SOUTH DAKOTA AGRICULTURAL COLLEGE,

BROOKINGS, S. D.

DUTCHER, BREED & STORGAARD, BROOKINGS.
To the Honorable,

C. H. SHELDON,

Governor of the State of South Dakota.

Sir:—I have the honor to transmit herewith the Sixth Annual Report of the Agricultural Experiment Station of South Dakota, in accordance with the requirements of law.

Yours Respectfully,

EDWARD T. SHELDON,

President Board of Trustees.

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A. W. Williams, Farm Foreman
FINANCIAL REPORT.

THE AGRICULTURAL EXPERIMENT STATION OF SOUTH DAKOTA

IN ACCOUNT WITH

THE UNITED STATES APPROPRIATION.

1893.

To receipts from the treasurer of the United States for the year ending June 30, 1893, as appropriated by act of Congress approved March 2, 1887

DR.

<table>
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| Total                                          | $15,000.00|

We the undersigned officers of the Board of Trustees have examined the vouchers covering the expenditures of the Agricultural Experiment Station of South Dakota for the fiscal year ending June 30, 1893, and we have compared them with the books of the Station Accountant, and we hereby certify that the books and vouchers agree, and that the expenditures have been made in accordance with the rules and orders of the Board of Trustees.

Signed,

E. T. Sheldon, Pres.

Lewis McLouth, Sec'y.

REPORT OF THE PRESIDENT.

During the year ended June 30, 1893, a number of changes were made in the personnel of the Station Council and the working staff.

In November 1892, Dr. Orcutt and his assistant J. M. Aldrich retired from the department of Entomology, and the work of Entomologist was added to the duties of the Botanist. Mr. W. S. Frost, secretary and accountant, also retired from the institution. On the first of January 1893 Mr. John C. Whitten resigned his position as acting Horticulturist to take a more attractive position under Dr. Trelease in the Missouri Botanical Gardens. In January 1893 Donald A. Cormack, D. V. S., was elected to the chair of Practical Veterinary Surgery and Medicine. In February 1893, Ellery C. Chilcott was elected to the chair of Practical Agriculture in place of Luther Foster. Lee C. Corbett, of Cornell University, was elected to the chair of Horticulture and Forestry, and Ed. F. Hewit was elected Secretary and Accountant. In April 1893, Harvey N. Ott, of the University of Michigan, was elected to the chair of Zoology and Animal Pathology.

So many changes in the working staff of the Station in a single year have had the effect of interrupting to some extent the continuity of the experimental work, although to no serious extent, and have made it necessary to make new plans in some directions; but the better articulation of departments under the reorganization, and the infusion of new blood and fresh ideas have given to the Station a visible impulse forward. At the present time there are complete harmony of purpose and a pleasant and helpful co-operation of all the departments for the good of all.

During the year five bulletins were published as follows: No. 32, in December, on Forestry, by Professor Whitten; No. 33, in February, by Professor Williams, on Plants Injurious to Stock; No. 34, in April, by Professor Shepard on the Sugar Beet; No. 35, in May, conjointly by Professors Corbett and
Williams, on Fungal Diseases and Insect Pests; and No. 36, in June, by Dr. Cormack, on Scab, Lumpy Jaw and Anthrax.

Early in the year 1893 a change was made in the manner of publishing "press bulletins." A semi-monthly periodical entitled "The Industrial Collegian," was established under joint management of the students and faculty of the College and Station. This became the means of communication by which many press bulletins and articles of agricultural interest were published.

A financial report of the Station for the year will be found on a preceding page, and special reports of the heads of departments follow.

LEWIS McLOUTH,
President of the Station Council.
Experiments with sugar beets were continued and completed during this year. Two sacks of seeds were imported direct from the grower, Aug. Knoche, Wall Witz. Of these 400 samples were distributed to farmers throughout the state. 158 samples of beets were received from the different growers and analyzed. The results of these analyses were reported in Bulletin No. 34. From the results obtained from the work of this and preceding years the conclusion was reached that sugar beets, well adapted for sugar manufacture, could be profitably grown in many parts of the state. By vote of the Station Council and of the Trustees it was decided to discontinue the experiments along this line.

Bulletin No. 34 also gives the results of the analyses of beets raised from seed grown on the Station farm. These beets showed excellent results and further experiments with home grown seed will be made.

During this year the analysis of native grasses and forage plants of South Dakota was pushed forward with the expectation of completing the work as far as possible during the coming year. As soon as possible after the completion of this work a bulletin will be issued giving the results obtained.

The preceding lines of work were the principal ones carried on by this department.

Although many miscellaneous analyses of minerals, waters, etc., were made, an encouraging decrease of such irregular work of value only to single individuals was observed.
On the 10th of March last the professor of agriculture who had had charge of this department since the establishment of the Experiment Station, retired, and was succeeded by the present incumbent.

As the notes and records of the work done and experiments made during the previous season, which were left in the office by the outgoing professor of agriculture, were not considered sufficiently full, clear and explicit to warrant their use by one entirely uninformed as to the plan, scope, and details of the experiments, aside from the information contained in such notes and records, in attempting to work out and publish the results obtained, it was decided to make no such attempt.

It is unfortunate that this work was not completed and published by the person under whose supervision experiments of last year were conducted, as there is possibly some matter that might be of value to the farmers of the state if it had been worked out and published by someone who was thoroughly familiar with the details and plans of the experiments. This work will not be entirely lost, however, as some of the notes can be used in connection with future work on the same lines.

Changes in the heads of departments, when necessarily made, still always cause serious temporary loss in the efficiency of the work done, particularly where so much of the work is under the supervision of the head of the department, as is the case at this Station.

Many experiments are of but little value unless they are continued through several years; and it is next to impossible for any man to leave his work and notes in such condition at any time before the experiment is completed, that another person can step in and continue the experiments already begun as well as though he had some more definite information as to the general purpose of the experiment, and the work already done, than he can usually obtain from the fixed notes on file in the office. Permanency in these offices should be maintained as far as possible.
To add to the difficulties under which this department was placed last spring the weather during April and May was unusually cold and wet making it almost impossible to do any work on the farm, until very late in the season. In what work was done the weather and the condition of the soil were often more potent factors in deciding the manner of putting in crops, the kind of crops and their location than was any prearranged plan of experiments.

In spite of all the above mentioned difficulties the following lines of work were undertaken, and as fast as results are reached they will be published in future bulletins:

**Forage Crops:**—Rape was sown at different times during the season to test its value as a feed for sheep and other stock.

Jerusalem corn, Kaffir corn, Durra corn, Sorghum, Milo Maize, Elephant corn, Peas and Oats, Peas and Millet were also planted or sown.

**Root Crops:**—Five varieties of mangel wurzels, four varieties of carrots, and five varieties of rutabagas were sown.

**Potatoes:**—One hundred and twenty varieties of potatoes were planted.

**Wheat:**—Thirty-eight varieties of spring wheat were sown for the purpose of ascertaining the yield, quality of grain, quality of straw, date of ripening, susceptibility to the attacks of rust, etc.

**Oats and Barley:**—Eleven varieties of oats and fourteen varieties of barley were sown, the same points being under consideration as with wheat, as well as different modes of seeding and preparing the ground.

**Corn:**—Twelve varieties of corn were planted under different systems of preparing the ground.

**Flax:**—An experiment was begun, intended to continue for several years, to decide what effect continuous cropping to flax has upon the soil and upon successive crops, and also to ascertain whether the bad effects supposed to result from growing flax are due to the exhaustive nature of the crop, or to some other cause. It is also intended to discover if possible to what extent these bad effects extend to other crops grown on land which has raised flax.
Grasses and Clovers:—A great variety of grasses and clovers have been grown on the Station grounds for several years. Some of the most promising varieties were sown quite extensively with different grains and by themselves at different times and under various conditions to ascertain the best method of seeding as well as their value in this climate for hay and pasture.

Renovating Pastures:—A line of experiments was begun to discover, if possible, some way of renovating and reseeding native or "wild" pastures that have become weedy and nearly worthless without losing the use of them as pasture during the long period necessary to break them up, subdue and seed them down again.
The reconstruction and rearrangement of the existing greenhouse, together with the addition of a new one, 10x40 in extent, render the work of providing plants for the experimental grounds much easier and more satisfactory, besides enabling us to carry on the cultivation of lettuce and radishes during the winter. The houses are built of cypress, glazed with double thick glass "butted." The sides and ends of the houses have two tiers of glass separated by an air space of one and one half inches. The wood sash-bars are supported by an iron frame of gas pipe firmly screwed together, and the pillars, which are also of gas pipe, are anchored at the base in a bed of stone and mortar.

An important addition to the out-door plantations is an experimental vineyard of 820 vines representing 42 varieties; all have made a good growth, and have gone into winter quarters in prime condition.

One plat of elms was added to the forest-tree plantation. The plan of treatment to be followed is to plant a hill of corn on the south side of each tree, which is to be cultivated the same as an ordinary field crop. When mature the corn is to be cut just below the ear leaving the stiff stalk standing to make a snow catch to protect the young plants and to supply them with moisture during the succeeding spring.

In the fall of '92 a preliminary test of the propagation of *Eleagnus hortensis* from seeds was begun by planting them in a cold-frame and covering the soil with a coarse mulch. In May the mulch was removed and the young plants came up quickly, and are making a good growth. This is a shrub of great promise for planting in our dry prairie soil, and if it can be easily propagated in this way it will undoubtedly fill an existing want in our list of hardy shrubs. During the year two bulletins were issued by the department: No. 32 on "Forestry," in December '92, and No. 35 on "Insecticides and Fungicides," in May '93.
DEPARTMENT OF BOTANY AND ENTOMOLOGY.

THOMAS A. WILLIAMS.

The work in botany for the year has been largely in line with that of last year. New lines of work have been added as opportunity and facilities allowed.

The study of the forage plant question has been pushed forward with all possible speed. It is expected that the results will be published soon in connection with those in the same direction obtained by the department of Chemistry. Tests of hardy varieties have been kept up. Much time has been given to the study of the rusts of small grain, particularly with regard to variety conditions and rust resisting varieties of grain. This study will be continued the coming season.

The "Tomato-rot" has given considerable trouble during the past season throughout the whole northwest, and the endeavor is being made to find out the exact cause of and physiological conditions attending the disease. Cultures have been made which tend to show a probable connection between the rot of the fruit and a leaf spot disease. It is hoped that the results of the coming season's work will enable us to find out the facts regarding the cause of this disease and to recommend a successful remedy.

The work on weeds of the state has been confined very largely to the study of the "Russian Thistle." Facts regarding its distribution, injuriousness as a weed, value as a forage plant and methods of handling have been gathered; some have already been given to the public, others will follow in future bulletins.

The study of the flora of the state has been continued as time would allow, much attention being given to native plants that give promise of greater or less economical value.

In connection with the work in Entomology, fungous and insect foes of forage plants are being studied: Many interesting facts are being gathered which will be published as circumstances allow.

The greater part of the Entomological work done since this has been added to the department, has been in the way of methods of combatting the insect enemies of fruit and forest
trees. Very successful experiments were carried out in treating Cottonwood leaf beetles, Elm caterpillars, and plum enemies. Some of these results will be embodied in a bulletin in the near future while others will be held until another season’s experiments can be carried out.

Considerable attention has been given to the study of the life history of new or little known insect pests. As far as possible, these are being bred in the insectary and their habits and characteristics closely watched.

The working facilities of the department have been very materially increased during the year by the addition of much needed apparatus and literature, and the procuring of more pleasant and commodious quarters.
During the present year this department of the Experiment Station has given special attention to the treatment of external parasitic diseases of sheep,—which diseases have caused considerable trouble in some of the northern counties of the state.

We have also devoted some time to the treatment of Actinomycosis (Lumpy jaw), in order to ascertain at what stage the disease is most amenable to the Potassium-Iodide treatment.

Complete instructions on the above subjects have been widely circulated among the stockowners of the state.

Another subject of far reaching importance to the stock interest of this state, which has engaged the attention of this department, is that of the correct diagnosis of the disease of Glanders and Farcy in the chronic or hidden form. We received a quantity of mallein from the Bureau of Animal Industry, with which we have tested several suspected cases of Glanders, in different parts of the state. The result of these tests were most satisfactory.

Animals infected with the bacilli of Glanders, when inoculated with a small quantity of the mallein, exhibit particular symptoms, which indicate the presence of the bacilli, while healthy animals, being injected with the same quantity of the mallein, do not exhibit any constitutional disturbance.

If county boards of health could be authorized to use this preparation as a means of diagnosing cases of Chronic Glanders and Farcy, it would be a great benefit to the state at large.
During the year this department has been placed on a more independent footing by having been allowed to assume control of the cows and other stock, together with the dairy barn, feeding etc. It was decided by the controlling boards that much of the stock heretofore kept on the college farm was not suitable for experimental and instructive dairying, and it was ordered sold, to be replaced with cows from the leading dairy breeds of the country. Accordingly in March 1893, nineteen thoroughbred cows were purchased which together with some of the best ones selected from the stock before on hand give us a dairy herd composed of six different breeds as follows: four Holstein Friesian, four Durhams or Shorthorns, two Devons, two Ayrshires, five Guernseys, five Jerseys and one scrub cow, twenty-four in all. A careful record has been kept of the products of these cows in milk, butter and cheese, in the hope that at the end of the calendar year this department will be able to determine, and publish in a bulletin, the receipts from each cow, together with the cost of feed consumed, and by this means, demonstrate beyond a doubt whether or not dairying can be carried on profitably by the farmers of this state. A part of this work has been completed and is now ready for publication; the remainder will be completed and published at a later day.

Aside from the regular instruction of the department, experiments have been made with deep and shallow setting of milk as compared with centrifugal separation, with a view of ascertaining the relative loss or gain of one method over the other, and the reliability of the separator for perfect separation of cream under widely different conditions.

The effects on cheese of the use of stagnant waters for cows instead of pure well water, will be discussed in a future bulletin.

This department is being made more efficient this year as the governing boards become more conversant with the needs of such a department, and the farmers evince a better appreciation of the work it is trying to do.