected from the shallow-tray stored potatoes.

Seed-Maturity Investigations

Unmatured tubers of White Peachblow and Netted Gem varieties were developed last season by planting these varieties on the first of July. Seed weighing from four to twelve ounces was selected and grown this season in comparison with matured seed from the same

varieties. The resulting yield of the White Peachblow was in favor of matured seed. That from the Netted Gems was in favor of the unmatured seed. Late maturing varieties planted this season on the first of July did not reach the four-ounce size in many cases.

Dry-Land Seed Investigations

For this experiment potatoes were selected which had been previously grown on the station farm but had been removed to a nearby farm and grown under dry-land conditions for one season. From these the Peoples and Netted Gem varieties were taken and planted with the station-irrigated seed of the same variety. In each case there was a marked difference in type and yield in favor of the irrigated seed.

Greening With Sunlight

This was purely accidental and was used only with the Idaho Rurals and Peoples planted on the first of July. In each case those which had been greened with sunlight germinated two weeks earlier than those which had been kept in a dark cellar. Moreover the yield was twice as large. In this section where the summer months are one succession of hot, dry days, it is imperative that the potato plants make a rapid and early growth in order to shade the ground and protect it from excessive heat and the loss of soil moisture. Where late spring frosts prevent early planting, greening the seed with sunlight may prove a very important factor in potato production.

Diseases Investigations

Mr. O. A. Pratt has been carrying on work in the investigation of potato diseases at this station and in various sections of south Idaho. Outside the station he has been engaged chiefly in planting and overseeing acre plats of potatoes which were planted with disease-free seed. These plats were located in different sections and on various types of soil with the object in view of determining the relation of soil to different potato diseases.

Every precaution was exercised this season to eliminate disease as perfectly as possible from the potato crop grown on the station farm; clean seed which had been treated with corrosive sublimate was planted and three times during the growing season we went over the entire field to remove all plants which showed any indication of disease.

Respectfully submitted,

G. W. DEWEY.

SANDPOINT SUB-STATION

In 1913 a tract of land lying just north of the city of Sandpoint was given to the University for experimental and demonstration purposes. The tract consists of 170 acres. One hundred acres are admirably suited to the work in mind. The remaining portion can be used for pasturage only.

Ten acres on the north end of the tract were cleared of stumps, brush, and fallen stuff in the fall of 1913 and sown to clover and alfalfa in the spring of 1914 to try out several varieties. The alfalfa

made a fair growth during the summer but was later winter-killed. Of the clovers, alsike and medium red produced the heaviest yields in 1915. A second ten acres just south of the first were cleared later, and made ready for plowing in the spring of 1915. This field was given over to a crop of mixed oats and peas which made a fair growth and was cut in July for hay.

It is believed that enough is already known of the characteristic properties of timber soils to permit of procedure on the assumption that for general cropping purposes they stand mostly in need of enrichment in organic matter and nitrogen. It is the intention, therefore, to make this twenty acres a demonstration of at least one method of bringing timber soils into a fertile condition by means readily available to all. These two ten-acre fields will be alternated with clover and mixed-grain and legume crops for hay and whenever plowed as much second-growth of clover as possible will be turned under. Since everything will be fed on the farm, it will be possible to supplement to a certain extent green with barnyard manure. With the exception of two check strips, the entire twenty acres have received an application of limestone at the rate of one and one-half tons per acre.

On the opposite end of the tract land is being cleared for experimental purposes. Approximately six acres are already under the plow and are being used by the Department of Soil Technology in Soil-Improvement studies and by the Department of Chemistry for the growing of several strains of wheat. It is the intention to make live stock, particularly dairy animals, hogs, and sheep, an important feature of the work on this farm. Consequently as additional land is made available on the south, it will be used in an experimental way for the growing of feeds suitable for grazing and feeding without harvesting; but all work of this kind will take into consideration the necessity for enrichment of the soil in organic matter and nitrogen.

All cultivatable land on this farm has been heavily timbered. Consequently the work of clearing for some time to come must each year take a very appreciable portion of the time of the superintendent and his men. One splendid feature, however, is the fact that the untouched stump land affords the finest pasturage imaginable and has made possible the starting of a dairy herd, the foundation animals of which have been secured from the University farm herd at Moscow.

Public spirited citizens of Sandpoint and vicinity by liberal donations have made possible a very serviceable set of farm buildings. They are under construction at the present time and should be ready for use before the new year.

Respectfully submitted,

F. H. LAFRENZ.

FINANCIAL STATEMENT

University of Idaho Agricultural Experiment Station
in account with
The United States Appropriations, 1914-1915

Dr.		Hatch Fund	Adams Fund
To balance from appropriations for 1913-14		None	None
Receipts from the Treasurer of the United States, as per appropriations for fiscal year ended June 30, 1915, under acts of Congress approved March 2, 1887 (Hatch Fund), and March 16, 1906 (Adams Fund)		$15,000.00	$15,000.00
Cr.	**Abstract**		
By salaries	1	$ 7,640.16	$ 8,993.30
Labor	2	3,162.41	1,658.52
Publications	3	349.04	.....
Postage and stationery	4	465.40	173.93
Freight and express	5	106.34	322.14
Heat, light, water, and power	6	351.23	195.79
Chemicals and laboratory supplies	7	143.75	961.20
Seeds, plants, and sundry supplies	8	577.13	468.58
Fertilizers	9		
Feeding stuffs	10	1,399.71	132.98
Library	11	5.25	10.08
Tools, machinery, and appliances	12	308.77	366.52
Furniture and fixtures	13	81.90	222.48
Scientific apparatus and specimens	14	107.78	862.05
Live Stock	15		
Traveling expenses	16	148.40	563.44
Contingent expenses	17	20.00	
Buildings and land	18	132.73	68.99
Balance			
Total		$15,000.00	$15,000.00

FINANCIAL STATEMENT—LOCAL STATION FUNDS

July 1, 1914 to June 30, 1915

Receipts:	
Interest on Deposits	$ 210.78
Horticultural Department. From sale of garden and orchard produce	1019.53
Chemistry Department. From sale of flour	215.45
Farm crops Department. From sale of seed	258.72
Bacteriology Department. From sale of legume inoculating material	208.80
Animal Husbandry Department. From sale of live stock	5.94
Dairy Husbandry Department. Sale of stock	1193.78
Poultry Husbandry Department. From sale of eggs and stock	342.03
Total	$3455.03

LOCAL STATION FUNDS—Continued

Disbursements:

Department	Total	Salaries	Labor	Bulletins & publications	Supplies	Other exp.	Books	Other equip.
Administration	$ 6.25					$ 6.25		
Agricultural Chemistry	112.87				$ 22.01	18.24	$72.62	
Animal Husbandry	1.60				1.60			
Field Crops	129.62		$ 41.50		63.65	16.97		$ 7.50
Horticulture	712.33		205.22	$108.50	344.71	53.90		
Soils	55.25		20.75		30.10	4.40		
Bacteriology	265.64		7.60	4.00	237.65	16.39		
Dairy Husbandry	1398.70	$ 40.00	499.22		672.56	62.92		124.00
Poultry Husbandry	158.72		22.25		27.96	64.71		43.80
	$2871.98	$ 40.00	$827.54	$112.50	$1400.24	$243.78	$72.62	$175.30

FINANCIAL STATEMENT—SUB-STATIONS

Receipts and Expenditures—April 1, 1915-June 30, 1915

Receipts:	Aberdeen	Caldwell	Gooding	Sandpoint
State appropriation	$5000.00	$2000.00	$4000.00	$4800.00
Local Station	7.57	1125.18	227.53-O. D.	645.01-O. D.
	$5007.57	$3125.18	$3772.47	$4154.99
Disbursements:				
Salaries	$ 362.80	$ 300.00	$ 00.00	$ 357.00
Sundry Labor	15.00	344.50	12.00	48.15
Sundry Supplies	172.69	116.35	34.92	183.14
Stationery and Office Supplies	8.29			
Freight and Express	3.48	1.31		
Traveling Expenses	1.45	27.60	38.15	21.90
Heat and Power, Water	18.75	5.75	30.00	
Telephone and Telegraph	2.26	11.57	9.94	
Insurance	52.43			
Feeding Stuffs		3.00		35.05
Buildings and Repairs	45.63	193.25	15.80	110.87
Live Stock		55.00		
Tools, Implements, and Machinery			51.65	12.50
Other Equipment			35.00	
Rentals				30.00
Totals	$ 682.78	$1058.33	$ 247.46	$ 798.61
Balance, July 1, 1915	$4324.79	$2066.85	$3525.01	$3356.38