

Historical Document
Kansas Agricultural Experiment Station

NINTH ANNUAL REPORT

OF THE

EXPERIMENT STATION

AT THE

Kansas State Agricultural College.

FOR THE YEAR 1896.

MANHATTAN, KANSAS.

1897.



KANSAS STATE AGRICULTURAL COLLEGE.

BOARD OF REGENTS.

- Hon. S. J. STEWART (1899*), President, Humboldt, Allen county.
Hon. C. E. GOODYEAR (1897), Vice-President, Oatville, Sedgwick county.
Hon. C. B. DAUGHTERS (1898), Treasurer, Lincoln, Lincoln county.
Hon. C. R. NOE (1898), Loan Commissioner, Leon, Butler county.
Hon. C. B. HOFFMAN (1897), Enterprise, Dickinson county.
Hon. C. G. BULKLEY (1899), Scandia, Republic county.

Pres. GEO. T. FAIRCHILD, Secretary (ex officio).
I. D. GRAHAM, Manhattan, Assistant Secretary.

*Term expires.

STATION STAFF.

COUNCIL.

- GEO. T. FAIRCHILD, LL. D., Chairman, President of the College.
GEO. H. FAILYER, M. S., Professor of Chemistry.
E. A. POPENOE, A. M., Professor of Entomology and Zoology.
G. C. GEORGESON, M. S., Professor of Agriculture.
N. S. MAYO, D. V. S., M. S., Professor of Physiology and Veterinary Science.
A. S. HITCHCOCK, M. S., Professor of Botany.
S. C. MASON, M. S., Professor of Horticulture.
I. D. GRAHAM, A. M., Secretary.

ASSISTANTS.

Table listing assistants and their specialties: J. T. WILLARD, M. S. (Chemistry), FRED. A. MARLATT, B.S. (Entomology), F. C. BURTIS, M. S. (Agriculture), D. H. OTIS, B. S. (Agriculture), GEO. L. CLOTHIER, B. S. (Botany), F. C. SEARS, M. S. (Horticulture), ISAAC JONES, B. S., April 20 to October 31 (Irrigation).

Historical Document
Kansas Agricultural Experiment Station

KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN, KAS., January 31, 1897.

To his Excellency Governor J. W. Leedy:

DEAR SIR — I herewith transmit, as required by act of Congress approved March 7, 1887, the ninth annual report of the Experiment Station of the Kansas State Agricultural College, for the year 1896 including the financial statement to June 30, 1896.

Respectfully yours, GEO. T. FAIRCHILD,
Secretary Board of Regents.



EXPERIMENT STATION
OF THE
KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN.

NINTH ANNUAL REPORT—FOR THE YEAR 1896.
FINANCIAL STATEMENTS.

Report of the Treasurer.

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, 1895, and March 31, 1896:

Received from the treasurer of the United States	\$11,250 00
Received cash credits on vouchers	285 00
Total	\$11,535 00
Paid approved vouchers Nos. 1 to 189, including credits..	10,751 07
Balance paid to C. B. Daughters, Treasurer	\$783 93

C. B. HOFFMAN, *Treasurer.*

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

GENTLEMEN —Herewith please find a report of my expenditures and receipts on account of the Experiment Station, for the period between April 1 and June 30, 1896:

Received from C. B. Hoffman, ex-Treasurer.	\$783 93
Received from the treasurer of the United States	3,750 00
Received from cash sales of products	254 75
Total	\$4,788 68
Paid approved vouchers Nos. 190 to 319	4,788 68

C. B. DAUGHTERS, *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, 1896, 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 and Board of Regents:

Experiment Station, Kansas State Agricultural College, in account with the United States appropriation, 1895-'96:

DR.

To receipts from the treasurer of the United States as per appropriation for fiscal year ending June 30, 1896, as per act of Congress approved March 2, 1887 \$15,000 00

CR.

By salaries	\$10,069 97	
Labor	2,216 33	
Publications	1,428 83	
Postage and stationery	70 46	
Freight and express	126 16	
Chemical supplies	24 66	
Seeds, plants, and sundry supplies	303 96	
Feeding stuffs	198 53	
Library	112 24	
Tools, implements, and machinery	163 89	
Furniture and fixtures	6 25	
Scientific apparatus	67 54	
Live stock	44 00	
Traveling expenses	121 20	
Contingent expenses	15 75	
Building and repairs	30 23	
Totals	\$15,000 00	\$15,000 00

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, 1896; 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) C. E. GOODYEAR, }
 [SEAL.] C. B. HOFFMAN, } *Auditors.*
 C. G. BULKLEY, }

ATTEST: GEO. T. FAIRCHILD, *Custodian.*

Supplementary Statement.

DR.

To receipts from other sources than the United States for the year ending June 30, 1896:

Farm and garden products..... \$539 75

CR.

Labor	\$92 93	
Building and repairs, irrigation	446 82	
Totals	<u>\$539 75</u>	<u>\$539 75</u>

The accounts covering the Station fund are kept in a separate set of books, as provided in the act of Congress under which the Station was organized, and duplicate vouchers covering every item of expenditure made during the year are on file in the office of the Secretary.

See statement of expenditures by departments on next page.

All correspondence of this office concerning the issue of bulletins is on record. Nearly 7,000 copies of each bulletin have been distributed upon the revised lists of the year, 1,000 of each being retained for binding with the annual report, for future needs. The total number of copies of all publications distributed during the past year is over 60,000.

Respectfully submitted.

I. D. GRAHAM, *Secretary.*

EXPENDITURES BY DEPARTMENTS, 1895-'96.

	Farm.	Horticultural.	Chemical.	Botanical.	Veterinary.	Entomological.	Irrigation.	General.	Total.
By Salaries.....	\$2,599 99	\$983 33	\$1,500 00	\$1,171 67	\$780 00	\$1,599 98	\$555 00	\$880 00	\$10,069 97
Labor.....	866 55	785 07	93 44	188 75	34 44		346 01		2,309 26
Publications.....	469 65	137 69		708 84				112 65	1,428 83
Postage and stationery.....	19 63	14 15		8 07	2 42		1 00	25 19	70 46
Freight and express.....	6 52	22 82	9 78	4 10	6 70		71 36	4 88	126 16
Chemical supplies.....		2 43	3 45		18 78				24 66
Seeds, plants, and sundry supplies,	85 22	118 50	4 15	11 11	2 05		82 93		303 96
Feeding stuffs.....	132 74	7 75			53 04		5 00		198 53
Library.....		1 00		111 24					112 24
Tools, implements, and machinery,	71 53	8 35			2 00		82 01		163 89
Furniture and fixtures.....				4 50			1 75		6 25
Scientific apparatus.....			4 08	29 20	34 26				67 54
Live stock.....	40 00				4 00				44 00
Traveling expenses.....	8 70			31 36	9 11		51 73	20 30	121 20
Contingent expenses.....	5 75							10 00	15 75
Building and repairs.....	95	28 53						447 57	477 05
Totals.....	\$4,307 23	\$2,109 62	\$1,614 90	\$2,263 84	\$946 80	\$1,599 98	\$1,196 79	\$1,500 59	\$15,539 75

REPORT OF THE COUNCIL.

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

GENTLEMEN —We present, as required by law, the following outline of the Station work for the calendar year ending December 31, 1896, leaving all detailed statements for bulletins already issued or to be issued on completion of experiments already under way. The season has been fair for most crops, and the field experiments have yielded data for some valuable conclusions and more material for comparisons with past records.

Eight bulletins, covering 246 pages of condensed information, have been published, in an edition of 8,000 copies, over 6,000 of which have been distributed to the press and to the farmers of the state. The subjects treated are shown in the following

Outline of Bulletins.

BULLETIN No. 57. June, 1896. Botanical Department.

Third Report on Kansas Weeds —Descriptive List, with Distribution (pp. 1-64): Containing a key to the species of Kansas weeds, based upon easily recognizable characters; a descriptive list of 209 kinds of plants which are known to become troublesome, at least in some localities, together with scientific and common names of each, their abundance, habitat, and nativity; index to common names; 22 plates containing illustrations of each species described, each being numbered to correspond with preceding list; four plates illustrating the distribution of each species by counties.

BULLETIN No. 58. June, 1896; Veterinary Department.

Cornstalk Disease of Cattle (pp. 65-88): Containing discussion of various theories of cause of disease— corn smut, bacterial corn disease, and impaction; symptoms; outbreaks reported; field and laboratory investigations; prevention; plan of future investigations.

BULLETIN No. 59. August, 1896. Farm Department,

Experiments with Wheat (pp. 89-106): Containing the following: Wheat continuously without manure; early and late plowing for wheat; subsoiling vs. surface plowing; time of seeding; amount of seed per acre; methods of seeding; quality of seed; effects of pasturing; rotation; test of varieties.

BULLETIN No. 60. September, 1896. Farm Department.

Steer-feeding Experiment, series V (pp. 107-146): Giving the results of feeding 20 steers divided into four lots of five steers each, of which lot I was fed on a balanced ration, lot II on corn-meal, lot III on ear corn, and lot IV on ear corn in the open yard. The bulletin shows the amounts of these feeds eaten and

the gains made; also contains data as to the cost of steers, cost of feed, cost of gain, and the receipts from the sale.

BULLETIN No. 61. November, 1896. Farm Department.

I.—Kaffir-Corn, Corn- and Soy-bean Meal as Feed for Pigs (pp. 147-160): Twelve pigs were divided into four lots of three pigs each, these several lots being fed in varying rations on the feeds above named. The bulletin shows the amount of feed eaten and gain made.

II.—Kaffir-corn and Soy-bean Meal as Fattening Feeds for Aberdeen-Angus Heifers (pp. 161-168): This is in like manner a test of the value of these feeds for cattle.

BULLETIN No. 62. December, 1896. Botanical Department.

Corn Smut (pp. 169-212, pl. i-x): Containing a description of corn smut, the amount of damage to the corn crop, and many other field-notes; an account of the germination in water and in nutrient solutions; the artificial inoculation of corn with the smut; the development of the smut plant within the corn plant; a bibliography of the subject; an appendix upon the head smut of sorghum on corn; 10 plates illustrating the preceding.

BULLETIN No. 63. December, 1896. Farm Department.

Experiments with Oats (pp. 213-226): The following lines of work are reported upon: Oats on land fall plowed, spring plowed, and not plowed; time of seeding; effects of quality of seed; methods of seeding; different amounts of seed to the acre; test to ascertain the effect of changing soils on the percent of smut in oats; comparison of oats and barley; test of varieties.

BULLETIN No. 64. March, 1897. Farm Department.

Experiments with Corn (pp. 227-246): Detailing results of the following experiments: Time of planting; amount of cultivation; methods of culture; sub-soiling vs. surface plowing; butt, middle and tip kernels for seed; fall and spring plowing for corn; early, medium and late varieties; test of varieties.

Other Work.

CHEMICAL DEPARTMENT.— Experiments were begun with fertilizers, especially upon fruits and vegetables. Chili saltpeter, superphosphate and potash salts are used in the trials, either together or separately. Applications were made to a young vineyard which has not yet come into bearing, and also to rather old and unthrifty vines. The latter grow on a poor, washed slope, which may account for their composition. Plats of young strawberry plants were also put under experiment. The growth and fruiting of all these are to be carefully noted.

Attempts to improve corn and Kaffir-corn as food plants are also being made. The work now undertaken is an effort to permanently increase the nitrogen content of these grains. It has been planned to work upon the wheat plant in the same general way. It is fully realized that results of value must be reached in these cases only after a series of years, if at all. Even if these plants be susceptible of

variation in this respect, the methods adopted may not be the ones necessary to bring about the desired result. That maize and Kaffir corn would be more valuable crops if richer in protein, must be apparent to all.

Work on soil moisture and the influence of different methods of treatment to conserve moisture was carried on during the year. Some of this work was upon the Station grounds at the College, and a portion at the substation at Oakley, in connection with the irrigation experiments. The results of this work are nearly ready for publication.

ENTOMOLOGICAL DEPARTMENT.— The subjects of specific inquiry during the past year include the following: Experiment, toward the control of the lemon plant-louse. Protection of the peach-tree from borers by the use of repellents. Study of the canker-worm and associated caterpillars and the modes of protection from their attacks. Study of the insects destructive to alfalfa. The important insect enemies of the grape, especially those abundant by exception during 1896. Further studies of the higher insect pests of domestic animals, and a continuation of the work of last year in the collection of information toward a complete discussion of the insect pests of the apple, the plum, and of some common ornamental and timber trees of Kansas. In response to inquiries of correspondents, attention has been paid to numerous other injurious insects, the results of this work having been disposed of, in the main, by letter to those interested.

FARM DEPARTMENT.— The following experiments were in progress and will be reported upon in due time:

A series of experiments in Kaffir-corn, and tests of various grasses and forage-plants.

A steer-feeding experiment with a view to test the feeding value of Kaffir-corn is under way. Fifteen steers are divided into three lots of five steers each; one lot is fed on corn-meal, one on white Kaffir-corn meal, and one on red Kaffir-corn meal, and a record is made of the food eaten and gains made. Hogs are following each lot of steers, and a record is kept of their gains.

A series of experiments with wheat, of the same nature as the experiments reported in Bulletin No. 59, is also under way.

VETERINARY DEPARTMENT.— The investigation of many animal diseases is necessarily limited to outbreaks of the disease and opportunities for study offered. Observations and experiments are made on all important animal diseases whenever opportunity is offered, and recorded for future use, when experiments and observations can be continued and conclusions drawn.

Investigations have been made, but not published, because of in-

completeness, of the following diseases of live stock: Poisoning by wild parsnip, *Cicuta maculata*; cockle-bur, *Xanthium Canadense*; nightshade, *Solanum nigrum*; buckeye, *Esculus arguta*; and jimson weed, *Datura stramonium*. A study has also been made of an infectious inflammation of the eyes of cattle, known as "Texas itch"; of bovine tuberculosis, with the tuberculin test; and of the poisonous properties of cottonseed meal. Investigations of the relation between nitrate of potash in cornstalks and the cornstalk disease of cattle, and of the relation of wormy and moldy corn to enzootic cerebritis (or "staggers") in horses, have been continued.

BOTANICAL DEPARTMENT.—The observations upon weeds have been continued through the year. The notes upon fruits and seeds of weeds are nearly ready for publication. Considerable attention has also been given to the roots, or underground parts, of our perennial weeds and to their method of propagation.

HORTICULTURAL DEPARTMENT.—The work of testing the comparative merits of apple grafts with varied lengths of stock and cion has so far progressed that a bulletin covering the ground has been authorized, and will be issued in the near future. Tables of growth of trees up to three years old have been prepared, and a large number of photographs showing actual character of the root growth secured.

In the time of budding peach-trees and in methods of management much valuable information is on file, and still further experiments are in progress. The feasibility of June budding in this latitude seems to be clearly disproved.

A series of experiments to determine the rooting tendency of different species and varieties of grapes has progressed to a point where a bulletin is deemed advisable.

An extensive series of miscellaneous notes on behavior of varieties of fruits is assuming an importance that calls for publication at no distant day.

Some additional tests in regard to second-crop potatoes, notes on the various vegetables cultivated, and on irrigation in the garden are among the lines of work in progress.

The culture of lettuce under glass and the forcing of tomatoes give facts which will be of interest to the market-gardeners of the state, and sufficient material has been collected for a bulletin.

The observations on rate of growth and endurance of the trees in the forest plantations, and on the adaptability of a long list of shrubs to our conditions and climate, have been continued.

Irrigation.

GARDEN CITY.— The unfavorable conditions for experiment reported last year proved permanent, and after careful examination by the Board of Regents the lease was canceled in February, 1896, all movable property being returned to the College. In this effort the Council spent more than \$1,500 a year, with very meager results so far as definite information is concerned. The defective water-supply may be credited with the failure.

OBERLIN.— At this place a further attempt to secure a satisfactory supply of water was made early in the year. Under direction of Hon. W. D. Street, then a regent of the College, an excellent windmill was erected and some effort was made to enlarge the well to meet the power thus provided; but no adequate results were obtained. It seems right that the Regents should take the contemplated action of withdrawing from this lease also.

OAKLEY. —On April 4, 1896, the Board of Regents accepted from the state board of irrigation a lease of about 40 acres near the city of Oakley, upon which was a good well, with pump and reservoir complete, and a gasoline-engine and pump-house. The terms of the lease required the board of irrigation to furnish gasoline and keep all the machinery in repair, while the Station was to experiment at will upon the land, keeping a competent man in charge to run the engine and report regularly to the board of irrigation.

On April 20, Mr. Isaac Jones, B. S., was placed in charge, under direction of a committee of the Council, with President Fairchild as direct correspondent and authority to the assistant. About 20 acres of prairie sod were broken, all being well cultivated with a disk harrow, one-third being thoroughly subsoiled. All was planted for experiment in garden crops, potatoes for tests of soil moisture, and in Kafir-corn, soy-beans, alfalfa, and other farm crops, although little was expected from the first year in the way of results. At best only a beginning could be hoped for, with the expectation of continuing experiments in after years if the state should decree. Accidents of various kinds to the machinery and delays in supplying gasoline and repairs limited use of the pump to less than one-third of the time during the growing season, so that no experiments in full irrigation were possible, and the well itself filled at last. Most of the crops suffered, as always in such sod ground, from inroads of insects innumerable, but some vegetables and a little forage were secured. The only results worthy of record are those from potatoes planted for tests of soil moisture. These will be embodied in a bulletin upon moisture in the soil, soon to be issued by the chemical division of the Station.

In the fall, a test of varieties of winter wheat was planned with reference to adaptation to climatic conditions, with the hope that results might be secured, whoever should have the place. The lease expired December, 1896. Future experiments will depend upon the legislature of 1897.

The Staff.

Few changes have been made in the working force. In September, Mr. J. B. S. Norton, B. S., assistant in botany, tempted by better pay and opportunities, resigned his place, to accept the position of assistant in the botanical gardens of the Missouri School of Botany, at St. Louis. Mr. G. L. Clothier, B. S., who had worked here nearly two years, was at once appointed his successor. During the working season in irrigation Mr. Isaac Jones, B. S., was employed as assistant at Oakley. At the close of the year Mr. F. C. Sears, B. S., assistant in horticulture, asks leave of absence for study, and Mr. Jones will take his place.

General Interests.

The work of the Council has been chiefly confined to consideration of general plans for experiment submitted by the several departments and careful estimates of expenses at the beginning of each quarter. Bulletins prepared by the several departments have been authorized for publication as presented. The chairman of the Council has read revised proof of all publications, but each department has prepared the copy for the printers. The State Printing Company, of Topeka, has printed the bulletins, under contract made by the Board of Regents, The Secretary has attended to the general correspondence, referring to the several heads of departments matters of special concern. The accounts are kept as directed by the secretary of agriculture of the United States, being audited by the Board of Regents quarterly.

The work of the year 1897 will continue lines of experiment not yet complete, introducing several variations of experiment in feeding, culture, soil moisture, beet culture, etc., for more accurate knowledge of underlying facts. Observations will still be carried forward upon insects, weeds, plant and animal diseases, and fruit culture, with special tests of forcing in propagating houses.

Respectfully submitted.

GEO. T. FAIRCHILD.
GEO. H. FAILYER.
E. A. POPENOE.
C. C. GEORGESON
N. S. MAYO.
A. S. HITCHCOCK
S. C. MASON.

PREVIOUS PUBLICATIONS.

Bulletins.

- *No. 1, April, 1888, "Organization, Equipment and Aims."
- *No. 2, April, 1888, "Experience with Cultivated Grasses and Clovers."
- *No. 3, June, 1888, "Life History of two Orchard Pests."
- *No. 4, September, 1888, "Experiments with Wheat."
- *No. 5, December, 1888, "Sorghum, and Sorghum Blight."
- *No. 6, July, 1889, "Silos and Ensilage."
- No. 7, August, 1889, "Experiments with Wheat."
- No. 8, October, 1889, "Preliminary Report on Smut in Oats."
- *No. 9, December, 1889, "Experiment in Pig Feeding."
- No. 10, May, 1890, "Notes on Conifers for Kansas Planters."
- No. 11, July, 1880, "Experiments with Wheat."
- No. 12, August, 1880, "Preliminary Experiments with Fungicides for Stinking Smut of Wheat."
- *No. 13, August, 1890, "Experiments with Oats."
- *No. 14, December, 1890, "Winter Protection of Peach Trees, and Notes on Grapes."
- No. 15, December, 1880, "Additional Experiments and Observations on Oat Smut."

- No. 16, December, 1890, "Experiments with Sorghum and Sugar Beets."
- No. 17, December, 1890, "Crossed Varieties of Corn, Second and Third Years."
- No. 18, December, 1890, "Experiments with Forage Plants."
- No. 19, December, 1890, "Germination of Weeviled Peas." "Garden Notes on Potatoes, Beans, and Cabbage."
- No. 20, July, 1891, "Wheat."
- *No. 21, August, 1891, "Stinking Smut of Wheat."
- *No. 22, August, 1891, "Smut of Oats; Smut and Rust of Wheat."
- *No. 23, August, 1891, "Smut of Sorghum and Corn."
- *No. 24, September, 1891, "Staggers of Horses."
- *No. 25, December, 1891, "Sorghum for Sugar."
- *No. 26, December, 1891, "Varieties of the Strawberry."
- *No. 27, December, 1891, "Crossed Varieties of Corn."
- *No. 28, December, 1891, "The Experimental Vineyard."
- *No. 29, December, 1891, "Oats."
- *No. 30, December, 1891, "Corn."
- *No. 31, December, 1891, "Sugar Beets."
- *No. 32, December, 1891, "Feeding Stuffs, and the Development of Grain Crops" "Soy-beans."
- *No. 33, August, 1892, "Experiment with Wheat."
- *No. 34, September, 1892, "Experiments in Feeding Steers."
- *No. 35, December, 1892, "Actinomyces Bovis, or 'Lumpy Jaw' of Cattle." "Some Observations upon Loco."
- *No. 36, December, 1892, "Experiments with Sorghum and with Sugar Beets."
- No. 37, December, 1892, "Experiments in Potato Culture."

- No. 38, March, 1893, "Preliminary Report on Rusts of Grain. "
- No. 39, August, 1893, "Experiments in Feeding Steers, II. "
- No. 40, August, 1893, "Experiments in Wheat. "
- No. 41, December, 1893, "Effect of Fungicides upon the Germination of Corn. "
- No. 42, December, 1893, "Experiments with Oats. "
- No. 43, December, 1893, "Experiments with Sorghum and Sugar Beets. "
- No. 44, December, 1893, "Further Study of Native Grapes. "
- No. 45, December, 1893, "Experiments with Corn. "
- No. 46, May, 1894, "Rusts of Grain, II. "
- No. 47, August, 1894, "Experiments with Wheat." "Experiments in Feeding Steers, III. "
- No. 48, December, 1894, "Six Years' Experience with Ensilage. " "Some Forage Plants" "Renovating a Prairie Pasture."
- No. 49, May, 1895, "Cattle Poisoning by Potassium Nitrate." "Mastitis."
- No. 50, June, 1895, "Kansas Weeds, I.—Seedlings."
- No. 51, June, 1895, "Steer Feeding, IV.—A Comparison between Pure-bred Shorthorns and Scrubs. "
- No. 52, September, 1895, "Kansas Weeds —Preliminary Circular on Distribution."
- No. 53, October, 1895, "Pig-Feeding Experiments with Corn, Wheat, Kaffir-corn, and Cotton Seed. "
- No. 54, December, 1895, "Experiments with Oats. "
- No. 55, December, 1895, "Small Fruits by Irrigation." "Culture of Strawberries."
- No. 56, December, 1895, "Experiments with Corn." "Experiments with Kaffir-corn. "
- No. 57, June, 1896, "Kansas Weeds, III.—Descriptive List."
- No. 58, June, 1896, "Cornstalk Disease of Cattle."
- No. 59, August, 1896, "Experiments with Wheat."
- No. 60, September, 1896, "Steer-Feeding Experiments, Series V."
- No. 61, November, 1896, "Kaffir-corn, Corn- and Soy-bean Meal for Pigs. " "Kaffir-corn and Corn-meal for Cattle."
- No. 62, December, 1896, "Corn Smut."
- No. 63, December, 1896, "Experiments with Oats."
- No. 64, March, 1897, "Experiments with Corn. "

REPORT FOR 1888.*—CONTENTS.

Waste of Manure in Summering Manures in the Yard. Experiments in the Corn Field. Experiments with Wheat, including Bulletin No. 4. Forage Crops. The Milk and Butter Product as Influenced by Feeding. The Pressure of Ensilage on the Walls of the Silo. Relation of Rainfall to the Corn Crop. Shrinkage of Hay in the Mow. A Comparison of Varieties of Sorghum, including part of Bulletin No. 5. A Test of the Keeping Qualities of Sorghum. An Examination of Individual Stalks of Sorghum, with a View to Improving the Plant. A Trial of Fertilizers on Sorghum. A New Method of Milk Analysis for the Use of Dairymen. Spraying in the Apple Orchard. Observations upon Injurious Insects, including Bulletin No. 3. Trials of Varieties of Potatoes. Trials of Varieties of Peas. Trials of Varieties of Tomatoes. Sorghum Blight, including part of Bulletin No. 5. Hackberry Knot. Experiments in Fertilization of Varieties of Corn. Germination of Weed Seeds. The Fungous Parasites of Weeds.

*Out of print. (The annual reports for 1888 and 1889 contain the subject-matter of Bulletins Nos. 2 to 9, inclusive.)

REPORT FOR 1889.— CONTENTS.

Experiments with Corn, Wheat and Forage Crops, including Bulletin No. 7. Silos and Silage, including Bulletin No. 6. Pig-Feeding Experiment, including Bulletin No. 9. Pigs from Mature and Immature Parents. Work upon Sorghum. Analysis of Feeding Stuffs. Composition of Corn at Different Stages of Growth. Ammonia and Nitric Acid in Atmospheric Waters. Comparative Trials of Garden Beans, of Peas, of Potatoes, of Tomatoes. Some Insects Injurious to the Bean. Loose Smuts of Cereals, including Bulletin No. 8. Crossing Varieties of Corn, First Year. Receptivity of Corn Silk.

REPORT FOR 1890.*—CONTENTS.

Summary of Bulletins 10 to 19, with index, and outline of other work undertaken.

REPORT FOR 1891.— CONTENTS.

Summary of Bulletins 20 to 32, with index, and outline of other work undertaken.

REPORT FOR 1892.— CONTENTS.

Summary of Bulletins 33 to 37, with index, and outline of other work undertaken.

REPORT FOR 1893.— CONTENTS.

Summary of Bulletins 38 to 45, outline of other work, meteorological summary for 36 years, with index to bulletins and report.

REPORT FOR 1894.— CONTENTS.

Summary of Bulletins 46 to 48, outline of other work, including irrigation experiments, with index to bulletins and report.

REPORT FOR 1895.— CONTENTS.

Summary of Bulletins 49 to 56, outline of other work, with index to bulletins and report.

*Out of print.

SUMMARY OF INVENTORY—JUNE 30, 1896.

CHEMICAL DEPARTMENT.

Absorption apparatus.....	\$15 70
Beakers.....	9 50
Bell jars.....	3 50
Beet pulper.....	2 25
Beet press.....	6 40
Bellows and blower.....	11 00
Bottles:	
Copper oxide.....	1 80
Reagent.....	25 45
Salt mouth.....	46 30
Specific gravity.....	4 25
Weighing.....	4 80
Burners and clamps.....	31 30
Combustion tubes.....	9 80
Condensers.....	39 30
Crucibles, porcelain.....	8 75
Desiccators.....	6 00
Evaporating dishes:	
Porcelain.....	18 05
Glass.....	11 15
Agate ware.....	7 20
Nickel.....	2 25
Extraction apparatus.....	106 60
Filters and filter paper.....	16 20
Filter pumps.....	4 40
Flasks:	
Copper.....	10 50
Balloon.....	11 70
Erlenmeyer.....	11 50
Digestion.....	7 00
Filtering.....	3 95
Ordinary.....	12 00
Washing.....	3 30
Fodder mill.....	50 00
Funnels and funnel tubes.....	13 05
Gas generator.....	5 00
Gas regulators.....	6 25
Glass tubing and rods.....	4 50
Graduated apparatus:	
Burettes.....	16 45
Cylinders.....	6 55
Flasks.....	9 05

Dec. 1896]

Summary of Inventory.

xix

Graduated apparatus—*Concluded:*

Milk test tube.....	\$1 20
Nesslerizing jars.....	9 00
Pipettes.....	10 10
Tubes.....	5 40
Hydrometers and jars.....	6 75
Mortar, agate.....	12 00
Mortar, porcelain.....	2 40
Ovens, drying.....	40 00
Platinum ware.....	386 00
Rubber stoppers and tubing.....	18 40
Scale, Troemmer's solution.....	20 00
Sieves.....	7 80
Spatulas.....	1 70
Supports for apparatus.....	35 45
Thermometers.....	11 75
Tongs.....	1 60
Water baths.....	17 05
Watch glasses.....	3 05
Weights.....	11 20
Miscellaneous apparatus.....	65 40
Chemicals.....	55 15
Books.....	33 35
Office furniture.....	8 60
Total.....	<u>\$1,320 10</u>

ENTOMOLOGICAL DEPARTMENT.

Office furniture.....	\$233 82
Microscopes and accessories.....	553 40
Microscope supplies.....	30 02
Spraying apparatus.....	21 42
Apiary.....	29 70
Miscellaneous.....	17 10
Total.....	<u>\$885 46</u>

FARM DEPARTMENT.

Buildings:	
Dwelling.....	\$750 00
Piggery (interior).....	200 00
Silos.....	275 00
Seed and storerooms.....	135 00
Cattle sheds.....	75 00
Water system.....	120 00
Work horses.....	175 00
Crops in field.....	753 00
Machines and implements:	
Belle City root cutter.....	40 00
Wagon.....	70 00
Iron harrow.....	11 00
Mowing-machine.....	65 00
Surface cultivator.....	15 00
Planet, jr., cultivator.....	8 00

<i>Machines and implements—Concluded:</i>	
Tower's cultivator	\$20 00
Subsoil plow	45 00
15-horse-power boiler	300 00
Flue cleaner	35 00
J. I. Case lister	40 00
Test churn	45 00
Buckeye grain drill	18 00
Babcock milk tester	10 00
Planet, jr., seed drill	8 00
Corn-cutting machine	25 00
Hand-cart	9 00
Cultivator shield	2 00
Fanning-mill screen	17 00
Hay racks	20 00
Spades, shovels, hoes, etc.	27 50
Platform and counter scales	25 00
Test bottles, thermometers, lactometer	10 66
Buckets, baskets, and measures	17 80
Office furniture and books	187 15
Harness, halters, etc.	46 75
Drawers in seed room	20 00
Hay caps and weights	75 60
Feed boxes	7 75
Labels, plat stakes, etc.	70 40
Exhibition trays	5 81
Miscellaneous	147 59
Total	<u>\$3,881 32</u>

VETERINARY DEPARTMENT.

General office and laboratory furniture	\$364 30
Zinc-lined culture room	165 00
Zeiss microscope and accessories	394 75
Dissecting microscope and accessories	53 21
Stains	15 00
Slips, cover glasses, etc.	2 25
Sterilizing and incubating ovens	50 25
Flasks, beakers, bell jars, and damp chambers	26 62
Bottles, test tubes, etc.	8 00
Drugs and chemicals	24 00
Microtome and imbedding accessories	39 84
Hæmacytometer and stains	8 40
Balances and weights	17 00
Surgical instruments	31 05
<i>Post-mortem</i> case	42 00
Gas machine and burners	127 90
Books	41 58
Stalls and pens	77 77
Live stock	31 30
Miscellaneous	46 85
Total	<u>\$1,567 17</u>



BOTANICAL DEPARTMENT.

Office furniture and fixtures.....	\$110 25
Cases and shelves.....	9 45
Microscope and accessories, including 10 eyepieces and 10 objectives....	629 00
Other microscopical and microtomic apparatus.....	97 14
Bacteriological apparatus.....	116 70
Photographic apparatus.....	51 85
Drawing tools.....	27 55
Bell jars.....	117 40
Bottles, beakers, and other glassware.....	69 76
Spraying pumps.....	26 00
Pots and germinating pans.....	18 65
Hand thrashing-machine.....	11 85
Balances and weights.....	42 68
Fascicles of fungi.....	91 95
Chemicals and reagents.....	93 50
Library.....	1,055 02
Miscellaneous.....	152 00
Total.....	<u>\$2,720 75</u>

HORTICULTURAL DEPARTMENT.

Office building and three propagating pits.....	\$2,068 63
Office furniture and fixtures.....	77 27
Books.....	10 05
Drawing tools.....	5 25
Thermometers.....	37 42
Scales and balances.....	25 30
Vineyard herbarium.....	100 00
Exhibit of garden peas.....	100 00
Geneva germinating pans.....	32 00
Engravings and electros.....	51 59
Horse and hand tools:	
Wagon.....	60 00
Plows and cultivators.....	36 00
Hand and barrel cart, combined.....	7 80
Garden hand tools.....	9 20
Pruning tools.....	12 20
Miscellaneous tools.....	33 05
Spraying apparatus.....	75 85
Garden hose.....	45 00
Irrigation pipe lines and water meter.....	248 28
Supplies:	
Garden stakes.....	50 00
Storage boxes.....	26 25
Plant pots.....	50 00
Miscellaneous supplies.....	46 31
Nursery stock on hand.....	150 00
Total.....	<u>\$3,379 79</u>



GENERAL DEPARTMENT.

Card catalogue case, in library.....	\$17 00
Bulletin case and drawers, in Secretary's office.....	99 65
Autograph stamps.....	5 75
Pamphlet cases.....	18 48
Inkstand, rubber stamps, etc.....	2 55
Records and mailing lists.....	18 50
File boxes.....	6 05
General library, 241 bound volumes.....	271 25
Total.....	<u>\$439 23</u>

GENERAL SUMMARY.

Chemical department.....	\$1,315 30
Entomological department.....	885 46
Farm department.....	3,881 32
Veterinary department.....	1,567 17
Botanical department.....	2,720 75
Horticultural department.....	3,379 79
General department.....	439 23
Total.....	<u>\$14,189 02</u>

LIST OF DONATIONS —1896.

CHEMICAL DEPARTMENT.

German Kali Works, New York city:
Potassium sulphate, 300 pounds.
Kainit, 200 pounds.
Potassium chloride, 50 pounds.

FARM DEPARTMENT.

United States Department of Agriculture, Washington, D. C.:
Sample of Siberian millet.
Ten samples of grass seed.
Eleven samples of oats.
Ohio Agricultural Experiment Station, Wooster, Ohio:
Eight samples of oats.
Minnesota Agricultural Experiment Station, St. Anthony Park, Minn.:
Four samples of corn.
Agricultural College, Guelph, Ontario, Canada:
Five samples of wheat.
Michigan Agricultural Experiment Station, Agricultural College, Michigan:
Four samples of wheat.
William Farrer, Lambrigg, Queanbeyan, New South Wales, Australia:
Fourteen samples of cross-bred wheats.
John K. King, Coggeshall, Essex, England:
Ten samples of mangel seed.
Frederick Henley, Gridley, Coffey county, Kansas:
Two samples of corn.
S. M. Smith, Fort Worth, Tex.:
Sample of white Swiss corn.
C. W. Bush, Grandville, Ill.:
Sample of corn.

HORTICULTURAL DEPARTMENT.

W. Atlee Burpee, Philadelphia, Pa.:
Thirty-two packets vegetable seeds.
Twenty-nine packets flower seeds.
J. D. Garlock, Garden City, Kas.:
One packet vegetable seeds.
M. Booll, Northville, Mich.:
Seedling potatoes.
Richard Nott, Burlington, Vt.:
One packet vegetable seeds.
Division of Pomology, United States Department of Agriculture:
Persimmon cions, two varieties.
Apple cions, 36 varieties.
John K. King, Goggeshall, Essex, England:
Twenty-five packets vegetable seeds.

Congressional Seed Distribution:

Five packets vegetable seeds.

F. Richards, Freeport, N. Y.:

One set Richards's transplanting tools.

Peters & Skinner, Topeka:

Four thousand stubs and No. 2 apple seedlings.

One hundred Japan pear.

VETERINARY DEPARTMENT.

Bureau of Animal Industry, Department of Agriculture, Washington, D. C.:

Tuberculin.

BOTANICAL DEPARTMENT.

Donors to weed herbarium since publication of Bulletin No. 57:

D. M. Adams, Rome, Sumner county.

D. E. Ballard, Ballard's Falls; Washington county.

Allen Chaplin, Bitter Creek, Sumner county.

H. V. Dwyer, Asheville, Mitchell county.

George Hearn, Circleville, Jackson county.

L. Herrick, Newton, Harvey county.

John W. Hey, Monmouth, Crawford county.

Thomas Keen, Western Park, Elk county.

Prof. E. B. Knerr, Atchison, Atchison county.

James Lockhart, Tecumseh, Shawnee county.

J. W. G. McCormick, Griffin, Woodson county.

Will Mead, Marysville, Marshall county.

John F. Nagle, Belvue, Pottawatomie county.

H. T. Porter, Stafford, Stafford county.

Fayette A. Smith, Cuba, Republic county.

J. H. Walker, Grenola, Elk county.

P. H. Wimpey, Burlington, Coffey county.