

EXPERIMENT STATION
OF THE
KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN.

BULLETIN No. 94—APRIL 1900.

CHEMICAL AND GENERAL DEPARTMENTS.

CHEMICAL DEPARTMENT.

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SUGAR BEETS, 1899.

THE work with sugar beets has been less satisfactory the past year than the two preceding, as but few samples were sent in for analysis. Fewer applications for seed were received, and the percentage of these who responded with samples for analysis in the fall was smaller. But for sake of completeness, a report might well be dispensed with. Our state is still interested in the sugar-beet question to a certain extent, however, and we feel that the chemical department of the Experiment Station is filling a real need in furnishing unbiased yet sympathetic service in the analysis of Kansas beets. We have always recognized that the agriculture of our state needs diversification; at the same time we have strenuously urged that attempts to establish the beet-sugar industry in our midst should not be hastily launched, but that a thorough agricultural and chemical investigation of the capacities of a given region should be made before investing capital largely. The lesson of the sorghum-sugar enterprises should not be forgotten in our zeal for new channels for investments.

Table Showing Analyses of Sugar Beets.

Serial No.	Name of grower.	Post-office.	County.	Date of planting.	Kind of soil.	Date of analysis.	No. beets..	Form of beets.	Average wt. in pounds.		Specific grav-ity of juice.	Total solids in juice.	Cane sugar in juice.	Pur-ity of juice.	Serial No.
									Gross.	Net.					
13	J. A. Maddy....	Faithaven.	Norton	May 8	Hillside, clay ..	Oct. 24	6	Medium..	1 35	1 23	1.070	17 00	13 82	81 3	13
26	Frank Georgia	Mankato.. . . .	Jewell	May 15	Black loam	Nov. 9	6	Medium.	...	1 78	1.065	15 85	12 49	78 8	26
10	Joseph Decker....	Rice..	Cloud	May 15	Black sandy loam..	...	6	Fair . .	1 70	1 49	1 055	13 52	10 49	77 6	10
33	Wm. Becker ..	Sylvan Grove. .	Lincoln	April 15	Sandy loam ..	Nov. 16	3	Fair . .	1 00	0 91	1 073	17 68	13 24	74 9	33
20	Chas. McGuire.	Beverly	Lincoln	May 1	Dark loam . . .	Oct. 30	6	Good ..	1 60	0.79	1 060	14 70	12 25	83 4	20
9	A. C. Hutchinson.	Blue Rapids....	Marshall	May 5	Black prairie loam,	...	6	Good ...	1 60	1 30	1.060	14 70	12 25	83 4	9
39	S. S. Dickinson. .	Larned.	Pawnee	May 23	Sandy loam . . .	Dec. 2	6	Fair	1 08	0.86	1 056	13 76	10 29	74 8	39
11	W. O. Park	Netawaka. .	Jackson	May 2	Sandy loam	Oct. 19	6	Poor....	1.35	0.55	1.056	13 76	11.45	83 2	11
4	J. W. Louthian. . .	Huron	Atchison..	May 9	Dark sandy	Oct. 18	10	Fair.	1 50	1 10	1.061	14 93	12 02	80 5	4
19	L. B. Bell	Winchester	Jefferson,	May 10	Sandy loam ...	Oct. 30	6	Fair	0 84	0 67	1 070	17 00	14 46	85 1	19
12	Geo. B. Bell.	Wakarusa. . . .	Shawnee..	April -	Black loam	Oct. 21	6	Fair	1 40	1 07	1 050	12 35	8 78	71 1	12
24	Peter Carey.	Burton	Harvey	June 1	Black clay	Nov. 9	6	Good .	1.45	1.34	1 078	18 81	14 11	75 0	24
27	Abraham Dick. . . .	Burton	Harvey	.....	. . . . .	Nov. 9	6	Medium.	0 53	0.47	1 073	17 68	15 72	88 9	27
14	Wilbern Bush .	Wichita Heights,	Sedgwick,	April 28	Sandy, dark... . .	Oct. 24	10	Fair .	...	1 66	1 060	14 70	10 66	72 5	14
21	Mrs. E. Smyser ..	Wichita Heights,	Sedgwick,	April 4	Black loam	Oct. 30	6	Medium.	1 70	1.25	1 043	10 68	7.80	73 0	21
23	J. W. Farber..	Mulvane.. . . .	Sumner..	May 5	Sandy loam ..	Nov. 6	6	Fair	1 20	0.95	1 058	14.23	9.67	68 0	23
22	Geo. A. Blair. . .	Mulvane. . . .	Sumner..	May 6	Sandy loam ..	Nov. 4	6	Fair	1.18	0 84	1 057	13.99	6 03	43.1	22
15	J. E. Throckmorton,	Mulvane.	Sumner..	. . . . .	. . . . .	Oct. 26	6	Medium.	1 60	1 40	1 067	16 31	13 50	82 8	15
40	Isaac Hemphill. . .	Vinland	Douglas	May 27	Timber soil	Dec. 4	12	Good ..	...	0.72	1 050	12.35	8 84	71 6	40
38	W. A. Pine	Lawrence .	Douglas	May 5	Dark loam	Dec. 2	6	Good .	1 38	1 40	1.063	15 39	12 05	78 3	38
25	B. B. Craig.	Waverly	Coffey .	May 1	Sandy	Nov. 9	6	Poor.. .	1 57	1 20	1 045	11.16	7 45	66 8	25

16	Homer Brown	Arkansas City.	Cowley	May 1	Black loam ...	Oct. 25	6	Fair ..	1 40	0 73	1 076	18 36	15 30	83 4	16
18	John Dozzefoiet.	Block. ..	Miami.	May 23	Black prairie loam,	Oct. 28	2	Poor. .	1 60	1 21	1 060	14 70	9 49	64 6	18
17	Andrew Listen	Block.	Miami. .	May 2	Black prairie loam,	Oct. 28	2	Poor. ...	1 60	0 97	1 040	9 97	4 33	43 4	17
5	E. D. Kramer.	La Harpe .	Allen..	June 1	. . . . .	.... .	2	Poor. ..	0 46	0 41	1 079	19 04	15.36	80.6	5
7	C. H. Bratt	Humboldt..	Allen.. ..	June 5	Black loam ..	... .	1	Fair	0 40	0 31	1 055	13 52	9 29	68 5	7
37	A. Nelson	La Harpe	Allen. .	June 1	... ..	Nov. 21	2	Medium	1 39	1 10	1 065	15 85	11 30	71 3	37
8	Wm. Overholt	Humboldt. ..	Allen. .	June 5	Black loam . .	...	1	Fair	0 34	0 27	1 054	13 29	9 43	71 0	8
1	O. D. Conch	Fort Scott.	Bourbon.	June 1	Black loam .	Oct. 14	1	Fair	0 32	0 28	1 067	16 31	13.18	80 8	1
2	Hiram Bulla. . .	Uniontown.	Bourbon.	June 1	Black loam	Oct. 14	2	Fair .	1.27	1 05	1 066	16 08	11 49	71 4	2
3	B. L. Wert.	Fort Scott.	Bourbon.	June 5	Black loam	Oct. 14	2	Poor....	0 77	0 48	1.061	14 93	11 34	76 1	3
6	R. Ewing	Godfrey ..	Bourbon	June 1	Black loam ..	.. .	2	Fair ..	2 34	1 87	1 050	12 35	8 63	69 6	6
35	..	Fort Scott.	Bourbon.	...	. . .	Nov. 20	3	Poor. .	0 98	0 83	1 040	9 97	4 50	45 2	35
32	R. Ewing	Godfrey	Bourbon.	May 25	Black loam	Nov. 9	6	Medium	0 25	0 20	1.071	17 22	14 17	82 3	32
31	A. Hunley. . .	Fort Scott.	Bourbon.	May 25	Black loam .	Nov. 9	5	Medium	0 45	0 38	1 067	16 31	14 05	86 2	31
30	Wm. Heath	Fort Scott.	Bourbon..	May 25	Black loam	Nov. 9	5	Fair .	1 09	0 93	1 061	14 93	12 05	80.7	30
29	— Bartam .	Fort Scott..	Bourbon.	May 25	Black loam	Nov. 9	6	Medium	0 54	0 45	1 061	14 93	12 39	83 0	29
28	G. H. McComb.	Fort Scott.	Bourbon.	May 25	Black loam ..	Nov. 9	6	Fair. ..	0 79	0 63	1 061	14 93	12 39	83 0	28
34	H. A. Emos .	Iantha, Mo.	Barton..	.	Black loam	Nov. 20	3	Poor.....	0 79	0 69	1 037	9 24	4 57	48 4	34
36	R. R. Selves.	Lamar, Mo.	Barton..	..	Black loam	Nov. 20	4	Medium	0 64	0 53	1.037	9 24	4 95	53 6	36
Averages.....									1.12	0.89	1.059	14.54	10.89	73.4	

The analyses made in 1899 are presented in the accompanying table. As last year, the counties are named in the order of their occurrence in belts from northeast to southwest, beginning at the northwest corner. These belts are approximately parallel to the isotherm of 70° F. for the months of June, July, and August. This temperature is believed to be the most favorable for the sugar beet. It lies entirely outside the state, but the counties by the arrangement chosen are named approximately in the order of their nearness to it.

The averages deduced from the table are presented below, and with them the corresponding figures for the two preceding years:

COMPARISON OF RESULTS OBTAINED.	1897.	1898.	1899.
Average gross weight, in pounds.	1.51	1.45	1.13
Average net weight, in pounds	1.09	1.12	0.87
Average specific gravity of juice.	1.064	1.06	1.059
Average total solids in the juice.	15.52	14.71	14.54
Average percentage of sugar in the juice	11.88	11.56	10.89
Average coefficient of purity of the juice.	76.10	77.80	73.40

The preceding summary affords but little encouragement to those who hope to establish the beet-sugar industry in our state. From the reports of growers, it should be said that the year seems to have been an unpropitious one in many localities, and a considerable number of the samples were remnants that had escaped from the floods, drought, insects or rabbits that destroyed the bulk of the stand. Under such circumstances good results cannot be expected. The reports also show that in but few instances was the culture and care such as it must be to insure the best results.

If we examine the details of the table, we find, as in former years, that excellent beets can be grown in the state, and it would seem that sufficient effort might result in the discovery of localities well adapted to their culture. Of the ten samples grown in the vicinity of Fort Scott, six showed over twelve per cent. of sugar in the juice.

In harmony with the wishes of the department of agriculture and the dictates of good judgment, a special effort was made to interest people in the culture of larger plats of the beets than most of them had previously, and forty-seven farmers at their own request were furnished with seed sufficient to plant one-fourth acre or more. This was with the understanding that the beets were to be cultivated as nearly as possible in accordance with the directions, and a more extensive record and report made upon the season, soil, etc., than was expected of others. Of these forty-seven but twelve sent in samples of beets for analysis. In some instances the crop was reported as destroyed, or a failure from circumstances beyond the control of the experimenter; but twenty-six never made any report whatever to the

Station. In the face of such conditions, it is evident that voluntary cooperation with the people of the state in an investigation will not be likely to be successful unless there is an immediate pecuniary interest in the case. The quality of the beets raised by those cultivating the larger plats was somewhat better than the average, they showing an average of 11.49 per cent. of sugar, and a coefficient of purity of 75.

CONCLUSION.

The results of the past three years confirm those of former years, and indicate that while Kansas has produced many individual plats of excellent quality she has produced more of inferior quality, and that states in higher latitudes are better situated for successful sugar-beet production. Doubtless with a better understanding of the conditions requisite to success, and a greater willingness to take the pains and make the necessary effort to meet these conditions, better beets can be grown. The state will always be at a disadvantage, however, and, with its superb adaptation to corn, wheat, alfalfa, and other staple crops, it is probably the part of wisdom to leave this one chiefly to other states, except as it is grown for feed.

However, the Station stands ready to assist all organizations within the state which desire to test its capabilities in this direction further, and will furnish seed this year to any group of farmers making application. Seed will be furnished only for the use of such groups of farmers. It is of the finest quality and is donated by the United States department of agriculture.

It seems proper to caution the public once more against hasty and ill-considered efforts to establish beet-sugar factories in this state, or indeed elsewhere. A thorough test of the beet-producing power of the locality, and the disposition of the farmers, should be made before a dollar is invested as fixed capital. The Station is ready to do its part in all such tests, with an eye single to the ultimate prosperity of the state.

Plans for 1900.

For the next season the Station will furnish sugar-beet seed only for the purpose of making thorough tests; hence, only to groups of farmers desiring to test given localities. To do this with any hope of satisfactory or conclusive results, the beets must be produced under the most favorable cultural conditions, as the limitations of our climate must be recognized as unfavorable. We have found no reason for modifying the directions adopted two years ago and include them in this bulletin. We also urge that the trial plats be not too small. With small plats the attacks of grasshoppers, rabbits, etc., are much more likely to result in total loss than when larger plats are employed. We also desire to especially urge early planting.

Directions for Growing Sugar Beets.

The following directions are based upon our own experience, combined with careful study of the methods in use for producing beets for sugar manufacture in Nebraska, Utah, and California. A correct judgment in regard to the adaptability of our state to the production of beets suitable for sugar making cannot be made unless the beets are grown under proper conditions. It is urgently requested, therefore, that these directions be closely followed.

Preparation of the Soil. If soil deeply plowed last fall, and suitable otherwise, is available, use that. It is necessary that the soil be readily penetrable by the growing beet to a depth of ten or twelve inches. If the soil has not hitherto been plowed to that depth, plow an inch or two deeper than before and loosen the subsoil in each furrow by a subsoil plow or a spade. Two rods square, well prepared, will be of more service than more improperly prepared. The soil must be in perfect tilth, well pulverized by repeated disking and harrowing, and as free of weed seeds as practicable. Soil that runs together and packs with rain is not suitable. Throughout the growth of the beet the soil must be permeable to the air, and this should be in mind in selecting it. The soil must not be handled when too wet or too dry; it should have been under cultivation at least two years, and must have no stable manure applied this spring.

Planting. Just previous to planting, the final harrowing of the soil should be given, so as to kill all weeds that may have started. It is well to roll the ground then. Plant by hand or with a seed-drill, in rows from sixteen to eighteen inches apart. The seed should not be covered deeper than one inch, and the soil above the seed must be well firmed by the press wheel of the drill or otherwise. Most failures to secure good germination are due to leaving the surface so loose as to dry out. Beet seed must be planted shallow, but must have moisture. If planted by hand, the seed may be dropped three or four together at the intervals desired for the beets. This almost insures an even stand. About twenty pounds of seed per acre is required in field planting. The time of planting varies with the latitude and the season, but should be about the same as early corn planting, so that the plants may be well grown before the summer droughts.

Thinning. When the beets have four leaves they must be thinned. If left more than a week longer the roots of the plants left are injured in pulling out the others. The distance apart that the plants should be left depends upon the richness of the soil—the richer the soil the closer they may be grown. Six to ten inches will include all

cases, and with most of our soils seven or eight inches is about right. It must be borne in mind that the mature beets are to be of about two pounds weight and that very large size is not desirable. Where the beets have been sown uniformly throughout the row, thinning is begun by "bunching" the plants by means of a narrow-bladed hoe, with which the beets are cut out entirely excepting bunches of three or four at the proper intervals for the mature beets. The bunches are thinned by hand, leaving the strongest plant, and at the same time pulling up any weeds near it.

Cultivation. In cultivation, the conditions to be met are perfect freedom from weeds, looseness of soil, and guarding against injury to the leaves or roots of the beets. If the ground becomes crusted by heavy rain before the beets are up, it should be hoed, following the marks left in firming the soil; otherwise a first shallow hoeing should be done as soon as the beets break through. A second hoeing must follow the thinning; this should be to a depth of three inches. Similar hoeings will be necessary later. The space between the rows may be cleaned with a suitable cultivator, but loosening the soil between the plants in the rows will require the hoe.

Irrigation. For such as are able to try the growth of beets by irrigation, a few words based upon information kindly furnished by Mr. George Austin, agricultural superintendent for the Utah Sugar Company, Lehi, Utah, may not be amiss. Beets should not be watered too freely. Let them suffer a few days before irrigating. The water must be applied by means of little furrows made by a six-inch furrower attached to the rear of the cultivator, taking care not to flood the ground. Unless the soil has considerable slope, or is very sandy, watering in alternate rows is sufficient. The second time, the water is run down the rows left without water the first time. Cultivate as soon as practicable after each irrigation, to a depth of five or six inches. Two to four irrigations are given during the season, in Utah, the last one three or four weeks before harvesting.

Taking and Forwarding Samples. Directions for this will be sent in due time to all taking part in this test, and the beets are to be left in the ground until such directions are received. Some of the beets will be called for early, others quite late. We expect to be able to furnish franked tags allowing free transmission of the samples by mail. Applications for seed to be used substantially as directed above will be filed as received, and seed sent as soon as possible. Be careful to write name and address very distinctly. Inquiries at any time will be gladly received and promptly attended to. Address all applications for seed and communications concerning the experiment to J. T. WILLARD, chemist of the Experiment Station, Manhattan, Kan.

GENERAL DEPARTMENT.

J. T. WILLARD, M. S., DIRECTOR.

THE STATION PUBLICATIONS.

THE publications of the Experiment Station include annual reports, bulletins, press bulletins, and monthly weather bulletins.

The first and second annual reports, in addition to financial and general statements, contained much matter that had been issued in the form of bulletins. This reprinting seemed an unnecessary expenditure of funds, and since 1889 the annual reports have contained no details of experiments, but simply statements in regard to the work of the year in general and in the several departments, and including the financial statements required by law. These annual reports, not being of general interest, therefore, are printed in small numbers and sent to libraries and officials only, except on special request.

The bulletins are the means of communicating the results of the Station work directly to the farmers. They are issued in the quantities judged necessary to meet the demand. All investigations are described in them when completed, and they are sent to all on our mailing lists, including all the newspapers of Kansas, as required by law.

The press bulletins are issued in limited numbers and sent to the papers, to certain state and county officers, and to a considerable number of public or semi-public institutions. Our hope is that through them farmers may learn something of the Station work, and be led to apply for the regular bulletins, and also that the local papers, by reprinting them, may give wider currency to the information they contain. It is suggested that any who appreciate the value of them can serve the community at large as well as themselves by using a little effort in inducing the papers to reprint them. They are short, readable, and popular, but, at the same time, accurate articles on subjects of current interest, and embodying observations and experiments of members of the Station staff. Extra copies are printed of some for use in answering inquiries.

The monthly weather bulletins are sent out the next day after the close of the month, to the same addresses as the press bulletins.

ANNOUNCEMENT.

The Experiment Station has in stock back numbers of many of its publications which contain matter that is still of interest and value.

We desire to put these out among the people, and, as many now on our list have not received them, it seems desirable to call their attention to this and invite them and others to make application for such as they desire. To facilitate these applications, a complete list of the publications to date is given herewith, those out of print being marked with a star. An index to the subjects of chief interest follows the list and may be made use of in applying for publications.

ANNUAL REPORTS.

First Annual Report, 1888.*

Financial statements, report of the Council, and reports of departments, including the following articles: 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.

Second Annual Report, 1889.

Financial statements, report of the Council, and reports of departments, including the following articles: 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.

Third Annual Report, 1890.

Financial statements, and a report of the Council, including outlines of Bulletins 10 to 19, with index, and a summary of work in progress.

Fourth Annual Report, 1891.

Financial statements, and a report of the Council, including outlines of Bulletins 20 to 32, with index, and summary of work in progress.

*Out of print. (The annual reports for 1888 and 1889 contain the subject-matter of Bulletins Nos. 3 to 9, inclusive.)

Fifth Annual Report, 1892.

Financial statements, and a report of the Council, including outlines of Bulletins 33 to 37, with index, and summary of work in progress.

Sixth Annual Report, 1893.

Financial statements, and a report of the Council, including an account of work in progress, outlines of Bulletins 38 to 45, a meteorological summary for thirty-six years, and an index.

Seventh Annual Report, 1894.

Financial statements, and a report of the Council, containing outlines of Bulletins 46 to 48, statements concerning irrigation experiments and other work in progress, and an index.

Eighth Annual Report, 1895.

Financial statements, and a report of the Council, containing outlines of Bulletins 49 to 56, a summary upon irrigation and other work in progress, and an index.

Ninth Annual Report, 1896.

Financial statements, and a report of the Council, containing outlines of Bulletins 57 to 64, a summary concerning irrigation and other work in progress, and an index.

Tenth Annual Report (January 1 to June 30), 1897.

Financial statements for the fiscal year, and a report of the Council for six months, including outlines of Bulletins 65 to 74, summary of work in progress, and an index to the report and Bulletins 65 to 75.

Eleventh Annual Report, 1897-'98.

Financial statements, and a report of the Council, containing outlines of Bulletins 76 to 80, and a summary of the work of the year and in progress.

Twelfth Annual Report, 1898-'99.

Financial statements, and a report of the Council, including outlines of Bulletins 81 to 89, a list of press bulletins 1 to 46, issued during the year, a summary of work in progress, and an index.

BULLETINS.

	Date.	Subjects,
*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	July, 1889	Experiments with Wheat.
*No. 8	October, 1889	Preliminary Report on Smut in Oats.

*Out of print. (The annual reports for 1888 and 1889 contain the subject-matter of Bulletins Nos. 3 to 9, inclusive.)

Date.	Subjects.
*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.
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. . . .	<i>Actinomyces bovis</i> , 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. . . .	Experiment 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.

Date.	Subjects.
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, Kafir-corn, and Cottonseed.
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 Kafir-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. . .	Kafir-corn, Corn and Soy Bean Meal for Pigs. Kafir-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.
No. 65.... May, 1897.	Grafting the Apple.
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No. 77 . . March, 1898	Some Insects Injurious to the Orchard.
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No. 79 . . April, 1898.....	Bovine Tuberculosis.
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No. 81. . . September, 1898. .	Feed and Care of the Dairy Cow.
*No. 82.... January, 1899	The Potato-stalk Weevil.
No. 83.... April, 1899	Sugar Beets.
No. 84.... April, 1899	Cold Storage for Fruit.
No. 85 . . April, 1899	The Growth of Alfalfa in Kansas.
*No. 86.... June, 1899.	Press Bulletins Nos. 1 to 34.
No. 87.... April, 1899	Native Agricultural Grasses of Kansas.
*No. 88.... May, 1899	Keeping Milk in Summer.
No. 89 . . June, 1899.. . . .	Soil Moisture.
No. 90.... January, 1900	Alfalfa in Eastern Kansas.
No. 91.... February, 1900	Swine-plague.
No. 92.... March, 1900	A New Drought-resisting Crop—Soy Beans.
No. 93 . . March, 1900.	Kafir-corn.
No. 94.... April, 1900	Sugar Beets, 1899. The Station Publications. Partial Index to Station Publications.

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No.	Title.	Department issuing.
1.	Wheat Experiments.	Farm.
2.	Keeping Milk in Hot Weather	Farm.
3.	The Fringed-wing Apple-bud Moth.	Horticulture and Entomology.
4.	Soil Moisture and Soil Stirring.	Chemical.
5.	Blackleg*.	Veterinary.
6.	The Sand Plum.	Horticulture and Entomology.
7.	Kafir-corn for Fattening Pigs*.	Farm.
8.	Some Reasons why Fruit Does not Set.	Botanical.
9.	The Peach Twig-borer*.	Horticulture and Entomology.
10.	Fall Preparation for Alfalfa Seeding*.	Farm.
11.	Celery*.	Horticulture and Entomology.
12.	The Balanced Ration.	Farm.
13.	Seed Breeding	Botanical.
14.	The Fruit-tree Bark-beetle.	Horticulture and Entomology.
15.	Kansas Sugar Beets for 1898.	Chemical.
16.	<i>Actinomycosis</i> (Lump-jaw, Big-jaw).	Veterinary.
17.	Hardy Ornamental Shrubs.	Horticulture and Entomology.
18.	Notes on Weeds.	Botanical.
19.	The Potato-stalk Weevil	Horticulture and Entomology.
20.	Possibilities in Corn Improvement.	Chemical.
21.	Winter Protection of Peach Buds.	Horticulture and Entomology.
22.	Grazing Grasses of Western Kansas.	Botanical.
23.	The Spring Canker-worm.	Horticulture and Entomology.
24.	A New Crop for Kansas Farmers (Soy Beans).	Farm.
25.	Alfalfa Hay for Fattening Hogs.	Farm.
26.	<i>Tænia fimbriata</i> (Fringed Tapeworm)*	Veterinary.
27.	Sugar Beet Experiments for 1899*.	Chemical.
28.	Treatment of Winter-injured Trees.	Horticulture and Entomology.
29.	Milking Scrub Cows.	Farm.
30.	Lice on Animals*	Veterinary.
31.	Potato Scab.	Botanical.
32.	Blackleg (A)*.	Veterinary.
33.	Blackleg (B)*.	Veterinary.
34.	Get Ready for the Drought.	Farm.
35.	Dysentery in Calves and Other Young Animals.	Veterinary.
36.	Experiments with Swine-plague or Hog-cholera.	Veterinary.
37.	Kafir-corn, Alfalfa Hay and Soy Beans for Pork*	Farm.
38.	What is a Digestion Experiment?	Chemical.
39.	Skim-milk Calves	Farm.
40.	Orchard Cultivation*	Horticulture and Entomology.
41.	Digestion Experiment with Alfalfa Hay	Chemical.
42.	To Rid the House of Flies.	Horticulture and Entomology.
43.	Selection of Seed Wheat.	Botanical.
44.	The Profitable Strawberry Bed.	Horticulture and Entomology.
45.	Early Plowing and Moisture Conservation.	Chemical.

No.	Title.	Department issuing.
46.	Soy Beans.....	Farm.
47.	Awnless Brome Grass...	Botanical.
48.	The Kansas Experiment Station	General.
49.	A Horn-fly Trap Experiment.....	Entomological.
50.	Infectious Abortion in Cattle.....	Veterinary.
51.	Alfalfa in Eastern Kansas.....	Farm.
52.	Some Nitrogenous Forage Plants....	Botanical.
53.	Experiments with Sugar Beets in 1899 and 1900.....	Chemical.
54.	Kafir-corn	Farm.
55.	Plant Breeding by Bud Selection*.. . . .	Botanical.
56.	Digestion Experiments with Kafir-corn Stover and Kafir-corn Meal.....	Chemical.
57.	Protective Inoculation Against Blackleg in Cattle...	Veterinary.
58.	Questions About Forage Plants.....	Botanical.
59.	How to Test the Vitality of Garden Seeds..	Botanical.
60.	Gophers and Crab-grass <i>versus</i> Alfalfa....	Farm.
61.	Salsify, or Oyster Plant..	Horticultural.
62.	Tame Grasses for Kansas..	Farm.
63.	Bromus Inermis..	Farm.
64.	Prevention of Grain Smuts.	Botanical.
65.	Horn-fly Remedies...	Entomological.
66.	Causes of Failure in Spraying	Horticultural.

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The following index is an outgrowth of the needs of this office in sending out publications in response to requests for information upon the various lines of our investigations. It is hoped that its publication here will be found a convenience to those making application for bulletins as well as those who have preserved files of them. It presents in concise form the range of work that the Station has touched. It refers in one way or another to every bulletin and press bulletin, and to the articles in the first two annual reports. Many of these references are given under general heads only. The index does not profess to refer to the many individual species of plants, insects, etc., that have been under experiment or observation, and, in fact, details are included in respect to the most important subjects only. The intention has been to make the references complete for the topics as named, and it is believed that no important omissions can have occurred, but it is too much to hope that there are no minor ones.

- Abortion, infectious, in cattle.
 Press Bulletin No. 50.
- Actinomycolosis* (lump-jaw).
 Bulletins Nos. 35, 86.
 Press Bulletin No. 16.
- Alfalfa, experiments in feeding.
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- Alfalfa, experiments in production.
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- Animals, diseases of.
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- Balanced rations, experiments upon.
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- Barley smut.
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- Blackleg.
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- Cattle, poisoning of, by saltpeter.
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- Clovers, cultivated, in Kansas.
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- Conifers, notes on.
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- Corn crop, as affected by rainfall.
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- Corn, crossed.
 Annual Reports, 1888, 1889.
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- Corn, experiments in feeding.
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- Corn, selection of seed.
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- Cottonseed meal, experiments in feeding.
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- Crossing and cross-fertilization.
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Ensilage.

Annual Reports, 1888, 1889.

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Feeding calves.

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Feeding cattle for beef.

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Feeding stuffs, analyses of.

Annual Report, 1889.

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Forage plants, experiments in feeding.

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Forage plants, experiments in production.

Annual Reports, 1888, 1889.

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Irrigation.

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Bulletin No. 55.

Irrigation, small fruits by.

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Kafir-corn, experiments in production.

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Bulletin No. 35.

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Milk analyses.

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Annual Report, 1888.
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Rainfall for thirty-six years.

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Rain-water, ammonia and nitric acid in.

Annual Report, 1888.

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Sorghum, experiments with saccharine.

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Sorghum, improvement by seed selection.

Annual Reports, 1888, 1889.

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Sorghum smut.

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Soy beans, experiments in feeding.

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Soy beans, experiments in production.

Annual Report, 1889.

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- Tapeworm, fringed.
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- Texas itch.
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- Texas fever.
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- Tuberculosis, bovine.
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- Weeds, experiments or observations upon.
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- Wheat continuously, without manure.
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- Wheat, experiments in feeding.
Annual Report, 1889.
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- Wheat, experiments in production.
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- Wheat, selection of seed.
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