

FOURTEENTH ANNUAL REPORT

OF THE

EXPERIMENT STATION

OF THE

Kansas State Agricultural College.

FOR FISCAL YEAR 1900-1901,

WITH AN

Index to Bulletins 99 to 103.

MANHATTAN, KANSAS.
1901.

KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN, KAN., November 1, 1901.

To his Excellency W. E. Stanley, Governor of Kansas:

DEAR SIR — I herewith transmit, as required by act of congress approved March 7, 1887, the Fourteenth Annual Report of the Experiment Station of the Kansas State Agricultural College, for the year ending June 30, 1901, including the financial statement for that period.

Respectfully,

E. R. NICHOLS,
Secretary Board of Regents.

KANSAS STATE AGRICULTURAL COLLEGE.

BOARD OF REGENTS.

- Hon. J. S. McDOWELL (1905),* President,
Smith Center, Smith county.
- Hon. F. D. COBURN (1905), Vice-president,
Kansas City, Wyandotte county.
- Hon. E. T. FAIRCHILD (1903), Treasurer,
Ellsworth, Ellsworth county.
- Hon. WM. HUNTER (1903), Loan Commissioner,
Blue Rapids, Marshall county.
- Hon. J. M. SATTERTHWAITE (1903),
Douglass, Butler county.
- Hon. S. J. STEWART (1905),
Humboldt, Allen county.
- Pres. E. R. NICHOLS (*ex officio*), Secretary,
Manhattan, Riley county.

Miss LORENA E. CLEMONS, Assistant Secretary,
Manhattan, Riley county.

STATION STAFF.

COUNCIL.

- E. R. NICHOLS, A. M.,
Chairman *ex officio*.
- J. T. WILLARD, M. S.,
Chemist and Director.
- H. M. COTTRELL, M. S.,
Agriculturist.
- E. A. POPENOE, A. M.,
Horticulturist and Entomologist.
- TAIT BUTLER, V. S.,
Veterinarian.
- H. F. ROBERTS, M. S.,
Botanist.

LORENA E. CLEMONS, B. S., Secretary.

ASSISTANTS.

- D. E. OTIS, M. S. Assistant in Dairying.
- R. W. CLOTHIER, M. S. Assistant Chemist.
- J. M. WESTGATE, M. S. Assistant Botanist.
- ALBERT DICKENS, M. S. Assistant Horticulturist.
- A. T. KINSLEY, M. S. Assistant in Veterinary Department.
- J. B. NORTON, M. S. Assistant Entomologist.
- ALICE M. MELTON, B. S. Assistant in Feeding and Field Work.
- ALICE M. MELTON, B. S. Clerk in Director's office.

*Term expires

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EXPERIMENT STATION
OF THE
KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN.

FOURTEENTH ANNUAL REPORT—FISCAL YEAR 1900-'01.

FINANCIAL STATEMENTS.

Report of the Treasurer.

(July 1, 1900, to April 13, 1901.)

To the Board of Regents of the Kansas State Agricultural College:

GENTLEMEN — Herewith is submitted my report of receipts and expenditures on account of the Experiment Station for the period between July 1, 1900, and April 13, 1901:

Balance on hand July 1, 1900	\$610.69
Received from the treasurer of the United States.. . . .	11,250.00
Received from cash sales of products	46.95
Total	\$11,907.64
Approved vouchers Nos. 1 to 228, including credits.. . . .	10,260.47
Paid to E. T. Fairchild, Treasurer.	\$1,647.17

W. T. YOE, Treasurer.

Report of the Treasurer.

April 13, 1901, to June 30, 1901.

To the Board of Regents of the Kansas State Agricultural College:

GENTLEMEN — Herewith please find a report of my receipts and expenditures on account of the Experiment Station for the period between April 13 and June 30, 1901:

Received from W. T. Yoe, ex-Treasurer.	\$1,647.17
Received from the treasurer of the United States.. . . .	3,750.00
Received from cash sales	5,298.26
Total	\$10,695.43
Approved vouchers Nos. 229 to 344, including credits	9,894.47
Balance on hand June 30, 1901	\$800.96

E. T. FAIRCHILD, *Treasurer.*

Report of the Secretary.

To the Board of Regents of the Kansas State Agricultural College:

GENTLEMEN—Herewith is submitted the following report of the financial affairs of the Experiment Station of the Kansas State Agricultural College for the year ending June 30, 1901, as prepared under directions from the United States Department of Agriculture. The several items of this account are covered by vouchers approved by the disbursing officer, certified by the Secretary, and allowed by the President of the Board of Regents:

Experiment Station, Kansas State Agricultural College, in account with the United States appropriation, 1900-'01.

DR.

To receipts from the treasurer of the United States as per appropriation for fiscal year ending June 30, 1901, as per act of congress approved March 2, 1887 \$15,000.00

CR.

By salaries	\$8,516.54
Labor	2,645.58
Publications	438.35
Postage and stationery	169.50
Freight and express	137.49
Heat, light, water, and power	11.00
Chemical supplies	111.88
Seeds, plants, and sundry supplies	258.31
Feeding stuffs	160.71
Library	134.65
Tools, implements, and machinery	144.17
Furniture and fixtures	153.33
Scientific apparatus	353.41
Live stock	1,446.85
Traveling expenses	62.21
Contingent expenses	10.00
Building and repairs	246.02
Total	<u>\$15,000.00</u>

We, the undersigned, duly appointed auditors of the corporation, do hereby certify that we have examined the books and accounts of the Experiment Station, Kansas State Agricultural College, for the fiscal year ending June 30, 1901; that we have found the same well kept and classified as above; and that the receipts for the year from the treasurer of the United States are shown to have been \$15,000, and the corresponding disbursements \$15,000; for all of which proper vouchers are on file, and have been by us examined and found correct, thus leaving no balance.

And we further certify, that the expenditures have been solely for the purposes set forth in the act of congress approved March 2, 1887.

(Signed) SAMUEL J. STEWART.

E. T. FAIRCHILD.

WM. HUNTER.

[SEAL.]

ATTEST: E. R. NICHOLS, *Custodian.*

Supplementary Statement.

DR.

To receipts from other sources than the United States for the year ending June 30, 1901:

Balance on hand July 1, 1900	\$610.69
Farm and garden products	5,345.21
Total	<u>\$5,955.90</u>

CR.

Labor	\$455.60
Publications	25.30
Postage and stationery	31.65
Freight and express	28.83
Heat, light, water, and power.	20.00
Chemical supplies	74.35
Seeds, plants, and sundry supplies	11.70
Feeding stuffs.	2,777.51
Library	39.56
Scientific apparatus	97.53
Live stock	1,557.41
Contingent expenses	<u>35.50</u>
Total	\$5,154.94
Balance	<u>800.96</u>
Grand total	<u>\$5,955.90</u>

Respectfully submitted.

LORENA E. CLEMONS.

Expenditures by Departments, 1900-'01.

ITEMS.	Farm.	Horticultural and entomological.	Chemical.	Botanical.	Veterinary.	General.	Total.
By salaries.....	\$2,140 00	\$1,685 00	\$1,132 50	\$1,099 04	\$1,172 50	\$1,287 50	\$8,516 54
Labor.....	1,076 75	1,441 46	107 50	303 34	76 37	95 76	3,101 18
Publications.....	99 75	154 12	7 60	86 75	.....	115 43	463 65
Postage and stationery.....	105 08	.....	2 50	14 13	12 40	67 04	201 15
Freight and express.....	50 09	31 00	21 95	16 68	12 73	33 87	166 32
Heat, light, water, and power.....	.....	.....	20 00	.....	11 00	.....	31 00
Chemical supplies.....	29 90	39 22	89 98	2 65	24 48	.....	186 23
Seeds, plants, and sundry supplies.....	103 97	110 61	7 54	34 04	10 97	2 88	270 01
Feeding stuffs.....	2,827 92	3 30	.....	.....	107 00	.....	2,938 22
Library.....	.....	30 76	4 70	121 27	17 48	.....	174 21
Tools, implements, and machinery.....	105 00	30 50	7 97	70	.....	.....	144 17
Furniture and fixtures.....	1 25	.....	19 42	44 50	70 98	17 18	153 33
Scientific apparatus.....	.....	.....	269 51	.....	181 43	.....	450 94
Live stock.....	2,590 56	.....	.....	.....	413 70	.....	3,004 26
Traveling expenses.....	17 85	28 36	.....	1 97	14 03	.....	62 21
Contingent expenses.....	.....	7 00	.....	25 00	.....	13 50	45 50
Building and repairs.....	208 79	.....	9 97	1 15	26 11	.....	246 02
Totals.....	\$9,356 91	\$3,561 33	\$1,701 14	\$1,751 22	\$2,151 18	\$1,633 16	\$20,154 94

REPORT OF THE COUNCIL.

To the Board of Regents of the Kansas State Agricultural College:

GENTLEMEN — We present, to accompany the financial statements, the following account of the Station work for the fiscal year ending June 30, 1901, as a part of the annual report of the Station to the governor required by law.

The Staff.

A number of changes in the staff have taken place. Early in September, 1900, Doctor Fischer resigned his position as veterinarian, and went to Ohio State University as professor of veterinary science. Dr. Tait Butler succeeded him December 13, 1900. Professor Hitchcock, botanist of the Station, resigned March 1, 1901, to take the position of assistant agrostologist in the United States Department of Agriculture, and was succeeded by Prof. H. F. Roberts March 27. Among the assistants, Mr. P. J. Parrott resigned August 15, 1900, to accept a position in the New York State Experiment Station as assistant entomologist. He was succeeded November 1 by Mr. Jesse B. Norton. Mr. J. G. Haney, assistant in field and feeding experiments, resigned his position March 1, 1901, to become the agricultural agent of the Chihuahua & Pacific Railway Company. His successor had not been appointed at the close of the period covered by this report. Mr. R. W. Clothier, assistant chemist, has been elected professor of agriculture and chemistry in the Third District Normal School of Missouri, but remained to the end of the year. These numerous changes in the staff, with more to come in the near future, cannot for the time being be other than prejudicial, but they seem to be unavoidable, since all have been entirely voluntary, and have been to take more remunerative positions elsewhere.

Publications.

The publications of the Station during the past year consist of the Thirteenth Annual Report, Bulletins Nos. 99 to 103, Press Bulletins Nos. 71 to 92, and summaries of the weather observations each month from July to December. An outline of the report and the bulletins and a list of the press bulletins follows.

Annual Report.

THIRTEENTH ANNUAL REPORT, November, 1900, 3000 copies issued. This includes the financial statements required by law, and a report

by the Council upon the changes in organization, the publications for the fiscal year, the work of the departments, and the general condition of the Station. It also contains an index to the report and bulletins for the year, and a list of the publications of the Station to the end of the year.

Bulletins.

BULLETIN No. 99. October, 1900. All departments. 25,000 copies.

Press Bulletins Nos. 35 to 70 (pp. 1-56).—This bulletin consists of a reprint of the press bulletins issued between April, 1899, and June, 1900. These contain much original matter in a form to invite perusal, and are put in a bulletin that they may reach the entire mailing list. They cover many lines of observation at the Station.

BULLETIN No. 100. March, 1901. Farm Department. 25,000 copies.

Soy-beans in Kansas in 1900 (pp. 57-116).— Gives the experience of the Station with soy-beans during the year, and that of nearly 300 Kansas farmers, living in seventy-five counties, including a number of field experiments in soil inoculation with the tubercle-forming bacteria.

BULLETIN No. 101. January, 1901. Horticultural and Entomological Department. 25,000 copies.

Notes from the Plum Orchard (pp. 117-176, including 17 plates).— This bulletin gives observations upon a large number of varieties of European, Japanese and native plums. It is illustrated by numerous cuts and plates.

BULLETIN No. 102. March, 1901. Botanical Department. 25,000 copies.

Forage Plants for Kansas (pp. 179-252, including 16 plates).— This bulletin gives the observations made at the Station upon a large number of forage plants, suggestions as to culture, investigations of native pastures, and tables of composition of forage plants. It contains numerous cuts and plates.

BULLETIN No. 103. June, 1901. Chemical Department. 25,000 copies.

Digestion Experiments with Kansas Feeds (pp. 253-275); Sugar Beets, 1891-1900 (pp. 275-286).— Gives the results of digestion experiments with alfalfa hay in three stages of development, buffalo-grass hay, prairie hay, Kafir-corn stover, Kafir-corn meal, and soy-bean meal. Also a summary of the work of the Station during the last ten years in analysis of sugar beets, and details for 1900.

Press Bulletins.

No. 71, July 14, 1900. Farm Department. 3600 copies.

Experience in Soiling and Pasturing Cows, 1899.

No. 72. October 30, 1900. Farm Department. 3600 copies.

Fattening Steers without Hogs.

No. 73. November 6, 1900. Botanical Department. 3600 copies.

Cultivated Blue-grasses.

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- No. 74. November 13, 1900. Horticultural Department. 3600 copies
Some Interesting Climbers for the Veranda.
- No. 75. December 4, 1900. Botanical Department. 3600 copies.
The Races of Corn.
- No. 76. December 11, 1900. Chemical Department. 3600 copies.
Sugar Beets in Kansas, 1900.
- No. 77. December 18, 1900. Horticultural Department. 3600 copies.
Honeysuckles at the Kansas Station.
- No. 78. January 8, 1901. Botanical Department. 3600 copies.
Johnson Grass.
- No. 79. January 15, 1901. Chemical Department. 3600 copies.
Digestion Experiment with Buffalo-grass Hay.
- No. 80. January 29, 1901. Horticultural Department. 3600 copies.
Notes on Plums.
- No. 81. February 5, 1901. Farm Department. 17,000 copies.
Soy-beans in Kansas in 1900.
- No. 82. February 5, 1901. Farm Department. 22,000 copies.
Discing Alfalfa.
- No. 83. February 12, 1901. Botanical Department. 3600 copies.
Clovers.
- No. 84. March 1, 1901. Farm Department, 17,000 copies.
Tests of Soy-beans by Kansas Farmers in 1900.
- No. 85. March 5, 1901. Farm Department. 17,000 copies.
Roots for Kansas Farmers.
- No. 86. April 23, 1901. Farm Department. 3600 copies.
Kafir-corn vs. Good Butter.
- No. 87. May 20, 1901. Farm Department. 22,000 copies.
When to Cut Alfalfa.
- No. 88. May 21, 1901. Farm Department. 3600 copies.
Condimental Stock Foods for Dairy Cows.
- No. 89. May 28, 1901. Farm Department. 3600 copies.
Shelled Corn Compared with Corn Chop for Young Calves.
- No. 90. June 4, 1901. Farm Department. 3600 copies.
Dried Blood as a Tonic for Young Calves.
- No. 91. June 11, 1901. Entomological Department. 3600 copies.
The Clover-hay Worm.
- No. 92. June 25, 1901. Farm Department. 3600 copies.
Cow-peas as a Second Crop.

Work of the Departments.

FARM DEPARTMENT. *Feeding Experiments.*— One hundred head of calves were fed for beef, using various combinations of alfalfa and prairie hay, and corn, Kafir-corn, and soy-beans. In connection with the Chemical and Veterinary Departments, thirty head of calves were fed to test the value of condimental feeds in fattening. Tests of condimental feeds were also made with dairy cows. Other feeding experiments with dairy cows were as follows: Making high records with scrub cows; the effect of roots in obtaining a flow of milk; a comparison of alfalfa with soy-bean hay and with cow-pea hay; alfalfa and sorghum as soiling crops; the effect of Kafir-corn on the quality of butter. The following experiments in calf raising were made: A comparison of the results in raising calves on skim-milk and whole milk and by allowing to run with the dam; comparing corn chop with shelled corn as feed; observations on whey and on oats and Kafir-corn as calf feed; effect of feeding dried blood on calf scours.

Field Experiments.— The field experiments with soy-beans have been continued. One hundred acres were inoculated with soil containing the organisms producing root tubercles. Experiments were also made in inoculation by means of solutions. Tests of sixteen varieties for hay and grain were made, and observations made on the effect of soy-beans upon the succeeding crop. Cow-peas were tried as a catch-crop after wheat and oats, and twenty acres, planted by different methods, were grown for hay. Nine varieties were on trial. A test was made of the velvet bean. Experiments were made in thickening the stand of alfalfa, and to learn the effect of discing after each cutting. Spring planting and fall planting of *Bromus inermis* were compared, also pasturing this grass with alfalfa.

Dairy Experiments.— In the dairy, comparative tests of separators have been made. Observations have been made upon the effect of the churning temperature upon the moisture of butter, variations in quality of milk, and methods of testing cream.

BOTANICAL DEPARTMENT. The work outlined in the preceding annual report has been continued. The crosses of wheat made in 1900 were quite successful, and the resulting seed was planted the following fall. The land available on the College grounds has not proved well suited to the raising of wheat. For this reason, the Experiment Station rented five acres of land lying about one and one-half miles west of the College, to be used for the wheat experiments. The piece of ground adjoins a wheat field on one side, and furnishes favorable conditions for wheat growing. Seventy-eight crosses made in previous years are being grown, with some seventy-three varieties uncrossed

and available for future work. One hundred and thirty-five varieties of corn, most of them crosses, were planted this season, and will be available for crossing and for selection.

In the experimental plats, the plants which are subject to their attack suffered severely from chinch-bugs. In spite of our efforts, the plants on some of the plats were entirely destroyed. The most serious loss was that of the timothy received from Professor Hopkins, and mentioned in the last report.

In forage plants, the experimental plats are being extended, and the work of investigation is being taken up on an extended scale in collaboration with the division of agrostology on land in Harper county furnished by Mr. H. B. Waldron.

The experiment with the cultivation of some of our important native grasses has been quite successful in the case of the big bluestem (*Andropogon furcatus*) and prairie oats (*Bouteloua racemosa*). The seeds were gathered from the wild plants and sown in the spring. They were kept free from weeds, and, though starting rather slowly, made a vigorous growth during the season, and *Bouteloua* produced an abundance of seed. A smaller quantity of seed was produced by the *Andropogon*.

CHEMICAL DEPARTMENT. The analysis of sugar-beets produced from seed furnished by the United States Department of Agriculture and distributed by the Station has been continued. About ninety samples were analyzed, mostly produced in the eastern part of the state, in the Kansas river valley, in a systematic test of that region, by some of its citizens, in respect to its capacity for the production of rich sugar-beets. These analyses have been published in Bulletin No. 103. In connection with the seed-breeding experiments in charge of this and the Botanical Departments, the determinations of nitrogen in the corn samples produced in 1899 were completed, and those of the crop of 1900 analyzed, about 375 in all. With the hope of establishing some fixed connection between the specific gravity of corn grain and the nitrogen content, an extended investigation, involving a large number of determinations of the specific gravity of individual kernels of corn, and of nitrogen in the same kernels, has been conducted. No definite relation was found to exist, but there is a tendency to higher percentage of nitrogen, with lower specific gravity, in kernels taken from the same variety. The requests for chemical analyses of minerals, water, feeds, etc., by citizens of the state, increase in number year by year. Such work is not a part of the duty of the department, but when it seems that the public would be served, directly or even indirectly, the analyses have been made, if possible. Minor qualitative analyses are made even

when of only private interest. The growing interest of farmers in exact knowledge of the quality of the fertilizers and feeds they are using indicates that the time is at hand for the establishment by the state of a definite office for such work, or provision for it in connection with the Experiment Station.

HORTICULTURAL AND ENTOMOLOGICAL DEPARTMENT. In deciding upon the lines of work in this department, we have been guided by the subjects of most importance as indicated by the line of inquiry through correspondence and newspaper notice. Our people are little interested in experiments in garden physiology, or fertilizers, or forcing houses, and other topics so well occupied by workers in states farther east, while they are vitally interested in cultural methods, modes of pest control, and profitable varieties. Practically the whole correspondence of the department is upon topics here indicated, and accordingly the work of the department is outlined for us by the popular demand. The following outline indicates the chief lines of inquiry:

Horticulture.— Continuing the study of plums of native origin. Breeding of the native plums through selection, and through crossing of established and desirable varieties. The most important species brought under these lines of work are the creek plum, *Prunus domestica*, the sand plum, *Prunus watsoni*, and the so-called chalk cherry, *Prunus besseyi*. The recognized hybrid groups are also brought into this experiment. Enlarging of the variety tests of apples. A new orchard has been laid out, to consist mainly of certain varieties of established hardiness, to be used as stocks for top-grafting, in the hope thus to grow orchard trees of greater longevity than now resulting under the usual modes of propagation. Study of certain prevalent diseases of orchard and nursery trees, among others, especially the crown gall, becoming destructive in the nurseries of this state; the apple rust, and its relation to the widely spread red cedar; the defoliating leaf fungi of the plum and cherry; the leaf curl of the peach and "plum-pockets" of the species of *Prunus*. Methods of orchard and garden culture to offset climatal disadvantages. Of these, however, owing to the situation of our Station, little attention is paid to irrigation. An elaboration of the results of the observations of several years upon the trees and shrubs available for lawn and park decoration. A bulletin embodying this experience is well under way.

Entomology.— Associated studies of plum insects and cheap modes of protection. Varied continuation of the trials of poisons for the apple-worm, the canker-worm, and other prevalent pests of the apple orchard. Study of the aphids or plant-lice, especially those of garden

vegetables and field crops; of the latter, the wheat louse has received the most attention, especially with a view to determining its mode of life from one wheat season to another. Review of the entire hemipterous fauna of the state, to determine extent, composition, range and economic importance of the several species.

VETERINARY DEPARTMENT. Experiments were continued to test the efficacy of Detmers' virus in preventive inoculation for hog-cholera. Experiments were conducted with a view to improving the blackleg vaccine. These experiments are not yet completed, but indicate that a weaker, and consequently safer and more desirable, vaccine than that usually sent out still retains the power to confer a degree of immunity sufficient to meet practical requirements. Observations have been made upon the cultural features of the tetanus bacillus, and experiments have been conducted testing the value of different disinfectants on this organism.

GENERAL DEPARTMENT. The division of the executive duties of the Station has been the same as inaugurated last year, the chairman of the Council, as Secretary of the Board of Regents, certifying to the correctness of vouchers, the Secretary keeping the minutes, and all financial records, and the Director being in charge of the general business and correspondence of the Station, its mailing list, and the printing, binding and distribution of its publications.

The number on the mailing list has increased by over 4000 names the past year, and at its end numbered over 21,000. Names are added to the list with great caution, very few being put on except on the direct request of their owners. Many are handed to Station officers in attendance at farmers' institutes. The manner of handling the mailing list was described in some detail last year, and with slight modifications remains the same. It is kept as a card list, from which copy is made up for the printer, who linotypes it, putting names in alphabetical order under the proper post-offices. From the linotype list, thus kept constantly corrected, mailing sheets are printed as required, for use with a mailing-machine. This mailing is done in the printing department of the College, under the extremely efficient oversight of Superintendent Rickman, to whose interest and care in this matter we wish to testify.

General Statement.

The general condition of the Station and its appreciation by the people continue to be good. The numerous letters requesting advice in respect to topics touching every line of work represented in the Station, and some that are not, show that it has the confidence of the people. The unavoidable changes in the personnel, which have

been more numerous than usual the past year, have unquestionably caused temporary breaks in the work of the several departments.

One of the means by which the work of the Station has been brought to the favorable notice of the public has been through the farmers' institutes, which have been held in large numbers in nearly all parts of the state the past year. An appropriation was made by the legislature to cover the expenses of these institutes, but the chief draft for speakers has been upon the Experiment Station force. The Council believes that a limited attendance upon farmers' institutes is not only of benefit to the localities visited, but that the Station force, by coming in contact with the problems of the state by meeting its people, are able to do better work, and that in the future the demands of this important educational field should be met by an appropriation that will provide for an increase in the Station force.

Respectfully submitted.

E. R. NICHOLS.	E. A. POPENOE.
J. T. WILLARD.	TAIT BUTLER.
H. M. COTTRELL.	H. F. ROBERTS.