ANNUAL REPORT

OF THE

DIRECTOR

OF THE

South Dakota
Agricultural Experiment
Station

For Fiscal Year Ending June 30, 1915

BROOKINGS, SOUTH DAKOTA
Dear Sir:

I have the honor to make the following report of the South Dakota Agricultural Experiment Station for the fiscal year ending June 30th, 1915.

ORGANIZATION

While the Experiment Station is supported by funds received from the federal government by law it is a part of the South Dakota State College of Agriculture and Mechanic Arts. With a very few exceptions the men employed in Station work are also numbered with the teaching force of the College. With this dual arrangement better prepared men can be secured and more valuable work can be done than if College and Station were separate institutions.

The five departments are: Agronomy, Animal Husbandry, Chemistry, Dairy Husbandry and Horticulture. There is a demand for work in other lines but I believe it better policy to confine the work to a few departments such as the funds will support, than to include more departments with inadequate support.

The salary of each employee is in proportion to the time he is occupied in Station and teaching work.

The state appropriates various sums annually for the support of substations and demonstration farms in different parts of the state, the object of which is to work out problems presented by the conditions in each locality.
THE WORK

The work of the Station has been very satisfactory the past year. Results of investigations, that have covered a period of years, are encouraging and during the next fiscal year some of the projects will be completed.

PUBLICATIONS

There were ten bulletins printed and distributed during the year as follows: No. 151, Trials With Sweet Clover as a Field Crop in South Dakota; No. 152, Testing and Handling Dairy Products; No. 153, Selecting and Breeding Corn for Protein and Oil in South Dakota; No. 154, The Pit Silo; No. 155, Selection and Preparation of Seed Potatoes, Size of Seed Pieces, and Bud Variation; No. 156, Kaoliang, A New Dry Land Crop; No. 157, Rape Pasture For Pigs in Cornfield. Kaoliang For Pigs; No. 158, Proso and Kaoliang as Table Foods; No. 159, Progress in Plant Breeding; No. 160, Silage and Grains for Steers.

There were 30,000 copies of each bulletin printed at a cost of $11.41 per page delivered in Brookings. About one-third of the expense of printing and distributing was paid by the state and the remainder from the federal funds.

Many weekly and monthly publications are received in exchange for the bulletins and are kept on file in the Station Library where students consult them frequently. Our bulletins are read by people in all sections of the country. Our practice is to add names of all public institutions to our regular mailing list when requested, add names of residents of the state to the list and to send individuals outside of the state a list of our available bulletins; on the return of this list we mail, free of charge, the bulletins desired. There were 84,835 more bulletins mailed this year than last year.

During the year 1914-15 there were 6,900 letters carrying postage mailed from the office of Director of the Ex-
periment Station and Professor of Animal Husbandry, showing a gain of 842 over last year.

The printing of our bulletins is one of the largest jobs of printing in the state. The contract for the work is let to the lowest bidder by the State Printing Commission.

SUMMARY OF CONTENTS OF BULLETINS

Bulletin No. 151, by the Agronomy Department, includes a brief account of the progress with sweet clover as a crop in South Dakota. It calls attention to the fact that if permanent systems of agriculture are to be established, the area of legume crops must be greatly increased. The results of growing this plant in standing corn and in small grain are given, also the results of growing the legume at the substations and other parts of the state with directions for making sweet clover hay. Two illustrations show the difference between alfalfa seed and sweet clover seed and several tables show the yields per acre from different systems of sowing.

Bulletin 152, by the Dairy Husbandry Department on the testing and handling of dairy products, is designed to meet the needs of the farmer, butter maker and cream buyer. The Babcock test for butterfat is explained in detail with several illustrations of the apparatus used in the test. Attention is also called to factors which should be observed in the use of the separator. The law governing unmerchantable cream for buttermaking purposes and ten different suggestions by the authors to assist in preventing the unmerchantable product, are included.

Bulletin No. 153, by the Agronomy Department, deals with the selection and breeding of corn for protein and oil content. The results show that there is a difference in the per cent of protein and oil in corn. From this report of progress the indications are that possibly in the future the farmer will grow two distinct kinds of corn, one for the production of growth of the animal and the other for the purpose of fattening for market.
Bulletin No. 154, by the Dairy Husbandry Department, is a short treatise on the pit silo. In the semiarid section of the state and on high locations where the surface water does not interfere, this form of a silo gives good satisfaction. Several illustrations show how the silo is constructed, how it is filled and how the silage is taken out of the pit.

Bulletin No. 155, by the Agronomy Department, on planting potatoes, gives the yields from seed pieces varying in size. The results indicate that a poor crop results from small seed, even the first year. For a good crop, use large seed pieces.

Bulletin No. 156, by the Agronomy Department, introduces to the residents of the semiarid region a new grain crop known as kaoliang and summarizes the treatise as follows:

1. Kaoliang was introduced by the United States Department of Agriculture to fill the demand for an early ripening grain sorghum in the Northern Great Plains.

2. It has been tested for five years and subjected to a careful process of selective breeding for uniformity and yield at the Highmore Substation of the South Dakota Experiment Station.

3. It is drought resistant and has produced a satisfactory yield in the driest seasons experienced at Highmore and has out yielded corn in a two year test at Cottonwood.

4. Its moisture requirement is comparatively low.

5. It should be planted from May 15th to June 1st on well prepared land, thoroughly cultivated and kept as free from weeds as possible.

6. This cultivation benefits the following crops.

7. Harvest can be handled either with or without expensive machinery.

8. The stock will thresh it for themselves.

9. Seed heads should be selected.

10. Both seed and stalks should be utilized for feed.
Results show that flint corn is about equal to dent corn for pigs. The 12 head receiving dent corn made an average gain per head of 45 pounds during the 42 days, as compared to an average of 44 pounds per head for lot receiving flint corn.

2. In each case the pigs receiving rape pasture with their ration of corn made larger gains than those that were getting corn alone.

3. Because the supply of flint corn was exhausted we were compelled to close the experiment. As the areas were equal and there were the same number of pigs on each, an acre of flint corn is not equal to an acre of dent corn for hogging off purposes. However, the flint variety might be of more value in localities where the dent varieties will not mature.

4. The low growing varieties of dent corn are to be preferred, to the tall growing varieties, to secure a suitable growth of rape, as the rape plant does not flourish when shaded.

5. Much labor may be saved by allowing the pig to pick his own living in the cornfield; and a cleaner job of husking is the result, providing the pig does not have too large an area.

6. The table of weights and gains shows that the gains made by the heaviest pigs compare favorably with the gains made in experiments where the ration was much more expensive.

7. Kaoliang grain is not as good as corn for fattening pigs. But when we consider its great drought resistant qualities it is a better feed to grow in some sections of the state than corn. See South Dakota Bulletin No. 156.

8. Both lots of pigs receiving the alfalfa hay with their grains made larger gains than pigs in lots not receiving alfalfa hay.

Bulletin No. 158, by the Horticultural Department, includes the history, the milling qualities of Proso and Kao-
liang as table foods, with many recipes by the Department of Home Economics for cooking Proso and Kaoliang, two new grains but recently introduced into the Northwest.

Bulletin No. 159, by the Horticultural Department, gives progress to date in plant breeding. It contains several illustrations of new fruits and describes in detail how these new varieties were produced. It also calls attention to a new method of hybridizing alfalfa in the field.

Bulletin No. 160, by the Animal Husbandry Department, includes the following summary of results in feeding silage and grain to steers:

1. With the rapidly increasing price of lands we believe a preliminary feeding period one of the best methods to follow in fattening cattle for market.

2. Corn silage produced more than twice as much gain as sorghum silage when fed as the sole ration. It required over twice as much sorghum silage for a pound of gain as it did corn silage.

3. When three pounds of oilmeal were added to both the sorghum and the corn silage rations, the gains were more than doubled over lots that received the silages alone, and the cost of producing these extra gains was reduced in both cases by adding oilmeal.

4. Large gains secured during the first 91 days of both experiments were maintained when steers were put on fattening ration.

5. Where the corn plant will mature there is no benefit to be derived in growing sorghum for the silo.

6. A preliminary feeding period with some cheap feed is desirable and we know of no other plant that will produce this cheap feed better than corn.

7. By feeding the leguminous hays better gains were made than with silage alone, but not as cheap gains. At the end of the 91 day preliminary feeding period, steers that received silage alone were in better condition than any of the lots receiving corn silage.
and hay. This was probably caused by the additional corn received in the ration.

8. The results indicate that alfalfa hay is the best of the legumes to feed with corn silage for a large gain. By tables III and IV, weights and gains, it will be noted that steers of lot IV made larger gains per head than any of the other lots. These extra gains were undoubtedly caused by feeding alfalfa during the preliminary period. However, the gains of the steers that received sweet clover hay during the preliminary period were nearly as large as those that received alfalfa hay. Just what the result would have been had we fattened these two lots on the same grain ration I am unable to state.

9. Corn silage as the sole roughage with the grains proved to be a suitable substitute for hay, as the average daily gain per head of the different steers, when we consider the length of the fattening period, are similar to gains made in other experiments where hays were fed.

10. Prairie hay did not prove to be of as much value when fed with corn silage, during the preliminary period in producing a large gain, as did the hays made from the legumes. This no doubt was caused by the absence of protein in the ration. See analysis of hays.

11. Sweet clover considered by so many as a troublesome weed, when made into hay before the stems become too woody and the hay run thru a cutter, proved to be nearly as valuable for feeding with corn silage during the preliminary period as alfalfa hay.

BLACKLEG VACCINE

We received 744 requests for blackleg vaccine and sent out 44,090 doses, being an increase of 10,420 doses over last year.
COOPERATION

This Station cooperates with the United States Department of Agriculture in the distribution of blackleg vaccine and in the improvement of the cereals of the Northwest. By assisting in the distribution of blackleg vaccine much time is saved to the cattle growers of the state. In the grain line many varieties are received annually and are given a trial under our conditions. Thru this arrangement many new and promising varieties have been introduced in the state and have proven to be of much value to our agriculture.

ANIMAL HUSBANDRY DEPARTMENT

The work in the Animal Husbandry Department included feeding and breeding experiments as follows:

(1) The value of corn silage for lambs. The object was to ascertain what proportion of the daily ration could be profitably composed of corn silage.

(2) The value of rape in the cornfield for pigs.

(3) Value of a preliminary feeding period, with cheap feeds before the more expensive concentrates are given.

(4) A breeding experiment with sheep, using the imported fat-rumped tailless rams from Siberia and the Shropshire, Hampshire and grade ewes.

Some of these experiments were completed and results reported in bulletins while others are continued for further results.

The following publications were received in exchange for our bulletins:

AMERICAN PUBLICATIONS

American Breeder, Kansas City, Mo.
American Farming, Chicago, Illinois.
American Hay, Flour and Feed, New York City.
American Hereford Journal, Kansas City, Mo.
American Miller, Chicago, Ill.
American Poultry Advocate, Syracuse, N. Y.
American Swineherd, Chicago, Ill.
Better Fruit, Hood River, Ore.
Berkshire World, Chicago, Ill.
California Home and Farmer, San Francisco, Cal.
Chicago Daily Farmers’ and Drovers’ Journal, Chicago, Ill.
College Farmer, Columbia, Mo.
Colman’s Rural World, St. Louis, Mo.
Commercial Fertilizer, Atlanta, Ga.
Connecticut Farmer, New Haven, Conn.
Corn, Waterloo, Ia.
Daily Drovers’ Journal-Stockman, South Omaha, Neb.
Dairy Record, St. Paul, Minn.
Dakota Farmer, Aberdeen, S. Dak.
Denni Hlasatel, Chicago, Ill.
Deutsch-Americanische Farmer, Lincoln, Neb.
Du Pont Magazine, Wilmington, Del.
Elgin Dairy Report, Elgin, Ill.
Facts About Sugar, New York City.
Farm and Fireside, Springfield, Ohio.
Farm and Real Estate Journal, Traer, Iowa.
Farm Engineering, Springfield, Ohio.
Farmer and Breeder, Sioux City, Iowa.
Farmers’ Digest, Columbia, Pa.
Farmers’ Guide, Huntington, Ind.
Farmers’ Wife, St. Paul, Minn.
Farmer, The, St. Paul, Minn.
Farm Progress, St. Louis, Mo.
Farm, Stock and Home, Minneapolis, Minn.
Field and Farm, Denver, Colo.
Field, The, New York City.
Flour and Feed, Milwaukee, Wis.
Flour, Hay, Grain and Feed, New York City.
Fruit Grower and Farmer, St. Joseph, Mo.
Furrow, The, Minneapolis, Minn.
Gentlewoman, The, New York City.
Good Poultry, Sagatwich, Mich.
Hampshire Advocate and Live Stock and Poultry Record, Peoria, Ill.
Harvester World, Chicago, Ill.
Hoard's Dairyman, Fort Atkinson, Wis.
Holstein-Friesian World, Ithaca, N. Y.
Hospodar, Omaha, Neb.
Hospodarsky Listy, Chicago, Ill.
I. C. C. Farmer and Poultryman, Scranton, Pa.
Indian School Journal, Chillico, Okla.
Interior Index, Interior, S. Dak.
Jersey Bulletin and Dairy World, Indianapolis, Ind.
Jewish Farmer, New York City.
Kansas Farmer, Topeka, Kansas.
Kimball's Dairy Farmer, Waterloo, Iowa.
Lebanon Independent, Lebanon, S. Dak.
Live Stock and Dairy Journal, Sacramento, Cal.
Lincoln Freie Presse, Lincoln, Neb.
Market Growers' Journal, Louisville, Ky.
Missouri and Kansas Farmer, Kansas City, Mo.
National Alfalfa Journay, Sioux Falls, S. Dak.
National Farmer, St. Louis, Mo.
National Farmer, Winona, Minn.
National Stockman and Farmer, Chicago, Ill.
National Wool Grower, Salt Lake City, Utah.
Negro Farmer, Tuskegee Institute, Ala.
Northwestern Agriculturist, Minneapolis, Minn.
Northwest Farmstead, Minneapolis, Minn.
Nut Grower, Waycross, Ga.
Oklahoma Farm Journal, Oklahoma City, Okla.
Pacific Dairy Review, San Francisco, Cal.
Poultry Life, Portland, Oregon.
Poultry Topics, Lincoln, Oregon.
Progressive Farmer and Southern Farm Gazette, Ral-
eigh, N. C.
Pure Products, New York City.
Reliable Poultry Journal, Quincy, Ill.
Rural New Yorker, New York City.
South Dakota Farmer, Sioux Falls, S. Dak.
Southern Farm and Dairy, Bryan, Texas.
Southwest Trail, Chicago, Ill.
Spokesman Review, Spokane, Wash.
Stock Yard Nugget, Kansas City, Mo.
Successful Poultry Journal, Chicago, Ill.
Svenska Amerikanaren, Chicago, Ill.
Ugebladet, Minneapolis, Minn.
Wallace's Farmer, Des Moines, Iowa.
Up-to-Date Farming, Indianapolis, Ind.
White Breeders' Companion, Rochester, Ind.
Wisconsin Farmer, Madison, Wis.
Yorkshire Swine Monthly, Franklinville, N. Y.

FOREIGN PUBLICATIONS

Agricultural Gazette of Canada, Ottawa, Canada.
Agricultural Gazette of New South Wales, Sydney, Australia.
Agricultural Journal of India, Calcutta, India.
Agricultural Journal, Pekin, Republic of China.
Agricultural Journal of the Union of South Africa, Pretoria, South Africa.
Farmers' Advocate, Winnipeg, Canada.
Farm and Ranch Review, Calgary, Canada.
Farmers' Magazine, Toronto, Canada.
Hawaiian Forester and Agriculturist, Honolulu, H. I.
Journal of the Department of Agriculture of South Australia, Adelaide, Australia.
Journal of the Department of Agriculture of Victoria, Melbourne, Australia.
Monthly Bulletin of Economic and Social Intelligence, Rome.
New Zealand Dairyman, Wellington, N. Z.
Philippine Agricultural Review, Manila, P. I.
Revista Industrial Agricola De Tercuman.

I enclose herein and make a part of this report, reports from the various departments giving a more detailed statement of the work in each department.
Respectfully submitted,
JAMES W. WILSON,
Director of the Experiment Station and Animal Husbandman.

AGRONOMY DEPARTMENT

Director J. W. Wilson,
South Dakota Experiment Station,
 College.

Dear Sir:

I have notice from you that the annual report of Brookings on Adams and Hatch Projects may be submitted at any time. Accordingly, I beg leave to hand you this somewhat brief written statement, reporting upon the projects singly, but not in great detail, owing to the fact that reports in the nature of bulletins will be submitted later.

Adams Project 1

Title: A Project on the Influence of Rotations Upon the Maintenance of Soil Fertility

This Project has been in force, as now outlined, since 1911. The general plan of the project is to conduct several definite crop rotations continually on definite plots of land, and, by means of chemical analysis, made at several periods of time, to discover in the several rotations,
whether the total plant food content has increased or decreased. The project has not been altered in its general scope since it was inaugurated. It has been altered somewhat as to details. It is now being conducted as previously.

The plots included under this project being now sampled and analyzed are East Farm, Brookings, 440-449, 450-459, 140-149, 151-159, West Farm, 140-147, 240-243, 250-253, 340-347, 351-353, 440-447, 540-547, 550-553, 650-653, total 112 plots.

Samples from these plots were taken 0 to 7, 7 to 14, 14 to 40 inches deep in 12 places in each plot. The 12 samples of each layer are well mixed to form a composite. The samples are taken in two rows of six each, exactly eight feet and three inches in from the edge of each plot.

During the fiscal year, which closed July 1st, 1915, plots 140-159, East Farm have been analyzed by H. Loomis, Agronomy Analyst, for calcium and magnesium. The analyses of these plots for nitrogen, phosphorus and potassium have been previously completed.

At the present writing soil samples are being taken from all plots, included under Adams I. This work is being efficiently carried out under the direct supervision of Professor J. G. Hutton. The actual sampling is being done by Professor Hutton and Mr. Eugene Swift.

*Adams Project No. 2*

Name: A Study of Correlations between certain Physical Characters of Plants and their Capacity for Yield.

Object: To discover whether any given qualities of crop plants, e.g. length of head in wheat, weight or position of ear in corn, amount of leaf surface in cereals, are associated with heavy production.

Results: One correlation study at a time is being attempted. Our present study is to find the correlation between length of head in Minnesota 169 wheat and yielding capacity. A correlation table completed shows a positive correlation of .48 between longer spikes and higher yield
of progeny. Thus the progress of this project is altogether definite and stated mathematically. It is desired to study this correlation in connection with the next generation of wheat plants. The details of the present project are being carried out by Professor Champlin and Mr. Matthew Fowlds.

Date Begun: 1910. Head rows of grain selected in 1910 were practically lost in 1911.

Results Accomplished: Have been largely due to the work carried out in 1912 and 1913, there having been loss of last year’s results due to rusts. The head rows of the present year are now (August 11) being harvested.

One year of results only have been tabulated under this project, namely, the results of 1913. The results of 1914 were evidently not worth tabulating, owing to the prevalence of rust in small grain for that year, and no tabulation was made. Sufficient seed was available, saved from 1913 however, for replanting the rows in 1915 and there seems now no apparent reason why the present year’s results may not be available. At the present writing, the head rows of small grain upon which results of this year largely depend are in excellent condition.

**Adams Project No. 3**

A Project to Determine Definitely the Extent to Which Water is a Limiting Factor in the Growth of Sweet Clover (*Melilotus alba)*.

Progress with Adams Project No. 3 has up to date consisted in considerable part in the preparation of apparatus. The special pots for growing sweet clover plants, included in the projects, were manufactured by F. H. Dudley, Lincoln, Nebraska. They have proven suitable for the project. At the beginning of the present season, sweet clover plants were started in the pots in the glass laboratory of the agronomy department. There is now completed, however, a wire cage and the pots have been removed to that out-door protection. Obviously, these outside conditions will be somewhat more normal, altho
the plants will be protected from hail.

The sweet clover plants of this project have been once harvested. Obviously, such plants represent growth of this first year. The height of all plants was taken, also the weights. Leaves from the several plants were copied by means of blue prints and the areas of the prints are now being measured by means of a planimeter.

It seems apparent that what might be called the minimum amount of moisture has not been supplied in any instance. This could only be determined by trial and this has been done.

_Hatch Project No. 1_

A Comparison of a System of Live Stock Farming With a System of Grain Farming With Especial Reference to Their Relative Effect Upon the Permanent Fertility of the Soil.

Three series of one-tenth acre plots are included in this project, namely, 360-369, 460-469, 560-569, West Farm. In the five plots included in the grain system, crop residues are returned to the land, namely, corn stover, oat straw, and clover haulm and on all five plots in each series of the live stock system, the manurial equivalent of these crop residues is returned. This project was laid out in 1909. The records indicate that the first plant food applications were made in 1912. The crop yields of the present year indicate strongly the difference of the several plots. The increased yield due to the application of phosphorus in the present season is especially notable on the clover just harvested.

_Hatch Project No. 2_

Breeding corn for chemical composition with especial reference to the comparative total yields of protein and oil per acre as produced by strains of high chemical content and low chemical content respectively.

Certain data was secured and this was published in Bulletin No. 153 during the year just closed. At the present time we have available row yields for one year of high protein corn for analysis and comparison. It is the purpose to construct actual correlation tables with per cent of
protein in the several row strains and their corresponding yield of protein per acre.

Hatch Project No. 3

Under Hatch No. 3 are included a number of variety tests of grain and potatoes and forage crops, which are not strictly included under other Hatch projects. For instance, the potato breeding reported upon in Bulletin No. 155 is being continued for several generations with a view to measuring the comparative effect of varying the size of the seed pieces and using culls for seed as compared with selected tubers.

The foregoing are the principal lines of work conducted by the agronomy department with Adams and Hatch funds. It may be well to note that these funds must cover all the experimental work done by this department, except that which is carried on cooperatively with the Bureau of Plant Industry, United States Department of Agriculture.

Very respectfully,

(Signed) A. N. HUME,
Agronomist and Superintendent of Substations.
CHEMISTRY DEPARTMENT

James W. Wilson,
Director.

Dear Sir:

There has been no change in the projects for this department during the past year.

_Hatch Project_

In this project experiments with sugar beets have been continued. We have been fixing the proper distances to space the beets and have determined that at eighteen inches in the row we can obtain the highest sugar yield per acre. This spacing however is too narrow for commercial cultivation. The next best result can be obtained at about twenty-four inches. While the sugar yield is slightly decreased these rows are far enough apart to permit horse cultivation. Greater distances up to thirty inches are quite unprofitable. It seems that the decreased number of rows and consequently the smaller number of beets per acre seriously affect the yield, moreover, when the beets are spaced so widely the per cent of sugar is also decreased. It is true that the size of the beets is increased but this increase does not offset the two serious losses previously mentioned. In passing it might be well to say that the sugar yield per acre is continuously high, showing that the crop will be a profitable one for the state.

The growing of sugar beet seed has been carefully conducted. Our experiments have shown that the commercial growing of seed in this state may be made a profitable industry. From our experiments we learn that the stechlinge may be siloed right in the field and that the beets came thru perfectly. During the present year the seed beets were placed in the silo the first week in November and carried in good shape until the first week of June. The building of the silo was a simple affair. A shallow trench about 10 inches deep and of the proper width and length was made, the beets were closely packed and dirt sifted thru until the desired height was obtained.
The silo was then covered with about four inches of prairie dirt and then it was covered about two feet deep with rotten straw.

Satisfactory work has been accomplished in fixing the uniformity high sugar percentage that selection and analysis of the mother beets have given us.

*Adams Project*

This work has been continued as before. Careful chemical analysis of the feeds given and the determination of the digestion coefficients and complete chemical control has been maintained as formerly, also physical measurements, blood count and inspection have been carefully continued. We are accumulating a valuable amount of data and it will probably be possible to bring this work to a close at the end of another year. The remaining two horses experimented with are beginning to show marked symptoms of bone deterioration which will indicate the perniciousness of the practice of feeding livestock of any kind an unbalanced one-sided ration.

Very respectfully,

(Signed) JAS. H. SHEPARD,
Chemist.

**DAIRY HUSBANDRY DEPARTMENT**

Director James W. Wilson,
College.

Dear Sir:

During the past year the Dairy Husbandry Department has been working on projects under both the Hatch and Adams funds.

Two bulletins were issued, viz: No. 152, on The Testing and Handling of Dairy Products, and No. 154, on The Pit Silo. Both of these bulletins, judged from the demands, have met a long felt want in South Dakota.

We are in the midst of the Adams fund project, viz: "The Role of Water in a Dairy Cow's Ration." Three trials were completed during the last year. In the first
period the cows were watered twice each day. We endeavored to find out the normal condition of the cow, and the normal composition of ingo and outgo of the cow; also the normal percentage distribution in the cow’s body of the different kinds of ingo. In the second trial, we endeavored to find out the effect of watering the cow only once each day. In the third trial, we tried to find out the effect of watering the cows only once each 60 hours. During the coming year, we hope to obtain data showing the effect, if any, upon the cow and her various functions by giving her only one-half of the amount of her normal water supply. We are not in position at the present time to make public any of the obtained results.

Under the Hatch fund the “Comparative Study of Different Milking Machines” has progressed. Six different machines are in operation. The per cent of stripping left by each of the different machines has been determined. We are also endeavoring to determine just how, and the extent, the kind of cow affects the work of the milking machine. The bacterial count of the milk from the different milking machines also is being determined. The mechanical milking in the dairy herd now has been continued for about five and one-half years. A long time is necessary to determine the effects of mechanical milkers on the length of lactation period, on the amount of milk, and whether or not the milking machines injure cows’ udders and teats. A bulletin will this year be issued on mechanical milkers.

The experiment on the subject “Ice on the Farm” has been continued. There are vast areas in rural South Dakota where there are no streams and lakes from which farmers may obtain ice during the winter. In these sections most of the water supply comes from artesian wells. Such water is usually of higher temperature than is other well water. This makes ice on the farm still more important. We have, during the last few winters been trying to work out a method by which water can be frozen into ice in cans and stored in a simple way for summer use. We have succeeded in freezing the ice. We
still must solve the difficulty arising from the unequal freezing in the can. The center of the water freezes last. When it does freeze, it bulges and cracks the block of ice on the surface. The experiment has the disadvantage that we can work at it only during cold weather.

The practicability and cost of using the coil cream vat as a combined pasteurizer and cream ripener, and the keeping property of butter made from cream pasteurized at different temperatures has been duplicated again this year. We shall publish a report of this during the coming year.

In addition to these regular experiments, the data pertaining to the different kinds of silos and the production of the dairy herd have been kept up. In time this will make very valuable data.

Last spring Associate Professor J. M. Fuller left this department to take charge of the dairy department at the Oklahoma State Agricultural College. We lost a very valuable man in Professor Fuller. To allow a valuable man, who properly fits into a position to go to another place because of a few hundred dollars increase in salary, I believe, is a poor policy. The changing of men in a department necessarily cripples the experimental work. Mr. V. R. Jones, a post graduate man of Cornell University, New York, and a former teacher in Washington State College, has been employed to fill this vacancy. Aside from this, the experimental work, from our point of view, has been going satisfactorily.

Respectfully submitted,
(Signed) C. LARSEN,
Prof. of Dairy Husbandry.

HORTICULTURE DEPARTMENT

James W. Wilson, Director,
South Dakota Agricultural Experiment Station.

My Dear Sir:

The work of the Department of Horticulture the past year has made progress along the lines indicated in pre-
vious reports. The main effort is devoted to creative horticulture, specially the breeding of hardy orchard and small fruits. Our prairie pomology demands a hardier and better list of varieties, since most of the old list is deficient in hardiness or other essential characters.

**Progress in Pears**

The season of 1914 was marked by a serious invasion of blight which is so destructive to apple and pear trees. A large number of seedlings of my new hybrid pears show immunity to pear blight. They are hybrids of the Sand Pear and Birch Leaved Pear, of Siberia and Northern China, with cultivated pears. In order to determine whether these new seedlings will be immune to blight under other conditions of soil and climate, it was determined to distribute scions of thirty-nine varieties in the spring of 1915. They were sent out under restrictions to twenty-four different men in several states to determine the character of the fruit as well as immunity to blight. Many more seedlings are coming on. Since propagation is the only test of a new variety, little attention will be given at present to preserving the original trees, but they will be tested under propagation as rapidly as possible. Twelve thousand pear seedlings of various kinds were planted this spring and the value of other stocks will also be tested in a limited way. The importance of this work is apparent since pear blight is the great obstacle to pear growing over a large part of the United States. The full pedigree of these thirty-nine new seedlings is given in Bulletin 159.

**Progress in Plums**

Since the publication of Bulletin 130 a number of new varieties of fruits have been distributed as a result of the work under this project. A summary is given in Bulletin 159, published May, 1915. In the spring of 1915 several hundred plum trees were distributed of the following varieties: Waneta, Tokata, and Kahinta. Of the new varieties of plums described in bulletins 130 and 159, easily a million trees are now in the nurseries and orchards of the northwest.
Progress in Apples

Out of fully 10,000 apple seedlings, only one variety has been introduced, the Amur crab, described in bulletin 159. A large number of new seedlings are now coming on along new lines of pedigree, specially complex hybrids and crosses of the first lot of seedlings. Many more crosses were made this season. The great need of the prairie northwest is a hardy winter apple, an apple that will keep until May in a common cellar and still be hardy, productive and of good size and quality. In connection with this work we find it necessary to work extensively with apple stocks, specially the Siberian crab seedling, for nursery propagation. The new apple seedlings are given the propagation test as rapidly as possible, since the behavior of the original tree is no criterion of its hardiness. Is root-grafting or budding the better method for the northern sections? Many details need to be worked out in this connection.

Progress With Other Fruits

The strawberry work is being continued and some new seedlings were marked for propagation. The main effort is to combine the wild strawberry of the Dakotas and the Canadian northwest and Alaska, with the best varieties from the eastern United States and from Europe.

Many seedlings are coming on of the raspberry, grape, Sand Cherry, and other fruits.

Progress in Roses

Work in breeding hardy roses is being carried on as Hatch fund project, especially with Siberian and native roses. Only one variety has been introduced, the Teton-kaha, described in Bulletin 159.

Bulletins

Two bulletins were issued by the Horticultural Department during the year: No. 158 "Proso and Kaoliang as Table Foods" including (1) History and Milling, (2)

Hulled proso millet was tried as a table food the past winter. The milling was done by the Horticultural Department and the new recipes were originated by the Home Economics Department of the College. This is an effort to reduce the high cost of living by utilizing a sure dry land crop as a table food. Proso can be raised in the driest years on our western uplands.

Alfalfa Transplanting

The work of distributing the new varieties of alfalfa from Russia and Siberia, specially the Cossack and Semipalantinsk, was continued during the year under the special state appropriation. The Legislature has made provision for completing the work by an annual appropriation of $3,000 for the next two years. This work has led to the machine transplanting method announced in Bulletin 141. Transplanting one-year-old alfalfa roots is extremely economical in seed and the experience of many farmers shows that it is a certainty under severe conditions where seed fails. Hence, some effort will be made to standardize and perfect the method. As a by-product of this work in alfalfa transplanting may be reckoned the new method of hybridizing alfalfa described in Bulletin 159. Considerable work in this line is under way this season. During the many severe late frosts this spring, the last on June 9th, these hybrid Siberian alfalfa plants proved proof against the cold.

Yours truly,
(Signed) N. E. HANSEN,
Horticulturist.
REPORT OF THE SECRETARY

James W. Wilson, Director,
State College.

Dear Sir:

I submit herewith, schedules showing receipts and disbursements for the Experiment Station and Substations for the fiscal year ending June 30th, 1915.

Yours truly,
(Signed) R. A. LARSON,
Secretary.
# EXPERIMENT STATION AND SUB-STATION

## Receipts, 1914-1915

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<th>Home Station</th>
<th>Highmore Sub-Station</th>
<th>Yankton Sub-Station</th>
<th>Cottonwood Sub-Station</th>
<th>Watertown Sub-Station</th>
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*Popular Bulletins.

*Includes returns from sale of hog cholera serum.
## EXPERIMENT STATION AND SUB-STATIONS
### Disbursements, 1914-1915

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<th>Item</th>
<th>Hatch</th>
<th>Adams</th>
<th>Home Station</th>
<th>Highmore Sub-Station</th>
<th>Eureka Sub-Station</th>
<th>Cottonwood Sub-Station</th>
<th>Vivian Sub-Station</th>
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### Popular bulletins
- Home Station—Local Fund, July 1, 1915: 1000.00
- Sub-Station Fund, July 1, 1915: 4081.08
- Cottonwood Sub-Station Fund: 2726.53

### Reverted to State Treasurer
- Cottonwood Sub-Station Fund: 45

### Grand Total
- 399874.95