FARM HOUSE—UNIVERSITY EXPERIMENT FARM.

ANNUAL REPORT

OF THE

AGRICULTURAL EXPERIMENT STATION

OF THE

UNIVERSITY OF MINNESOTA.

1894.

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☞ The bulletins of this station are mailed free to all residents of the state who make application for them.

MINNEAPOLIS, MINN., Jan. 1, 1895.

To His Excellency Knute Nelson, Governor of Minnesota:

I have the honor to transmit to you herewith the annual report of the Agricultural Experiment Station of the University of Minnesota, for 1894.

J. S. PILLSBURY,
President Board of Regents.

LIST OF THE BULLETINS PUBLISHED DURING THE YEAR 1894.

PRESS BULLETIN No. 1.—February.—Smut in Wheat.

PRESS BULLETIN No. 2.—March.—Organizing Co-operative Creameries.

BULLETIN No. 33.—July.—The Russian Thistle.

BULLETIN No. 34.—September.—The Chemical Development and Value of Red Clover; the Russian Thistle—Its Food Value and Draft upon the Soil.

BULLETIN No. 35.—October.—Dairy Herd Record for 1893; Cost of Butter Production in Winter; Comparing Prairie with Timothy Hay; Rearing Dairy Calves; Co-operative Creameries; Experiments in Sweet Curd Cheese.

BULLETIN No. 36.—November.—Miscellaneous Analyses of Feeding Stuffs; the Digestibility of Wheat.

BULLETIN No. 37.—December.—The Chinch Bug.

BULLETIN No. 38.—December.—Garden Tillage and Implements.

BULLETIN No. 39.—December.—Potatoes—Variety Tests, Blight and Internal Brown Rot; Tomatoes—Variety Tests, Training; Strawberries—Variety Tests; Apple Tree Sun-scald; Raspberries—Variety Tests, Cane Rust.

BULLETIN No. 40—December.—Forage and Grain Crops—Varieties Corn for Minnesota; Silage of Dent, Flint, Sweet and Southern Ensilage Corn Compared as Foods for Dairy Cows; Better Varieties of Corn by Breeding; Corn Cultivation; Wheats—Variety Tests, Varieties Selected for Propagation; Improving Wheats by Crossing and Selecting; Barley—Variety Tests; Flax—Variety Tests; Peas—Variety Tests; Millet—Variety Tests; Oats—Thickness of Seeding, Methods of Seeding, Rolling to Prevent Lodging; Succotash of Small Grains; Hay Production by Seeding Annual Crops; Tests of Grain Seeding Implements and Best Time of Planting Wheat and Oats; Time and Depth of Sowing Wheat, Oats, Barley and Flax; Field Management and Rotation of Crops; Smut in Wheat.

REPORT

OF THE

CHAIRMAN OF THE EXPERIMENT STATION CORPS.

The University Experiment Station has finished a successful year, and has been of more help to our farmers, and to our School and College of Agriculture, than ever before. The corps of workers is fulfilling the faith I expressed a year ago in its ability to do practical and scientific work. Thorough harmony prevails in all divisions of the station, all experiment work is taking definite direction in important lines. Difficult and expensive as agricultural experimenting is, our state is receiving a large benefit from the money and energy expended. The needs of our agricultural school and the varied farming interests make it necessary that our experiments cover more lines of work than the funds now furnished by the government will support. The future agricultural education of our country will find its firmest basis on the experiments, the publications, and in the general writings emanating from the agricultural experiment stations. The station is doing much to put agricultural instruction in the university on an advanced and permanent basis. As the interest in the school, farmers' institutes and agricultural societies is appreciated there will be no more proper demands for the supply of funds with which to conduct researches.

In the agricultural division great progress has been made, though the unprecedented drought made valueless over half the field experiments undertaken. The farm has been somewhat remodeled as to the management of its fields, and it will henceforth be an experiment farm rather than a model farm. The barnyards, lanes and roads are being much improved. The general field management aims at preparing each piece of land for future definite plot experimenting. An extended study of field management has been inaugurated on the University Farm, and preparation is made for extending this line of work to Coteau Farm, and if possible to two other sub-experiment farms. This work includes carrying out, through a long series of years, rotation of crops on nu-

merous plots at each of these farms to get at the relative product of land in the farm under different systems, and also to determine the net income.

To determine matters of cost and value of products, to be used in applying the facts found in the rotation experiments, a system has been organized for gathering statistics in reference to crops. Data obtained from farmers throughout the state will also be used.

The work with varieties of field crops is being concentrated along the practical lines of improvement of quality and quantity. The best varieties of wheat, corn, oats, barley, timothy, clover, etc., of superior varieties are already on hand in quantities sufficient soon to be distributed to a limited number of our farmers, and if means are provided by the state or by the general government more will be grown for distribution. Secretary Morton, heartily supported by President Cleveland, and we trust by the strong majority of both houses of congress, proposes that hereafter governmental expenditure of money for distributing new and valuable seeds to farmers shall be through and under the control of the state experiment stations. The Minnesota Experiment Station has this matter in hand probably better than in any other state. Numerous experiments are under way with forage and grain crops, to determine methods of planting, cultivating, harvesting and storing. Fiber crops are also being tested and methods being developed for handling them.

We realize that general farm and field management, and the adaptation of various crops to our different soils and climatic conditions, can be studied at the University Farm for only one section of the state, and for certain of its conditions. A plan is being outlined for extending experiments to three other representative points, thus covering the four general widely different conditions of this large state. Through the courtesies of the Board of Farmers' Institutes and its able superintendent, O. C. Gregg, the agricultural committee was able to have Professor Hays take charge of the direction of certain lines of experiments on Mr. Gregg's farm in the southwestern part of the state. Though the season was unfavorable and a late beginning unavoidable, some very interesting lines of field and horticultural work were instituted. Mr. T. A. Hoverstad, as superintendent in charge, was employed to conduct them. Study has also been made regarding the best location for two other experiment farms, one to represent the Red River Valley and the adjacent parts of the northwest corner of the state, the other to represent the lighter soils of the great north central timbered section. By consulting the state geological surveys and doing some traveling, Professor Hays has formulated a general plan as to where these farms should be located. The foreman in the agricultural division, Mr. Andrew Boss, is developing into an able assistant, not only in the farm work but in teaching the handling and preparation of meats.

Our horticultural work is making strong growth. Professor Green has given this line of work a good standing among horticultural people of the state. Material assistance has again been given to the ten horticultural trial stations of the State Horticultural Society, by assisting them to do excellent work and receiving from them in return work helpful to the experiment station. Drought at St. Anthony Park also injured the horticultural work. Low prices and poor crops have caused farmers to direct their attention to a greater diversity of crops and to economy of living. This has created more interest in horticultural work, as is shown by increased correspondence and inquiries. The apple trees at the university farm, including the Russian orchard, produced a very light crop. Grapes produced only a medium crop, raspberries fair, and blackberries rather poor crops. Most other small fruits yielded well, and the many new kinds of strawberries, ripe when the horticultural society held its summer meeting at the University Farm, were highly commended. Experiments have been carried on with varieties of potatoes, potato diseases, and implements for digging potatoes. A thorough trial and comparison of garden implements was also made, nearly all manufacturers having donated samples of their tools. Diseases of small fruits likewise were studied. The greenhouse serves a most useful purpose in the station and school work, proving useful for the girls as well as for the boys. Professor Green has done for the state and for the school a most commendable thing in publishing his little book entitled "Amateur Fruit Growing."

Great interest has been taken in Dr. Lugger's work in chinch-bug experiments throughout the southern half of the state. The great drought was very unfavorable to the spread of the disease but favorable to the spread of the insects, and further experimenting on a larger scale seems desirable. Grasshoppers at Duluth and other points threaten also to do damage next season and the doctor deems it important that the state should direct measures preventative of their ravages.

A large collection of agricultural plants has been made, and specimens are taken from each plot for the newly started agricultural museum. In this museum are also being collected specimens of our weeds, economic grasses and of wild birds and animals of interest to our agriculture. The collection of insects is being enlarged and classified and arranged to show how each is injurious or beneficial. Instruction in entomology and zoology in the school of agriculture and in bacteriology in the dairy school has been well received. Lectures along these lines were also given to the students in the girls' summer school.

The value of our chemical division has been proven by its works and by the esteem in which it is held by other agricultural institutions. One of the prominent features of the laboratory work has been soil

investigations. The relation of humus, or decaying plant substance, to the fertility and water-holding power of the soils is proving a rich field for investigation. Professor Snyder has devised a new method of soil analysis, which was published in the last annual report, and which has been adopted as the official method by the American Association of Agricultural Chemists. Minnesota soils exhibited by the station received a high award for richness in plant food at the Columbian Exhibition. This division is co-operating with the agricultural division in the study of crop rotations, soils from forty-two plots having been analyzed the past season. The new meat house will afford opportunity for the study of meats as human foods. Numerous analyses of animal foods have been made and experiments to determine digestibility of wheat are under way. Much analytical work is being done for other divisions, including analyses of dairy products, feeding stuffs, fertilizers and insecticides. Studies have been made of milling different kinds of wheat. The farmers have shown their appreciation of this division by sending in numerous samples of various products for analysis, which have received careful attention.

The experiment side of the dairy division has been considerably developed in spite of its special activity in school work. The school has done much to indicate lines of experimenting needed by our factorymen and farmers. The scientifically made records of the dairy herd in 1892 have been continued, and the individual cow records for 1893 now being published make the best showing of any experiment herd on record The experiments in raising calves on skim-milk and flaxseed meal have been successful, and a useful report of the comparison of timothy and wild hay is being printed. The introduction of fancy cheese instruction into the dairy school and into the state has created quite an interest among factorymen, and farmers' wives have found that they can make their sweet curd cheese in their kitchens without dropping for the entire day other household duties, as is necessary in making American cheddar cheese. Professor Haecker has carried out experiments in the making of various kinds of fancy cheese, and is now publishing the methods of manufacture. The valuable discussion on selecting dairy cows, as suggested by the annual testing of individual cows of the herd, is being issued in a bulletin, and will attract general attention. In the dairy school during the past year 216 persons have received instruction. The applications for the coming year bid fair to be largely in excess of this number. Already the increased duties and work demand a large increase in room and facilities.

In animal husbandry the experiments in meat production have been somewhat hindered by needed alterations in buildings, by the drought which interfered with grazing experiments, and especially by tubercu-

losis among the cattle. Useful facts have been learned in the experiments in making beef and in fattening lambs. That well-bred lambs are profitable in Minnesota has been shown. Experiments are under way in rearing calves on skim-milk to determine weight and profits of calves at one and two years old. Improved pigs are being compared with unimproved, and various crosses of swine are being compared to determine the relative value of various breeds for crossing. The feeding value of wheat is being studied. Heavy versus moderate grain rations for fattening steers and sheep are under trial. Wheat is being compared with screenings for fattening sheep. Sheep are fed under protection in comparison with others not under a shed, and lambs are being fattened in comparison with mature sheep to determine relative profits. Experiments are under way to determine the number of sheep one acre of land planted to successive forage crops will maintain and to test the suitability of forage crops. An effort is being made as how best to produce cross-bred ewes which will drop lambs in the fall. It is planned that next year we shall erect a capacious sheep house, move and enlarge the hog house and remodel the south basement of the barn for the representatives of the beef breeds. Professor Shaw now lectures to students on breeds, breeding and feeding, and much practice is given in judging living specimens of breeds.

In the veterinary work at the station Dr. Reynolds is growing into a large correspondence with farmers, and is frequently called to different parts of the state to investigate diseases sometimes thought to be contagious. In Cottage Grove township, Washington county, a swine plague which destroyed 350 animals was investigated and the farmers taught preventative measures. Most of this loss could doubtless have been avoided had local authorities called the doctor earlier. A number of horses have been tested for glanders with the mallein test, four of which were condemned. At Brainerd several distinct horse diseases, happening together, caused unnecessary alarm, which was quieted by examination. A series of experiments, testing eserine alone and in combination with other drugs, has been carried on, and the whole matter of hypodermic cathartic treatment as compared with stomach administration with cathartics is being developed in a most promising way. A new way of chloroforming horses for surgical work is being tried with most hopeful results. Bursatee, an uncommon disease, has appeared in unusual numbers in the clinic for students and is being studied. About 200 tuberculin tests have been made, and of the nearly seventy-five head of cattle tested at the University Farm, twenty-five have shown the tuberculin reaction, nine of which were not destroyed but were held for experiments in curative treatment. Breeders fear the introduction of tuberculin, but it promises to prove a friend to the breeders as well as to

the human family in general. Our records show that tuberculosis is liable to follow in family lines but not to respect breeds. The tuberculin test is a perfectly practical guide in diagnosing tuberculosis, being above ninety-five per cent accurate. The time seems near at hand when the tuberculin test will be required by purchasers of thoroughbred cattle, and the testing of dairy and other herds will ere long become a common practice. Breeders of beef and dairy stock should early take up this test rather than be forced to do so by purchasers of breeding animals and by domestic and foreign consumers of our meat and dairy products.

FINANCIAL STATEMENT.

Statement of Disbursements and Receipts of the Minnesota Agricultural Experiment Station for the Twelve Months beginning Jan. 1, 1894, *and ending Dec.* 31, 1894, *inclusive.*

	Disbursements.	Cash Receipts.	Cash Outlay.
Station	$6,395.78	$269.63	$6,126.15
Agriculture	5,587.75	309.26	5,278.49
Coteau Farm	1,204.39	.....	1,204.39
Animal husbandry	4,134.03	650.31	3,483.72
Horticulture	2,710.12	472.62	2,237.50
Chemistry	1,796.81	.....	1,796.81
Entomology	1,294.39	.....	1,294.39
Veterinary	1,438.48	213.13	1,225.35
Dairy	821.79	.....	821.79
Totals	$25,383.54	$1,914.95	$23,468.59

Below is a statement of the cost of the Coteau Experiment Farm from April 1, 1894, to Nov. 30, 1894, inclusive:

DEBIT.

To labor	$1,185.23	
To seeds and plants	76.99	
To sundries	182.35	
		$1,444.57

CREDIT.

By 1,100 bushels of wheat at 45 cents	$495.00	
By 75 tons of hay at $5	375.00	
By experimental grains	75.00	
By 80 acres plowing at $1.25	100.00	
		$1,045.00
Balance		$399.57

J. A. VYE,
Secretary.

The foregoing financial statement from the secretary shows the cash outlay in the different divisions of the station. It is very difficult to divide the expenditures of the station work from expenditures in the educational work of the agricultural department of the university. Each head of a division in the station is also a professor in the College and School of Agriculture. With so many students in the School of Agriculture and in the Dairy School, and the demands for the more highly specialized work in the college course, the equipment and work of each division demands increased expenditures. Much of this is, as a matter of course, charged to the experiment station, though used in common by station and school. On the other hand, owing to the former method of keeping the accounts, which was changed during the past year, some expenditures, as in the dairy, have been charged to the educational work, which should have been charged to the station. On the whole however, somewhat more money has been expended in experiment work than the $15,000 supplied by the government for the experiment station.

WILLIAM M. LIGGETT,
Chairman.