

**Historical Document**  
Kansas Agricultural Experiment Station

**EXPERIMENT STATION**

*OF THE*

**KANSAS STATE**

**AGRICULTURAL COLLEGE,**

**MANHATTAN, KANSAS.**

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**REPORT FOR 1890,**

**CONSISTING OF THE**

**THIRD ANNUAL REPORT**

**AND**

**BULLETINS 10-19.**

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**TOPEKA.**  
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KANSAS STATE AGRICULTURAL COLLEGE.

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**Historical Document**  
Kansas Agricultural Experiment Station

KANSAS STATE AGRICULTURAL COLLEGE,  
MANHATTAN, KAS., January 31, 1891.

*To his Excellency Governor L. U. HUMPHREY :*

DEAR SIR- I herewith transmit, as required by act of Congress approved March 7th, 1887, the third annual report of the Experiment Station of the Kansas Agricultural College, for the year 1890, including the financial statement to June 30, 1890.

Respectfully yours,

GEO. T. FAIRCHILD,  
*Secretary Board of Regents.*



EXPERIMENT STATION  
OF THE  
KANSAS STATE AGRICULTURAL COLLEGE,  
MANHATTAN.

THIRD ANNUAL REPORT—FOR THE YEAR 1890.

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, 1890:

Received from the Treasurer of the United States . . . . . \$15,000  
Paid approved vouchers, Nos. 1 to 369 . . . . . 15,000

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, 1890. 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 organ-



ized, 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

C.R.

June 30. By Salaries . . . . .	\$9,719 22
Labor . . . . .	1,666 32
Apparatus. . . . .	449 15
Supplies . . . . .	652 18
Printing. . . . .	2,064 80
Stationery . . . . .	16 13
Postage . . . . .	37 20
Library . . . . .	141 80
Telegraphing . . . . .	60
Traveling . . . . .	7 05
Freight . . . . .	206 97
Drayage . . . . .	12 55
Photographs . . . . .	16 05
Membership, Ass'n Agr'l Exp't Stat'ns . . . . .	10 00
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 360, for \$15,000 received and expended on account of the Experiment Station during the fiscal year ending June 30, 1890, and having diligently compared the same with the books of the Secretary, hereby certify both books and vouchers to be correct.

Respectfully submitted.

MORGAN CARAWAY,  
R. W. FINLEY,  
A. P. FORSYTH,  
*Committee.*

## REPORT OF THE COUNCIL.

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

GENTLEMEN—We herewith present for publication the Third Annual Report of the Kansas Experiment Station, covering in outline the general work of the year 1890, and a statement of accounts to the close of the fiscal year ending June 30, 1890.

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 10 to 19 inclusive in the full series since the organization of the Station.

### OUTLINE OF BULLETINS.

#### BULLETIN No. 10. May, 1890. Department of Horticulture.

*Notes on conifers for Kansas planters:* Describing species and varieties of coniferous trees that have been grown with more or less success on the College grounds, and giving the experience of many years in the methods and times of planting and pruning, to which is added a list of sorts unsuccessfully planted.

#### BULLETIN No. 11. July, 1890. Farm Department.

*Experiment with wheat, giving the results:* (1) Of growing wheat continuously on the same ground without manure or any other renovating treatment of the land, save good culture. 1890 completes the 10th year. The average yield for that time is 22.37 bushels per acre, and the yield in 1890 was 22.90 bushels. (2) The result of listing wheat as compared with drilling. This experiment showed an increase of five and one-half bushels per acre by listing instead of drilling. (3) Rotation of wheat with other crops on five distinct systems of cropping. (4) Test of 19 varieties grown on experimental plats, with a view to ascertain what kinds are best suited to Kansas. All but one of these were also grown in 1889. The Currell gave the best yield both years, the average being 38.36 bushels per acre for the two years.

#### BULLETIN No. 12. August, 1890. Botanical Department.

*Preliminary experiments with fungicides for stinking smut of wheat:* Including a general account of stinking smut, of the fungus causing the disease, a tabulation of the details of experiments with the following fungicides: Lye, hot water, copper sulphate, Bordeaux mixture, eau celeste, sodium hyposulphite, potassium sulphide, arsenic, lime, salt, Castile soap, chloroform, sulphurous oxide, carbon bisulphide, ether, ammonium hydrate, carbolic acid, sodium bicarbonate, sal-soda, potassium bichromate, corrosive sublimate, salicylic acid, and sodium sulphate, followed by notes on the treatments, remarks on the more important results, graphic representations of the per cent. of smut in the 15 most successful treatments compared

with the untreated plats, and of the yield of 11 of the most successful treatments compared with that of untreated plats, and directions for carrying out the recommended Jensen hot-water treatment.

BULLETIN No. 13. August, 1890. Farm Department.

*Experiment with oats:* Including (1) Methods of seeding — as listing, drilling, broadcasting, covering seed with cultivator, and covering with plow. (2) Character of the seed — comparing the value of light seed, heavy seed, and seed of common quality as it came from the thresher, showing how it pays to grade seed oats. The heavy seed yielded six bushels per acre more than the common seed. (3) single varieties *versus* a mixture of varieties. (4) Oats grown in rows and cultivated, as compared with the ordinary method of culture. (5) Harvesting oats at different stages of ripeness, and proving that the crop ought to mature fully for the best yield of grain. (6) Oats as a hay crop. (7) The results of a comparative test of 85 varieties. The latter series proved the high merits of certain varieties, and the almost total worthlessness of others for this region of the State, the yield ranging all the way from 50 bushels per acre down to less than 5 bushels.

BULLETIN No. 14. December, 1890. Department of Horticulture.

*Winter protection of peach trees, and notes on grapes:* Showing the method of laying down and covering the peach trees to protect the fruit buds from the usually fatal cold of the Kansas winter; and briefly describing the varieties of grapes fruited in the Station vineyard, with notes on their behavior as to productiveness, hardiness, and keeping qualities.

BULLETIN No. 15. December, 1890. Botanical Department.

*Additional experiments and observations on oat smut made in 1890:* Including a brief statement of the life-history of the fungous parasite causing the disease, statement of percentage amount of smut in 1890, account of "hidden" smut, tabular arrangement of experiments in preventing smut with the following fungicides: Potassium sulphide, potassium bichromate, potassium sulphate, copper nitrate, copper sulphate, ammonium hydrate, soda, sodium sulphate, sodium byposulphite, lime water, ether, chloroform, salicylic acid, carbon bisulphide, corrosive sublimate, and water at temperature of 49° C. to 62° C., immersion from 3 to 20 minutes, grain sometimes previously soaked 3 to 8 hours; arrangement of treatments in groups according to efficacy, graphic representation of best yields of treated plats, increase of yield in treated plats above the amount that would be obtained by simply replacing smutted heads by sound ones, amount of damage from smut, and directions for treating the seed with hot water and with potassium sulphide, and plate II, with explanations.

BULLETIN No. 16. December, 1890. Chemical Department.

*Giving the results of the experiments with sorghum and with sugar beets for the year 1890:* The work on sorghum comes under four principal heads: (a) A comparison of well-known varieties. This is the third year these have been grown for this purpose. The analytical results are tabulated. (b) An investigation of the quality of many new kinds of sorghum grown from recently imported seed. (c) Efforts to improve sorghum by seed selection. (d) A study of the effects of fertilizers upon the sugar content of sorghum. Nine varieties of sugar beets were grown from imported seed and the analytical results are tabulated in the bulletin. Methods of analysis and some study of climatic conditions and effects also find a place in the bulletin.

BULLETIN No. 17. December, 1890. Botanical Department.

*Crossed varieties of corn, second and third years:* Including summary statement as to similar work of 1888 and 1889, list of varieties used, record of second-year "crosses" planted, with summary and tabular statement as to visible evidences of cross recorded, crossing to improve varieties, description of the sixty-two ears obtained, followed by the record of crossed corn in 1890, list of the second-year crossed corn planted, descriptions of the ears obtained, practical summary, one plate, and explanation of the same.

BULLETIN No. 18. December, 1890. Farm Department.

*Experiments with forage plants:* Giving results of the yield of a large number of forage plants, with a view to learn what may be profitably grown in this section of the country; and descriptions are given of the character and habit of growth of plants that are not already well known here. Some of the leading points about which information is given are: (1) The value of a large number of non-saccharine sorghums as producers of grain and fodder. (2) A comparison of several kinds of millet. (3) The yield and value of Soy beans. Some of these were imported direct from Japan, and the early-ripening varieties promise to take a high rank here. (4) Tests of teosinte and of pearl millet as producers of fodder. (5) Tests of Thousand-headed kale, vetches, and lupines. (6) The culture and value of stock melons. (7) The culture of corn and sorghum grown singly and as a mixed crop. (8) A comparative test of 14 varieties of corn for ensilage.

BULLETIN No. 19. December, 1890. Department of Horticulture and Entomology.

*Germination weeviled peas — garden notes on potatoes, beans, and cabbage:* Giving the results of extended tests, both in the propagating-house and in the field, of the germinating power of peas injured by the pea weevil, with references to the more important previous views on the subject; of trials to test the amount and quality of product of potato seed from first- with that from second-crop planting of the previous season; of a comparison of varieties of beans, with descriptions and notes on a number of Japanese sorts; and of a comparison of varieties of cabbage, as to earliness and quantity of marketable product.

OTHER WORK UNDERTAKEN.

The Chemical Department has had under way other lines of work than that already reported. Some of this work is practically completed, while other portions are yet in progress. The whole will be published in bulletin form at an early date. The following statement will give some idea of the character of the main portion of this unpublished work:

Several of our common feeding stuffs, such as prairie hay, shorts, bran, shipstuff, millet hay and oil meal, have been analyzed. The composition of the less-common cattle foods—sweet potatoes, artichokes, stock melons, sugar beets, beet leaves, Kaffir corn fodder and grain—have been determined. The composition of Kaffir corn at different stages of growth has been studied, by making analyses of both fodder and grain, cut at different periods of development. The composition of milk, as affected by rations of certain common as well as less-common cattle foods, is now receiving attention.

In the Horticultural Department, besides matter already reported on, there were planned the following experiments:

Variety-tests of 92 sorts of lettuce; of 84 sorts of radishes; of 49 sorts of celery; of 112 sorts of peas; of 34 sorts of cauliflower; of 101 sorts of tomatoes, and of 317 sorts of potatoes.

Of potatoes, there were planted 104 lots in duplicate, to compare the product of seed from early and later plantings of last year; 27 lots in nine varieties, each in triplicate, one lot from early-grown seed, the second from seed of the main crop, the third from seed of the second crop of lot I, the purpose a test of second-crop seed as against that of the first or of the main crop; 84 lots in duplicate, to test the value of mulching compared with clean culture; 100 lots in duplicate, to compare the product of single-eye pieces with three-eye pieces for seed; 6 lots of three varieties in duplicate, to test single-eye seed as compared with whole tubers.

With the exception of those reported in Bulletin No. 19, pp. 196, 197, these trials resulted so unsatisfactorily, through the partial or complete failure of growth in the drouth of summer, that their data are of no value in forming conclusions.

A considerable number of sorts of apples, plums and cherries not previously on trial here, were added to the lists by purchase from the Iowa State Agricultural College, and will be grown in the Station orchards for future report.

The life-histories of many injurious insects were studied, and drawings and descriptions of their stages made for future use in their proper connection.

A partial trial was made of the value of spraying with the arsenites as a protection against the plum curculio, and a further trial of the same insecticides in the apple orchard as a protection against the codlin moth, the latter resulting in a confirmation of previous conclusions as given in the first report of this Station, and the former mainly as a suggestion for further trials.

Besides the work published in Bulletins 12, 15, and 17, the Botanical Department has attempted or carried on other work as follows:

Observations have been recorded in regard to many parasitic fungi infesting cultivated or native plants, their extent and ravages, and in some cases means of checking have received attention, with a view of publishing the results in future bulletins.

An experiment was attempted with a view of determining whether the smut of corn enters the plant during germination. The trial proved abortive by reason of the early and total destruction of the crop by drouth and chinch-bugs. The experiment will be repeated next season.

Near the end of the year a preliminary trial in the green-house was begun with smut of sorghum. The object of the trial is to determine if possible whether the infection takes place through the seed. The experiment will be completed early next year.

Aside from the work indicated in the bulletins already published, the

Farm Department also experimented with corn, grasses, and miscellaneous crops, which, owing to the excessive drouth, proved partial or complete failures. The following brief synopsis may here be given:

A trial of grasses and forage plants not in common use, embracing 38 genera and 58 species, was made, but, owing to dry weather immediately after seeding, the young plants were killed as they appeared, or germination was prevented.

With corn, the following experiments were carried through: (1) Surface planting *vs.* different methods of seeding, embracing surface planting, shallow, ordinary, deep and double listing (the latter meaning that the ridges formed by the first listing are split by a second listing), listing with much loose earth in the furrow, listing two days before planting; (2) harvesting corn for grain and fodder, at different stages of maturity; (3) effect of suckering and tasseling corn; (4) planting corn in hills and drills; (5) effect of planting large and small kernels and kernels from broken-rowed ears; (6) effect of planting butt, middle and tip kernels; (7) effect of seed from ears with different number of rows; (8) effect of various methods of treating seed, embracing heating to about 150° F. and then cooling gradually, soaking in tepid water for 18 hours just before planting, smoking six days continuously in smoke-house along with meat, compared with seed not treated; (9) effect of planting early, medium and late varieties at different dates; (10) effect of methods of cultivating corn (as regards depth of stirring soil, giving respectively level, surface, and deep culture); (11) effect of frequent cultivation; (12) test of 141 varieties; (13) distance of planting corn (distance from two to four feet between rows, and stalks four to twenty inches apart); (14) co-operative corn experiments (comparing corn from Northern, Middle and Southern States, in conjunction with other experiment stations); and (15) corn as a second crop.

Buckwheat was subjected to experiment twice—as a spring and as a fall crop. The frost injured the first and the drouth the second crop.

Sorghum for ensilage: Twenty-five saccharine varieties were grown successfully, but they were killed by frosts September 12th.

Mangel-wurzels and sugar beets: Sixteen varieties were planted in April and a second time in May; no stand was obtained.

Several feeding experiments, which have been instituted during the year, will be reported in bulletins as soon as the subject-matter can be made ready for publication.

The work done in the Veterinary Department, none of which has been reported upon in bulletins, is as follows:

Soon after assuming the duties of the Station, in November, investigations were called for and made of an outbreak of "hog cholera" in Wabaunsee county. As the outbreak subsided before the experiments were completed, the results will be published as soon as opportunity offers to finish them.

Investigations of actinomycosis or "lump-jaw" of cattle and the so-called

“stalk disease” of cattle are being carried on, and results will be given when completed.

Experiments were conducted to determine the cause and nature of a peculiar disease of horses commonly called “mad staggers,” and a bulletin on this disease is in preparation.

Investigation was made of tuberculosis of cattle at Emporia, with which were associated peculiar glandular symptoms.

Many isolated cases of various diseases were investigated, specimens examined, and advice given, as far as circumstances would permit.

The several departments have frequently and cheerfully responded to requests of farmers, gardeners, and stockmen of the State for information upon matters of interest to them individually or to their communities.

The second annual report (1889), a volume of 370 pages, 5,000 copies, was issued from the press of the Kansas Publishing House in June. The bulletins, with one exception, have been printed by the same house, all in admirable shape. These have been sent, as soon as printed, to the 800 newspapers of the State, and to over 5,000 farmers upon request. Several of the bulletins have been published simultaneously in the report of the Secretary of the Board of Agriculture for wider circulation. All have been received with interest by the press of this and other States, and some have received high commendation. We have good reason to be pleased with the general interest attracted.

The organization of the Council has remained as outlined at the beginning of the year, except that N. S. Mayo, M.S., D.V.S., a graduate of the Michigan State Agricultural College and of the Chicago Veterinary College, entered upon duty as Instructor in Physiology and Veterinary Science for the College November 1st, and became *ex-officio* Veterinarian for the Station. The staff of assistants has remained without change, all having given efficient service and shown an earnest interest in the work. It is probable that more important and remunerative work elsewhere in the same line may draw away some of these before many months. We shall be sorry to lose any of them.

The Council has given full consideration to the lines of experiment undertaken in the several departments, and to all estimates prepared for the quarterly meetings of the Board; but the established routine in each department has become so well understood that less frequent meetings of the Council have been necessary.

Respectfully submitted.

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