

Historical Document
Kansas Agricultural Experiment Station

EXPERIMENT STATION

OF THE

KANSAS STATE

AGRICULTURAL COLLEGE,

MANHATTAN, KANSAS.

REPORT FOR 1891,

CONSISTING OF THE

FOURTH ANNUAL REPORT

AND

BULLETINS 20 TO 32.

TOPEKA.
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1892.



KANSAS STATE AGRICULTURAL COLLEGE.

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* Term expires.
† Resigned September 1, 1891; A. S. Hitchcock, M. Sc., appointed to take the chair January 1, 1892.
‡ Resigned May 1, 1891; M. A. Carleton, B. Sc., appointed January, 1892.
§ Resigned October 1, 1891; F. C. Burtis, B. Sc., appointed.

Historical Document
Kansas Agricultural Experiment Station

KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN, KAS., January 31, 1892.

To His Excellency, Governor L. U. HUMPHREY:

DEAR SIR—I herewith transmit, as required by act of Congress approved March 7, 1887, the fourth annual report of the Experiment Station of the Kansas Agricultural College, for the year 1891, including the financial statement to June 30, 1891.

Respectfully yours,

GEO. T. FAIRCHILD,
Secretary Board of Regents.



EXPERIMENT STATION
OF THE
KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN.

FOURTH ANNUAL REPORT—FOR THE YEAR 1891.

FINANCIAL STATEMENT.

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 fiscal year ending June 30, 1891:

Received from the Treasurer of the United States	\$15,000 00
Paid approved vouchers, Nos. 1 to 270	15,000 00

Respectfully submitted. JOHN E. HESSIN, *Treasurer.*

REPORT OF THE SECRETARY.

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

GENTLEMEN—Herewith is submitted the following statement of the financial affairs of the Experiment Station of the Kansas State Agricultural College, for the year ending June 30, 1891. 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. The accounts covering the Experiment 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.



DR.

To appropriation for the year ending June 30, 1890, under act of Congress approved March 2, 1887 \$15,000 00

CR.

June 30. By Salaries	\$10,280 12
Labor	2,364 31
Apparatus	420 67
Supplies	533 77
Printing	767 95
Stationery	18 30
Postage	13 40
Library	226 13
Live stock.....	10 00
Traveling	200 27
Freight	149 18
Water supply	15 00
Photographs	90
Total	<u>\$15,000 00</u>

Respectfully submitted, I. D. GRAHAM, *Secretary.*

REPORT OF THE FINANCE COMMITTEE.

We, the Finance Committee of the Board of Regents of the Kansas State Agricultural College, having duly examined vouchers Nos. 1 to 270, for \$15,000, received and expended on account of the Experiment Station during the fiscal year ending June 30, 1891, and having diligently compared the same with the books of the Secretary, hereby certify both books and vouchers to be correct.

Respectfully submitted,

R. W. FINLEY,
 JOSHUA WHEELER,
 A. P. FORSYTH,
Committee.

REPORT OF THE COUNCIL.

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

GENTLEMEN—We herewith present for publication the Fourth Annual Report of the Kansas Experiment Station, covering, in outline, the general work of the year 1891, and a statement of accounts to the close of the fiscal year ending June 30, 1891.

The work of the year has been more extensive in all directions than in any previous year, as the published results show. More than 4,000 different plats were under observation during the season, not counting some hundreds in beet culture at various points in the State. All the available land upon the College farm was under crops in some form of experiment, and nearly 30 acres outside was profitably cultivated in the same way.

The details of most of the experiments have already been published in a series of bulletins, paged consecutively, an index to which is appended to this report. These bulletins are numbered from 20 to 32, inclusive, in the full series since the organization of the Station.

OUTLINE OF BULLETINS.

BULLETIN No. 20. July, 1891. Farm Department.

Experiments with wheat [pp. 1-46]: This bulletin contains a full report of our experiments with wheat during 1891, including (1) Methods of seeding—as broadcasting, shoe drill with press wheels, shoe drill without press wheels, hoe drill, roller drill, and cross-drilled. (2) Effects of the character of the seed—comparing the value of light seed, heavy seed, and seed of common quality. (3) Effects of top dressing wheat with plaster, and of harrowing wheat in spring. (4) Single varieties *versus* a mixture of varieties of seed wheat. (5) Effects of pasturing wheat in fall and spring: plats compared with plats not pastured. (6) Wheat grown continuously on the same land without manure. (7) Rotation experiments with wheat, with plan of the rotations adopted. (8) A comparative test of 240 varieties, with description of their leading characters.

BULLETIN NO. 21. August, 1891. Botanical Department.

Second report on fungicides for stinking smut of wheat [pp. 47-72]: Including brief remarks on the Jensen hot-water treatment; a tabular arrangement of experiments in preventing smut with the following fungicides of various strength: Bordeaux mixture, eau celeste, copper sulphate, copper acetate, copper nitrate, copper chloride, mercuric chloride, potassium bichromate, Ward's seed manure, and hot water at various temperatures—in all, 93 plats, alternating with 94 untreated— together with the total number of heads, number of smutted heads, per cent. smutted, pounds of sound and smutted grain and straw, and the calculated yield per acre of same;

graphic comparisons of treated and untreated plats in the 15 meet successful treatments, of 27 in which the yield was increased by treatment, and of 18 showing the extra increase in yield beyond that which would result from replacing smutted heads by sound ones; an analysis of the tabulation; directions for applying the Jensen hot-water treatment; summary; and Plate I, with explanation.

BULLETIN No. 22. August, 1891. Botanical Department.

Smut of oats in 1891—test of fungicides to prevent loose smut of wheat—spraying to prevent wheat rust [pp. 73-93]: Including notes on the amount of smut in 1891, a tabular arrangement of experiments in preventing smut with potassium sulphide, calcium sulphide, and sulphur of various strengths; a general tabulation of oat-smut yield experiments and summary of same; tabulation of gain by treating seed, and graphic representation of extra increase in yield; tabulated notes on loose smut of wheat in 1891; a tabular arrangement of experiments for preventing loose smut of wheat by soaking seed in the following fungicides of various strengths: Copper sulphate, Bordeaux mixture, potassium bichromate, eau celeste, corrosive sublimate, copper nitrate, verdigris, copper chloride, Ward's seed manure, and hot water at various temperatures; 54 plats alternating with 55 untreated, the tabulation being nearly the same as in Bulletin No. 21; experiments to prevent wheat rust by spraying two varieties of spring wheat, six varieties of barley and one variety of oats with potassium sulphide, chloride of iron, Bordeaux mixture, and sulphur; notes on the appearance of rust, tabulated statement of effect of spraying on yield, and conclusions.

BULLETIN No. 23. August, 1891. Botanical Department.

Smut of sorghum—corn smut [pp. 95-105]: Giving notes and references on the grain and head smuts of sorghum, with preliminary tests for the purpose of infecting young plants in the green-house with both these; a tabulated arrangement of field experiments in preventing smut by treating infected seed with potassium sulphide, chloride of iron, and hot water, with conclusions; green-house and field experiments in infecting maize with corn smut; experiments in preventing corn smut by spraying with potassium sulphide, chloride of iron, and Bordeaux mixture; summary of bulletins, and plates II, III, IV, with explanation.

BULLETIN No. 24. September, 1891. Veterinary Department.

Enzoötic cerebritis [pp. 107-116]: Giving the results of an investigation of a disease of horses known as "staggers," or *Enzoötic cerebritis*, including an account of its prevalence, mortality, post-mortem examinations, causes, symptoms, treatment, and means of prevention; also accounts of other outbreaks of this or similar diseases that have been reported.

BULLETIN No. 25. December, 1891. Chemical Department.

Experiments with sugar sorghums during 1891 [pp. 117-125]: Varieties are compared. Of the many old and new varieties, including crosses, that have been tested in past years, only the superior ones are retained this year. The efforts to improve sorghum by seed selection and by the use of fertilizers have been continued. The results of all this are given in tables of analytical data.

BULLETIN No. 26. December, 1891. Department of Horticulture and Entomology.

Experiments with strawberries [pp. 127-138]: A comparison of varieties of the strawberry, giving the results of two seasons' trial of 71 sorts, the data being con-

densed into a descriptive list, important characters being further compared in a series of graphic tables.

BULLETIN No. 27. December, 1891. Botanical Department.

Crossed varieties of corn, third year [pp. 139-158]: Including a list of varieties crossed, followed by descriptions of ears obtained from seed of crosses grown the previous year, one variety of crossed corn the fourth year, miscellaneous experiments with corn, and practical conclusion.

BULLETIN No. 28. December, 1891. Department of Horticulture and Entomology.

Second report upon the experimental vineyard [pp. 159-168]: Continuing from Bulletin No. 14 the record of behavior of certain sorts, giving descriptive notes upon varieties first fruited in 1891, and discussing the season of ripening, the susceptibility to black rot, the keeping qualities and conditions affecting them, the methods and results of spraying with fungicides, and the cost and advantages of bagging the clusters to prevent injury.

BULLETIN No. 29. December, 1891. Farm Department.

Experiments with oats [pp. 169-180]: Including (1) Methods of seeding—broadcast and rolled, broadcast and not rolled, shoe drill with press wheels, shoe drill without press wheels, hoe drill with press wheels, hoe drill without press wheels, cross-drilling, roller drill, listing, covering with disc harrow, plowing under, drilling one-half and broadcast one-half of seed. (2) Grading oats for seed, the grades being light, common and heavy seed. (3) Varieties of oats for hay. (4) Preparation of land—fall plowed, spring plowed and not plowed land. (5) Single varieties compared with a mixture of the same varieties. (6) Seed oats harvested at different stages of maturity— as dough, hard dough, and ripe. (7) Quantity of oats to sow per acre, the amount of seed varying from one to four bushels per acre. (8) Time to harvest oats. (9) Salt as a fertilizer for oats. (10) oats treated with hot water to prevent smut. (11) Comparative test of 85 varieties.

Bulletin No. 30. December, 1891. Farm Department.

Experiment with corn [pp. 181-207]: A brief statement of the methods followed in the experiments on the farm, followed by details on the following 10 lines of experiments: (1) How often corn should be cultivated. (2) When to harvest corn for grain and fodder. (3) Large and small kernels for seed. (4) The effect of using butt, middle and tip kernels for seed. (5) The distance at which to plant corn for grain and fodder. (6) The distance at which to plant corn for ensilage. (7) Effect of removing the tassels from part of the corn crop. (8) Plaster and oil meal as fertilizers for corn. (9) Effect of treating seed corn with creosote for smut. (10) Comparative test of 140 varieties. Finally, a brief summary of the results reached in these experiments.

BULLETIN No. 31. December, 1891. Chemical Department.

Sugar beet trials [pp. 209-223]: Containing tabular statements of the analytical results, the distribution over the State of the trial plats, and the methods of culture. Eighteen plats of sugar beets were grown on the Station grounds from seed of good strains, and 360 farmers and gardeners of the State, in 56 counties, grew beets for us, the object being to learn how the State is adapted for sugar-beet culture.

BULLETIN No. 32. December, 1891. Chemical and Farm Departments.

On feeding stuffs and the development of grain crops [pp. 225-244]: Showing the composition of some common feeds, as well as of some less well known; also, the composition of Kaffir corn fodder and grain, of oats, and of wheat, cut at different stages of development. The results are given in tables.

Test of the soy bean (*Glycine hispida*) and *Phaseolus radiatus*, both imported from Japan, with comments on their probable value for this country; the use of plaster and oil meal as fertilizers on millet; the effect of plaster applied as a fertilizer on both tame grasses and prairie grass.

OTHER WORK UNDERTAKEN.

CHEMICAL DEPARTMENT.—Much of the work in this department, while continued from year to year, is, in a sense, completed each year, and the results published. But final conclusions in many cases, as in the improvement of varieties and the effects of fertilizers, must necessarily come after a period of years. The work not yet reported upon is in line with that of previous years, including the analysis of feeding stuffs and animal products, and determining the nitrogen of rain-waters.

HORTICULTURAL DEPARTMENT.—In addition to the work already reported upon, investigations were continued on the habits of insects of economic interest, and on the methods of their control; and extended observations upon the times of appearance, the food habits and the life-histories are recorded in the department note-books for use in future more complete reports. In the garden there were planted, for comparison, 55 varieties of the cucumber, 88 varieties of the cabbage, 112 varieties of the pea, 64 varieties of the bean, and 55 varieties of the tomato. For all these there were kept full series of notes, including the habit of the plant, its productiveness, its vigor, and, in fine, its value as compared with that of others. With the cucumber, the cultural experiments compared the effect upon production where some vines were allowed to ripen fruits, while on others all were kept cut to pickling size. With the tomato, the results of trellising and pruning were compared with those of unsupported vines not pruned. Of the potato, there were undertaken cultural experiments to determine the value of hilling compared with flat culture, a comparison of varieties, including 257 named sorts and 28 unnamed seedlings, and a continuation of the trial of second-crop seed. On account of dry weather in July and August, the results of the potato trials are inconclusive.

ORCHARD WORK.—An important beginning of a new experimental orchard was made by planting 410 trees, of 59 varieties of apple, after several methods of propagation; and of peaches, 93 trees, of 21 varieties. In the vineyard there were planted two vines each of 33 varieties of grapes not hitherto on trial. For the convenience of future reference, the varieties and style of trees and vines planted are given in the appended list:

APPLES.

VARIETY.	* Source.	Age, years.	NUMBER AND STYLE.		
			Graft.		Bud.
			Piece root.	Whole root.	
Arkansas Black	Stark	1	3	3	3
Babbitt	Stark	1	2	3	3
Ben Davis	Hort.	2	62	2	
Ben Davis	Stark	1	2		
Bononi	Cutter	2	2		
Bluemont (unpublished name)	Hort.	2	6		
Broadwell	Stark	1			3
Buckingham	Stark	1	3	3	3
Celestine	Stark	1	3	3	
Clayton	Stark	1	3	3	
Cooper's Early	Stark	1	2	2	
Cooper's Early	Cutter	2	2		
Crawford	Stark	1	6		3
Cullen's Keeper	Hanan	2	5		
Early Ripe	Stark	1	3	3	
Early Sweetheart	Stark	1			3
Edgar Red Streak	Stark	1	3	3	
Fallowwater	Cutter	2	3		
Fanny	Cutter	2	3		
Fink	Cutter	2	3		
Gano	Stark	1	4		2
Gano	Cutter	2	3		
Grimes' Golden	Cutter	2	3		
Grimes' Golden	Stark	1	2	2	
Haas	Cutter	2	3		
Huntsman's Favorite	Cutter	2	2		
Huntsman's Favorite	Stark	1	3	1	
Hubbardston	Stark	1	3	3	3
Isham Sweet	Cutter	2	3		
Isham Sweet	Stark	1	3	3	
Jonathan	Stark	1	2	2	
Jonathan	Cutter	2	2		
Kinnard's Choice	Stark	1	3	3	3
Lady Sweet	Stark	1	3	3	3
Lowell	Cutter	2	2		
Lowell	Stark	1			
Loy	Stark	1	3	3	3
McIntosh Red	Stark	1	3	3	
Mammoth Black Twig	Stark	1	3	3	3
Mann	Stark	1	3	3	
Mason's Orange	Cutter	2	3		
Milam	Stark	2	3		
Mother	Stark	1	3	3	3
Powaukee	Stark	1	3	3	
Pickard's Reserve	Stark	1	3	3	3
Rawle's Genet	Cutter	2	3		
Red Bletghelmer	Cutter	2	3		
Rome Beauty	Stark	1	4	2	
Salome	Cutter	2	3		3
Scarlet Cranberry	Stark	1	3	3	3
Shannon	Stark	1	3	3	
Smith's Cider	Cutter	2	2		
Smokehouse	Stark	1	3	3	
Stark	Stark	1	3	3	3
Stuart's Golden	Stark	1	3	3	3
Stump	Stark	1	3	3	
Tetofsky	Stark	2			3
Water Wonder	Stark	1	2	2	2
Wealthy	Stark	1	2	2	
Wine	Stark	1	3	3	
Winesap	Cutter	2	2		
Winesap	Stark	1	2	2	
White Winter Pearmain	Stark	1	2	2	
White Winter Pearmain	Cutter	2	2		
Wolf River	Cutter	2	3		
Yellow Transparent	Cutter	2	3		
York Imperial	Cutter	2	3		
York Imperial	Stark	2	2	2	

* Stark—Pike County Nurseries, Louisiana, Mo.
 Hort.—Horticultural Department, this Station.
 Cutter—William Cutter & Son, Junction City, Kas.
 Hanan—E. P. Hanan, Arlington, Kas.
 † Dormant bud.

PEACHES.

From T.V. Munson, Denison, Texas, five trees each of the following varieties:

Alexander.	Heath Cling.
Crawford's Early.	Oldmixon Free.
Family Favorite.	Ringgold.
Governor Briggs.	Also, 10 trees of Elberta.

From Stark Bros., Louisiana, Mo., the following, on plum stocks, three trees of each variety:

Bishop's Early.	Heath Cling.
Bonanza.	Lemon Cling.
Columbia.	Oldmixon Free.
Crawford's Early.	Salway.
Crawford's Late.	Stump the World.
Elberta.	Yellow St. John.
George IV.	

GRAPES.

Purchased from Geo. S. Josselyn, Fredonia, N. Y.:

Arnold's No. 1.	Hermann.
Arnold's No. 2.	Janesville.
Arnold's No. 16.	Nectar.
Berckmans.	Norwood.
Champion.	Rockwood.
Esther.	Victoria.
Geneva.	

From T.V. Munson, Denison, Texas, the following, bearing the names and numbers given by the originator:

Munson's No. 76, Admirable.	Munson's No. 111, Sweetey.
“ “ 82,	“ “ 122, Letoney.
“ “ 92, Van Deman.	“ “ 129, Carman.
“ “ 98, Blood.	“ “ 130, Hilgard.
“ “ 104, Isidor Bush.	Also, two 2-year vines of the Scuppernong.

From Messrs. Bush & Son & Meissner, Bushberg, Mo., two 2-year vines of each of the following:

Arnold's No. 5.	North Carolina.
Challenge.	Northern Muscadine.
Conqueror.	Uhland.
Israella.	Waverly.
Lutie.	Wilding.

FARM DEPARTMENT.—In addition to the many mentioned above, several experiments were tried during the year which have not been reported, either because not yet completed, or because it has been deemed best to supplement and extend the work at some future time. Thus, a steer-feeding experiment is now under way, the object of which is to determine the relative merits of stabling compared with open lots, of corn meal compared with whole corn, and the effect of a balanced ration. The results will be published in a bulletin when the experiment is completed.

Several varieties of mangels have been grown, with a view to ascertain which are the best yielders. Four varieties of flax, for fiber, were grown, the seed of which was furnished by the Department of Agriculture, at Washington. For lack of facilities in properly handling the crop, the fiber has not yet been cleaned. Nearly 150 varieties of foreign non-saccharine

sorghums, the seed of which had been imported from China, India, Africa, and elsewhere, and donated to the Station, were tried with indifferent success, most of them being too late to mature seed in this latitude.

An experiment on the distance to plant non-saccharine sorghum was undertaken; also, on the use of plaster and castor-bean pomace as fertilizers for sorghum. Several grasses and other forage plants were sown in trial plats, but did not make sufficient growth during the season to compare results.

VETERINARY DEPARTMENT.—Other work, undertaken or carried on by the Veterinary Department and not reported upon, is as follows:

Observations and experiments with actinomycosis, or “lump jaw” of cattle, to determine more of its nature, mode of contracting the disease, and treatment.

With the “corn-stalk disease,” experiments have been made to determine if the Burrill bacterial corn disease causes stalk disease in cattle.

Remedies for the cure of hog cholera have been tried in several outbreaks.

An outbreak of “mad itch,” or “hydrophobia,” so-called, in cattle, was visited, an investigation made, and treatment given. No further loss resulted.

The subject of the “loco” disease is also being investigated.

THE STAFF.

The organization of the Council has remained throughout the year what it was at the close of 1890, except that Prof. W. A. Kellerman, botanist, much to our regret, resigned September 1st, to take the chair of botany in the Ohio State University. His place remained vacant until the close of the year, when Prof. A. S. Hitchcock, M. Sc., a graduate of Iowa Agricultural College, and assistant in the Missouri School of Botany, entered upon duty as Professor of Botany in the College, becoming *ex-officio* member of the Council.

The staff of efficient assistants reported a year ago has met with several changes, Mr. W. T. Swingle, B. Sc., accepted, on May 1st, a call at double the salary here to the division of vegetable pathology in the United States Department of Agriculture. His place was supplied temporarily by the employment of Miss Emma A. Allen, B. Sc., who was almost immediately prostrated with quick consumption, terminating in death on June 23d. The work has been carried through the season by the aid of Mr. C. H. Thompson, a member of the third-year class, who, after Professor Kellerman's departure, prepared the matter for Bulletin No. 27. Mr. M. A. Carleton, B. Sc., a graduate of this College, in the class of '87, and since instructor in natural sciences at Garfield University, has accepted the place of assistant in botany for 1892. On October 1st, Mr. H. M. Cottrell retired from the position of assistant in agriculture, to accept a more lucrative place as superintendent

of Vice-President Morton's model dairy farm of 1,000 acres, at Rhinecliff, N. Y., and Mr. F. C. Burtis, B. Sc., who had been employed in the Station since his graduation in June, was appointed in his stead. Mr. J. T. Willard, assistant in chemistry, was promoted September 1st to the place of assistant professor of chemistry in the College, but still retains his duties as assistant in the Station staff.

EXECUTIVE MATTERS.

The meetings of the Council have been held at such times as seemed necessary to meet the needs of the Station. All lines of experiment have been submitted for approval, and all expenditures have been under estimates prepared by the Council for the quarterly meetings of the Board of Regents. The publication of bulletins has been as ordered by the Council. Those for 1890 were not all printed until late in the spring, so that the third annual report was not issued until the last of June.

Under direction of the Council, the Departments of Chemistry, Horticulture and Agriculture made a display of the products of their experiments at the State fair, in September, the College bearing the expenses of transportation, etc. The display, consisting of 20 varieties of sugar beets, 25 of sugar sorghums, 100 of grapes, 30 of cucumbers, 200 of potatoes, 40 of tomatoes, 240 of wheat, 100 of corn, 100 of forage plants and non-saccharine sorghums, with several other matters of importance, filled a building 28x56 feet, and attracted with interest the multitudes in attendance. Distinct labels showed the object of the exhibit.

The annual report and bulletins of the year have been issued in an edition of 7,000, which have been mailed at once, upon publication, to the 800 newspapers of the State and to the farmers who have sent in requests, about 5,000 in number. Several of the bulletins have been given wider circulation by simultaneous publication in the reports of the Secretary of the State Board of Agriculture, who has given such opportunity whenever possible. If the State could provide for such publication, as some States have done, the results of the Station work might be more widely disseminated. As it is, the importance of these bulletins has been generally recognized, and the press of this and other States has given them due commendation. We may hope during the coming year to make such information more attractive to the newspapers, through special summaries concerning matter prepared for the Columbian Exposition, in which this Station has been given a prominent part, through the placing of Prof. E. A. Popenoe in charge of the general exhibit in horticulture from all the Stations.

The several departments have carried on extensive correspondence with individuals throughout the State concerning matters of experiment, or of interest in any line of agriculture, and members of the Council are glad to receive such communications at all times. These are received by the several heads of departments, or the Secretary, who refers them to the proper authorities upon the subjects in question.

The work planned for 1892 is a continuation of previous tests, with such additions as the season and facilities permit. The Station was never so well equipped for all lines of investigation as now, and never had fuller or more definite plans.

Appended are acknowledgments of donations, and a list of previous publications of the Station.

Respectfully submitted,

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

ACKNOWLEDGMENT OF DONATIONS.
1891.

CHEMICAL DEPARTMENT.

- From the Chemical Division, United States Department of Agriculture:
About 50 pounds of Imported Sugar-Beet Seed, three varieties.
Two dozen selected Sorghum-Seed Heads.
- From Ephraim Link, Tennessee:
One packet of Sorghum Seed.

HORTICULTURAL DEPARTMENT.

- From Francis Brill, Hempstead, L. I.:
American Erfurt Cauliflower, one packet.
- From A. D. Perry & Co.:
One variety each of Pea, Bean, Corn, and Lettuce,
- From United States Department of Agriculture:
Chinese Potato Bulblets, three packets.
- From Christian Wekesser, Niagara Falls, N. Y.:
Bean and Sunflower, one packet each.
- From W. Atlee Burpee & Co., Philadelphia, Pa.:
Dwarf Lima Bean, one packet.
- From Joseph Harris Seed Co., Rochester, N. Y.:
Tomato, one packet.
- From Isaac F. Tillinghast, La Plume, Pa.:
Sweet Corn and Beet, one packet each.
- From James Vick, Rochester, N. Y.:
Cabbage, Celery, Cucumber, Lettuce, one packet each.
- From Joel Horner & Son, Delair, N. J.:
Muskmelon and Tomato, one packet each,
- From B. P. Hanan, Arlington, Reno county, Kas.:
Four trees Cullen's Keeper Apples.
Twenty plants of Cowley County Raspberry.
- From H. E. Van Deman, U.S. Department of Agriculture, Division of Pomology:
Scions of Pear and Apple, 15 varieties.
- From Wm. Henry Maul, Philadelphia, Pa.:
Potatoes.
- From William Band, Vesper, Lincoln county, Kas.:
Potatoes, unnamed seedling.
- From B. E. Fernow, U.S. Department of Agriculture, Division of Forestry:
Forest-Tree Seeds, of six species.
Forest-Tree Seeds, of 11 varieties.

-
- From Geo. S. Josselyn, Fredonia, N. Y.:
Plants of Red Jacket and Triumph Gooseberry.
FARM DEPARTMENT.
- From Prof. A. Batalin, Director Botanic Gardens, St. Petersburg, Russia:
Five varieties of Russian Millet Seed.
- From Steele Bros. Co., Toronto, Ontario:
Sample of Campbell's White Chaff Spring Wheat.
- From Marsh Oil Co., Kansas City, Mo.:
Castor Bean Pomace, 1,600 pounds.
- From F. C. Clotton, London, Eng.:
Package seed of *Lathyrus silvestris*.
- From United States Grass Station, Garden City, Kas.:
Nine varieties of Grass Seed.
- From Director Tracy, Agricultural Experiment Station, Miss.:
Grass Seeds.
- From United States Department of Agriculture:
Four varieties of Flax Seed.
Package of Link's Pedigree Corn.
- From Gale Manufacturing Co., Albion, Mich.:
Daisy Spring-Tooth Cultivator.
- From Gov. G. W. Glick:
Package of Millet Seed.
- From North Dakota Experiment Station:
Samples of Corn.
- From A. A. Denton, Sterling, Kas.:
Samples of Seed of Non-Saccharine Sorghum.
VETERINARY DEPARTMENT.
- From Dewey Bros., Manhattan, Kas.:
Two steers affected with actinomycosis.
- From Mr. Greeley, Manhattan, Kas.:
One steer affected with actinomycosis.

PUBLICATIONS PREVIOUS TO 1891.

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, 1890, "Experiments with Wheat."
No. 12, August, 1890, "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, 1890, "Additional Experiments and Observations on Oat Smut made in 1890."
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."

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 Fungus Parasites of Weeds.

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.
Analyses 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.