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CLIMATE AND CROPS IN OKLAHOMA
FIELD EXPERIMENTS WITH KAFIR CORN.

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CLIMATE AND CROPS IN OKLAHOMA.

By G. E. MORROW, Director,

The year 1896 was somewhat exceptional in Oklahoma so far as the climatic conditions were concerned. The average mean temperature, 61.7 deg., as shown by reports from 21 stations, including some in the Indian Territory, was higher than in 1895. No report was made of a temperature below zero at any time during the year, and in but two cases was the minimum below 6 deg. The maximum temperature was unusually high, every station reporting a maximum ranging from 104 to 115 deg. With one exception the highest temperature was at some date between August 1 and 20. With one exception each station reported a maximum of over 100 deg. in July, as did all but two in September.

The rainfall was below the average in most parts of the Territory. The average as reported by 17 stations in Oklahoma was 24.69 inches, ranging from 15.04 at Beaver in the far northwest, to 31.71 at Guthrie and 31.40 at Stillwater. In many cases the rainfall was not distributed well throughout the year. Thus, at Stillwater, 11.69 in. fell in 31 days from June 21 to July 21. A still more striking case is that of Burnett, where, out of a total rainfall of 26.08 in. for the year, 6.02 in. fell in one day in May. At Oklahoma City the rainfall was the least for any year of the last six and 10.74 in. less than the average for the preceding five years.

The records for a single year cannot be accepted as a trustworthy indication of the usual or average climatic conditions. Even the six years during which observations have been made at several points in the territory do not give sufficient data from which to draw positive conclusions. It has recently been pointed out that, in Illinois there have been at least three successive periods of 11 years the average rain-fall for which varied considerably. Fortu-

nately at Ft. Reno and a few other army posts in or near Oklahoma observations have been made for a considerable series of years. Records at Ft. Reno for 14 years (not quite complete for some of the earlier years) give an average rainfall of 27.67 in., per year. For the first seven years the average was 29.93 in., for the last seven years, 25.41 in., or a difference of over four and one half in., per year in the two periods.

Some generalizations can be made with reasonable certainty, bearing in mind that, in a territory so large as is Oklahoma, there are considerable differences in the climate of different parts. A maximum temperature of 100 degree or more may be expected in almost any part of the Territory in July, August or, possibly, September. Usually the time during which extreme high temperature continues is short. A minimum temperature of 12 or even 20 degrees below zero is possible, but unusual. The mean average temperature for the year is from perhaps 59 to 62 degrees.

With occasional marked exceptions the annual rainfall decreases from the east to the west and, in not so marked a degree, from the south to the north, Section Director J. I. Widmeyer, of the Oklahoma Climate and Crop Service, reports the interesting fact that the rainfall for three years past at Arapahoe, well to western side of the Territory, has been above the average of those years for the Territory.

For 1896 seven stations lying east of 97 deg. 30 min. west long. showed an average rainfall of almost 27 in., while seven lying west of this line showed an average of about 24.50 in: Beaver and Mangum were not included in the latter list as they are considerably west of the other stations.

In general the heaviest rainfall is during the months from May to August inclusive. In 1896 only two stations in Oklahoma reported a rainfall over two inches for either of the first months of the year. Occasionally there are remarkably heavy rains in a day or a month. Mainly compiled from the reports of the Oklahoma Section of the Climate and Crop Service of the U. S. Weather bureau, which reports are prepared by Sergeant Widmeyer, of Oklahoma City, several tables are appended given facts well deserving careful study. Heartly thanks are due the unpaid, voluntary observers at different stations for their work.

FIELD CROPS FOR OKLAHOMA.

Application is frequently made to this station, especially by farmers who have recently come to the territory, for information as to the field crops they may most safely cultivate. Oklahoma lies on the border between the north and the south. North of the great cotton growing belt and south of the great corn growing regions, each of these crops can be successfully grown with fairly favorable seasons. The amount and distribution of the annual rainfall is the chief factor to be considered, except where irrigation can be practiced—and this is possible for only a small percentage of the acreage in farms, with our present knowledge. As in the Dakotas, Nebraska, Kansas and Texas, the eastern part of the territory has a greater rainfall in most years than does the western part. The rainfall cannot be relied on in the western counties (unless Greer be an exception) as sufficient to justify any attempt to cultivate grain crops on any extended scale. It is impossible to draw a line showing the dividing point, but the general proposition must be kept in mind. A striking illustration is found in the crop report for 1896 in Kansas. The State Board of Agriculture estimates show that one county in the central part produced more corn than 32 counties in the western part of the state.

INDIAN CORN—This is and promises to continue to be the chief grain crop for the eastern part of the territory. Relatively little is grown west of the line of the Rock Island R. R., and much the largest part of the crop is grown east of the line of the Santa Fe R. R. The creek and river bottoms are usually best adapted for this crop and some of the timber land is better than the average upland prairie. Fairly large varieties, maturing medium early are to be preferred to either very early or late varieties. Varieties which have been grown in the territory or near it for some years are to be preferred to those brought from a distance. Considerable corn is planted in March, especially in southern part of the territory, but the great mass is planted between the first and middle of April. Corn is the best crop in parts of the territory, not only

for the grain but also for the fodder or stover. On the other hand, many acres of corn have been planted too far west or on land not suited to the crop and disappointment has resulted.

KAFIR CORN—The acreage planted to Kafir corn is annually increasing in the territory as it is in Kansas. Not the equal in feeding value of corn, the grain is nutritious and palatable. This crop may be safely planted in parts of the territory in which sufficient rainfall for corn cannot be relied on. It will also do somewhat better than will corn on upland prairie soil. It withstands drouth and hot winds much better. The white variety is preferred in the territory to the red. Little has been done in the way of improvement of varieties. This crop may be planted thicker than is best for corn. It should not be planted until soil is fairly warm and may be planted with safety later than can corn. In a good many cases fair crops have been secured where the planting was done on wheat stubble. It is sometimes sown broadcast but this plan is of doubtful value. Kafir corn is believed to be superior to any plant of its class—such as milo maize, Jerusalem corn, etc., or to sorghum, although the latter frequently gives large yields of valuable feed.

WHEAT—In a majority of the years since the territory was settled, wheat has done fairly well; in some years surprisingly well. The crop of 1895 was almost a failure. That of 1896 was injured by chinch bugs. A relatively large acreage was sown last fall in eastern and southern Oklahoma. It is probably safer to try wheat culture further west than would be advisable for corn. Many of the varieties commonly grown in states further north and east have been tried with fair success. Pasturing of the wheat fields is practiced both in fall and spring by many farmers. In many cases a large amount of good food is secured in this way with little or no injury to the yield of grain.

OATS—Oklahoma lies south of the best oat growing region. In some cases large yields have been secured. For two years past the crop has not given satisfactory results. It is not thought advisable to make it a prominent crop. Winter oats have done fairly well in the southern part of the territory. Presumably the so called rust proof and other varieties grown in Texas would be better than varieties brought from far north.

Rainfall, In Inches, At Stations In Oklahoma and Indian Territories, 1896.

(7)

STATIONS.	LAT.	LONG.	JAN.	FEB.	MARCH	APRIL	MAY.	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	
Alva	36.48	98.40	1.00	.25	.50	2.80	.80	4.65	3.45	.90	2.80	5.30	.50	1.25	23.40
Arapahoe.....	35.30	98.55	1.51	.22	.86	1.70	1.60	5.04	4.77	1.26	2.36	2.37	.65	2.85	25.19
Anadarko.....	35.08	97.15	.85	.18	1.07	1.45	2.30	1.03	1.36	.50	1.85	3.55	1.25	1.90	17.29
Beaver.....								2.08	2.28	.4	2.00	1.55	.19	.93	13.04
Burnett.....	35.10	97.10	.90	.78	1.27	.83	10.21	1.14	1.50	1.18	2.04	1.63	3.48	1.11	26.08
Clifton.....	35.30	96.55	.77	.23	.95	.69	2.01	3.12	1.96	1.96	2.51	1.21	3.31	.71	19.43
Ft. Reno.....	35.33	98.01	.40	.30	.60	1.65	1.50	1.29	4.5	3.31	1.85	2.18	1.30	1.90	19.13
Ft. Sill.....	34.40	98.23	1.40	.41	1.23	1.63	1.26	1.38	1.20	1.66	.81	1.55	1.83	2.75	17.12
Guthrie.....	35.55	97.20	.45	.28	1.38	1.56	6.00	6.01	5.45	1.57	2.50	3.0	2.11	1.30	31.71
Healdon.....	34.10	97.25	2.15	1.31	1.89	1.32	.83	1.60	3.34	1.41	.97	1.59	1.72	2.67	20.75
Keokuk Falls...	35.25	96.40	.65	.55	1.77	.95	5.50	3.70	2.06	1.55	2.10	1.21	2.7	.90	23.71
Lehigh.....	34.32	96.10	1.32	1.51	1.13	2.54	1.87	2.17	1.63	2.43	1.55	2.50	2.56	.79	22.43
Mangum.....	34.38	99.32	1.47	.90	.10	1.75	1.76	3.33	4.37	.95	1.34	1.87	.61	3.55	22.85
Norman.....	35.20	97.30	.74	.42	1.12	.85	2.50	3.20	2.12	1.25	1.90	1.45	3.00	1.31	23.78
Oklahoma City	35.26	97.33	.45	.4	1.03	1.07	4.62	3.32	1.81	1.83	2.14	1.91	2.41	1.22	21.90
Pond Creek.....	36.45	97.50	.65	.20	.86	1.23	1.00	4.76	5.60	.72	4.17	5.85	.38	.43	26.01
Purcell.....	35.00	97.16	1.45	.90	1.24	.87	8.74	2.27	1.65	2.75	2.73	1.92	.....	1.35	31.28
Sac & Fox Agcy	35.30	96.40	.80	.30	1.40	1.90	7.20	3.30	2.50	.95	2.10	1.89	3.00	.70	25.25
Stillwater.....	36.10	97.05	.55	.19	1.21	.94	5.93	7.26	5.85	1.64	2.51	2.88	1.58	.85	31.40
Tallequah.....	35.48	94.58	1.61	.68	1.23	2.33	5.36	2.80	.35	.....	1.87	3.43	2.86	1.12	26.35
Winnview.....	36.10	93.30	2.16	.08	.67	.99	.71	3.71	6.14	1.33	2.46	1.93	.41	1.16	21.72

Rainfall at El Reno, O. T.

	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1891	2.02	.13	2.47	2.10	3.02	5.02	6.97	1.02	1.17	.30	.85	1.70	26.77
1892	.66	1.00	3.10	1.12	7.37	2.62	1.80	4.30	1.93	5.21	0	4.40	33.51
1893	.30	.72	1.90	1.92	1.88	3.25	5.62	10.25	1.17	.0	.93	1.46	29.40
1894	1.51	.50	1.30	3.30	1.30	1.10	1.31	1.60	3.16	1.49	1.00	.10	17.44
1895	1.13	.75	.25	1.74	.94	2.41	2.24	4.45	.60	2.53	3.24	2.50	22.78
1896	.40	.30	.60	1.05	1.50	1.29	4.05	3.31	1.85	2.18	1.30	1.30	19.3
	.83	.40	1.60	1.87	2.67	2.67	3.66	4.15	1.64	4.12	1.29	1.91	24.85

Rainfall—Oklahoma City, O. T.

	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1891	2.48	.44	3.04	4.30	5.92	4.73	6.17	.79	5.43	.31	1.17	2.65	37.43
1892	.93	2.22	3.17	1.33	11.90	2.48	3.66	4.27	1.29	4.68	1.01	5.35	42.29
1893	.43	.69	1.25	3.12	1.53	1.60	3.80	5.65	3.20	.06	1.26	1.69	24.28
1894	3.74	1.11	4.79	2.82	1.87	3.71	1.66	1.95	1.65	1.84	.07	1.51	26.72
1895	.93	.07	.82	.41	1.34	3.11	5.95	4.44	2.93	2.93	5.79	3.78	32.49
1896	.45	.14	1.03	1.07	4.62	3.32	1.81	1.83	2.14	1.91	2.41	1.22	21.90
Average--	1.49	.78	2.35	2.17	4.53	3.15	3.84	3.15	2.77	1.95	1.95	2.70	30.85

Rainfall in Inches and Hundreds, in Oklahoma Territory.

PLACE.	COUNTY	1889	1890	1891	1892	1893	1894	1895	1896
Burnet	Pottawatomie	31.91	.....	.....	41.84	26.65	25.10	36.17	26.08
Fort Reno	Canadian	29.29	28.79	26.77	33.51	29.40	17.28	22.78	19.13
Fort Sill	Comanche, I. T.	23.61	31.08	32.76	34.32	24.19	24.14	29.17	17.12
Fort Supply	Woodward	.....	18.26	30.43	21.99	13.15	18.24	.....	.....
Guthrie	Logan	.....	.....	.....	37.98	.....	22.99	30.71	31.71
Mangum	Greer	.....	.....	.....	27.10	11.17	19.25	.....	22.85
Oklahoma City	Oklahoma	.....	.....	37.43	42.29	24.28	26.72	32.49	21.90
Pond Creek	Grant	.....	.....	.....	.....	.....	17.79	21.56	26.01
Purcell	Chickasaw, I. T.	.....	.....	.....	40.03	32.38	24.88	.....	31.28
Tulsa	Creek, I. T.	26.28	34.15	24.80	46.16	34.12	27.09	46.81	23.80
Winview	.....	.....	.....	.....	.....	.....	29.98	26.19	21.72

Monthly Mean Temperature, Oklahoma, O. T.

	Jan.	Feb.	Mch.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1891	37.8	39.2	43.6	60.8	64.4	74.3	76.2	76.8	72.4	60.8	47.0	44.4	58.1
1892	33.0	44.5	44.6	59.2	66.2	75.1	79.0	77.0	72.4	62.0	48.0	35.6	58.0
1893	37.6	35.8	50.2	62.4	65.4	76.2	81.2	75.2	74.4	61.7	45.4	43.7	59.1
1894	36.8	34.8	52.6	62.9	68.2	75.5	79.4	78.4	74.4	64.0	49.8	41.6	59.9
1895	33.2	29.5	50.0	63.1	69.3	76.8	78.3	79.1	76.1	55.7	45.0	38.4	57.9
1896	39.4	43.4	46.4	66.1	73.3	76.7	80.7	83.2	71.9	59.2	46.8	40.2	61.0

BARLEY—This is a minor crop. It often makes a fine growth giving good pasturage and a good yield of grain. Its early maturing especially subjects it to attack by chinch bugs.

RYE—Very little rye is grown, and its suitability to the climate is not proved.

COTTON—Much attention has been given to cotton culture and it is now apparently certain that a greatly increased acreage will be planted in 1897. It has done well in many cases. The bottom lands are best; timber lands usually preferred to upland prairie. The Storm Proof variety is most generally recommended, although it is not as early maturing as would be desirable. Oklahoma extends north quite to the limit of profitable cotton culture, and, probably 95 per cent of the crop of the whole country is grown south of a line running through Guthrie or Kingfisher. In favorable seasons early varieties should do reasonably well even in the northern part. Planting as early as is thought safe so far as danger from frost is concerned is advisable,

CASTOR BEANS—Although a minor crop many castor beans are grown. They withstand drouth better than does corn. The better the land the better the yield usually, but a considerable acreage has been grown on upland prairie soil. This is largely a "labor crop" in its production and is a direct "money crop" in its sale. Especially where farmers have a family working force of fair size, beans are well worth trial.

ROOTS AND TUBERS—Oklahoma is moderately adapted to potato culture; much of it is especially suited for growth of sweet potatoes. With fair summer rainfall turnips do remarkably well. Peanuts are counted a profitable crop by some farmers. Artichokes have not done well usually. The territory has too warm and dry a climate for best production of beets.

MILLET—The different varieties of millet usually do well unless injured by chinch bugs. Probably the German millet is the best variety to select. The millet crop is objected to by many because of its liability to chinch bug injury and because of an exaggerated opinion of its injurious effects on the soil. As a "catch crop," following wheat or to be put on land where a failure to secure a stand of corn has been made, millet may be wisely grown in many cases.

COW PEAS—There is an increasing and well founded appreciation of the value of cow peas for Oklahoma, more especially for the southern part. Under reasonably favorable conditions they produce a large yield of fairly good food for either horses, cattle, sheep or hogs. They can be sown later than is wise with most crops; often sown in the corn or Kaffir fields at time of last cultivation. They are probably the best crop to be plowed under as a "green manure." For the latter purpose such varieties as the unknown or wonderful should be selected. Where the crop is designed primarily for feeding, earlier maturing varieties are preferable.

SOY, SOJA OR JAPAN BEANS—These bean are well worthy of more extended trial; more especially in northern part of the territory. They answer much the same purpose as do the cow peas, but have an erect and coarse stalk.

GRASSES—Already many acres have been plowed which, with our present knowledge, would have been more wisely left covered with the native grasses. No one of the cultivated or "tame" grasses can as yet be confidently recommended for the territory as a whole. Bermuda grass does well in the southern part; northern Oklahoma is beyond its safe limit. At the station farm at Stillwater, on upland prairie soil there has been moderate success with timothy. Probably orchard grass would do fairly well on some bottom soils. Some grasses imported from other countries or other parts of this country give promise of usefulness. The chief reliance, as yet, must be on the native grasses. Work is being done in the way of trying to improve and cultivate some of these.

CLOVERS—Much the same report must be made concerning the true clovers as about the grasses. In some places there has been reasonable success with the red and the alsike varieties, but they cannot be safely recommended. Trials of the annual crimson clovers have not been conclusive.

ALFALFA—Alfalfa, or lucerne, is by far the most valuable introduced pasture and hay crop for Oklahoma. It will not thrive in the extreme western part, but it does well over much of the territory. The station farm has alfalfa doing well on upland prairie. It will do best on good bottom land. There is often difficulty in securing a good stand. The land should be well prepared and as free from weed seeds as practicable. From 15 to 20 pounds seed per acre are

usually recommended. It is not wise to sow until danger from freezing is past. Some have had good success by sowing in late summer or early autumn. It is well to mow the crop the first season rather than to pasture it.

TEOSINTE—Teosinte is a large, coarse grass looking not unlike corn. It does not produce seed in this climate. It is planted and cultivated as is corn. Very large yields have been secured. Its feeding value is fair. It is a more troublesome crop to harvest than is corn or Kaffir and its lack of seed reduces its value and increases the cost of cultivation somewhat as the seed must be bought each year. It is doubtful whether, as a whole, it is to be preferred to corn or Kafir.

EXPERIMENTS WITH KAFIR CORN, 1896.

G. E. MORROW, Director.

Believing that Kafir corn is to be the most valuable grain and "rough forage" yet found for considerable areas in Oklahoma, an extended series of field experiments was started on the station farm in the spring of 1896. The results well illustrate the difficulties with which the field experimenter frequently has to contend. Much of the seed obtained had small vitality and in very few cases was an even and satisfactory stand obtained. All the plants were injured by chinch bugs and grain lice, but the extent of the injury varied much—in some cases almost destroying the crop. Detailed reports of results would have little value in such a case, and might lead to incorrect conclusions. A few results may be given.

The yield of Kafir grain was somewhat larger than that of corn grown on the same tract of land and under like condition in general. There were remarkable variations in the yields from different plants, both as regards total crop and the seed. One plat gave at rate of 68 bu. per acre (56 lb. per bushel.) The next largest yield was at rate of over 49 bu., a third 41 bu. Eleven other plats each gave at rate of over 30 bu., and 31 others at the rate of over 20 bu. Several plats gave yields of less than ten bushels per acre. There were equally striking variations as regards

total crop. The largest yield was about seven and one-fourth tons per acre; the next about five and one half; the third about four and one half; while many plats gave a total yield of less than three tons per acre. These differences were largely due to imperfect stand and insect injury.

The white or the black hulled white gave better yields than did the red variety.

While corn planted March 21 and 28 gave moderately satisfactory stand, Kafir planted on adjacent plats the same days failed to grow. That planted in May and June was nearly or quite destroyed by insects. The best yield in this test was from planting April 11.

The largest yields of both grain and stalks was from planting at the rate of one stalk each three inches in rows 30 inches apart; the next from planting at rate of one stalk each eight inches, (three each 24 inches) in rows 30 inches apart, but the stand was quite uneven in each case. The thickest planting gave stalks taller and thinner but slightly heavier than those from thinner planting. In general, with rows three feet apart, the best yields were obtained when the stalks averaged from six to nine inches apart in the row. The largest stalks and heads are obtained by thin planting but the greatest quantity of good food is obtained by relatively thick planting. As the stalks do not grow as high as those of corn there seems no good reason for having the rows on upland more than three feet apart. As with corn, the smaller stalks are more readily eaten than are the larger ones. The results of tests of methods of cultivation were inconclusive. Apparently the expected happened—better yields from shallow cultivation.

Planted April 6, the first heads appeared June 27, and the seeds were mature and the crop cut August 13 to 15. Planted April 11, the first heads appeared July 1. Planted May 2, the first heads appeared July 13. The red headed slightly before the white variety when planted at same time.

The percentage of seed to total crop, as cut, varied from 24 to 28.5 per cent.

While 56 lb. per bushel was accepted as the weight, a bushel of well dried seed of the white variety weighed 60 and one of the red variety 61 lb.

Little difference was noticed in the rate of growth or the height of the red and black varieties. The greatest growth observed in 24 hours was 2.5 inches, while stalks of corn grew over four inches in a day. The average rate of growth per day from May 18 to June 18 was about one inch. For a time after this the growth was more rapid—about one and one half inches per day from June 18 to June 29. Observations were made once a week for three weeks which showed that the rate of growth for 12 hours from morning to evening was .53 in. while that from evening to morning was .39 in.

These experiments were supervised and many of the details planned by assistant agriculturist J. H. Bone, the work being most carefully and thoroughly done. Had it been possible to control the unfavorable conditions, the results would have had much value. As it is they are only suggestive.

Feeding trials of Kafir corn, fed to cattle and hogs have been conducted and are being continued. The results are not yet sufficient to make it wise to make dogmatic statements. It seems clearly proven that the seed does not equal corn weight for weight in feeding value. The stalks of Kafir seem to be eaten as readily as those of corn. There is great waste in feeding the seed unground to either horses, cattle or hogs. If grinding is not practicable it is better to feed the unthreshed heads, as mastication is more thoroughly performed.

The acreage in Kafir corn may wisely be increased in many parts of the territory, especially on uplands and in the more western parts. Where grinding mills are not near at hand it may be better to drill it thickly in rows three feet apart. This will reduce the yield of grain but give smaller stalks, more readily eaten. A fair crop may be obtained, in favorable seasons by planting after the wheat crop is removed.

