

EXPERIMENT STATION

O F T H E

KANSAS STATE AGRICULTURAL COLLEGE,

M A N H A T T A N .

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FARM DEPARTMENT.

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EXPERIMENTS WITH CORN

The following series of experiments with corn were carried out the past season:

- I. Time of Planting.
- II. Amount of Cultivation.
- III. Methods of Culture.
- IV. Subsoiling vs. Surface Plowing for Corn.
- V. Butt, Middle and Tip Kernels for Seed.
- VI. Fall and Spring Plowing for Corn.
- VII. Early, Medium and Late Varieties.
- VIII. Test of Varieties.

On the whole the season was favorable for the corn crop, and in good soil the yields on the College farm were fair. During the first half of August, however, there was a short period of drought, in which the corn in several of the experiments suffered severely. This was especially true of plats located on the old farm. The experiments were located in various fields, where suitable ground could be found. The conditions governing these experiments are explained under their respective headings.

I. TIME OF PLANTING CORN.

An experiment comprising 35 plats, in which corn was planted at various dates, from the 20th of April to the 29th of May, was located on the old farm, a mile west of the College. The accompanying table shows the dates of planting and the yields per plat and the rate of yield per acre, and also the averages for two years of the same treatment. The land is not the best. It was in grass from 1890 to 1895. The dry season of 1894 almost killed the grass, but, being short of pasture, it was left undisturbed during 1895 also. In the winter 1895-'96 it was broken to the depth of 12 to 14 inches with the "Secretary" plow. This implement did good work, and in the spring of 1896 the soil was in good condition for planting. There were five plats planted on each of the dates named in the table, and each plat covered one-twentieth of an acre, being 14 feet wide by 156 feet long, and contained four rows three feet apart. The rows were planted by hand in shallow lister furrows, two kernels being dropped every 16 inches, and covered with a hoe. The object in planting two kernels is to secure a uniform stand, the plants to be thinned to one in a place after the first cultivation. The variety used was the Leaming, a medium-early yellow corn. The results are shown in table I.

It will be noticed from this table that, in most cases, the heaviest yields resulted from the plantings made in the last of April and beginning of May, and that the average yield of good ears is highest for the planting made May 1, though the total yield from that planting is slightly less than the total yield from April 20. It will also be noticed that there is a falling off from May 1 for every successive planting till May 29. In the averages for the years 1895 and 1896, the early May plantings yield nearly the same as the plantings on the 18th and 20th of April, and they are higher than the yields from any succeeding planting. There is a decided agreement in these results for the two years given, which warrants the inference that the beginning of May is the safest time to plant.

Table I.
TIME OF PLANTING CORN. Plats, one-twentieth of an acre.

No. of plat.	Date of seeding,	Yield of plat.		Rate per acre.		
		Good ears, lbs.	Nub-bins, lbs.	Good ears, bus.	Nub-bins, bus.	Total bus.
1	April 20	110	34	31.42	9.71	41.13
2	" 24	87	47½	24.85	13.57	38.42
3	May 1	90½	35	25.85	10.00	35.85
4	" 8	105½	27	30.14	7.71	37.85
5	" 18	64	43	18.28	12.28	30.56
6	" 25	39	51	11.14	14.57	25.71
7	" 29	32	48	9.14	13.71	22.85
8	April 20	108½	32	31.00	9.14	40.14
9	" 24	111	40	31.71	11.42	43.13
10	May 1	135	26	38.57	7.42	45.99
11	" 8	127	40	36.28	11.42	47.70
12	" 18	75	47	21.42	13.42	34.84
13	" 25	67	50	19.14	14.28	33.42
14	" 29	41	56	11.71	16.00	27.71
15	April 20	92	43	26.28	12.28	38.56
16	" 24	52	40	14.85	11.42	26.27
17	May 1	87	48½	24.85	13.85	38.70
18	" 8	59	52	16.85	14.85	31.70
19	" 18	46	43	13.14	12.28	25.42
20	" 25	44	53	12.57	15.14	27.51
21	" 29	31	54	8.85	15.42	24.27
22	April 20	101	46	28.85	13.14	41.99
23	" 24	104	47	29.71	13.42	43.13
24	May 1	128	35	36.57	10.00	46.57
25	" 8	123	32	35.14	9.14	44.28
26	" 18	74	43	21.14	12.28	33.42
27	" 25	81	47	23.14	13.42	36.56
28	" 29	49	57	14.00	16.28	30.28
29	April 20	101	52	28.85	14.85	43.70
30	" 24	91	45	26.00	12.85	38.85
31	May 1	94	41	24.42	11.71	36.13
32	" 8	85½	38	26.85	10.85	37.70
33	" 18	64	45	18.28	12.85	31.13
34	" 25	70	37	20.00	10.57	30.57
35	" 29	61	46	17.42	13.14	30.56
Averages	April 20			29.28	11.82	41.10
	" 24			25.42	12.53	37.95
	May 1			30.05	10.59	40.64
	" 8			29.05	10.79	39.84
	" 18			18.45	12.62	31.07
	" 25			17.19	13.59	30.78
	" 29			12.22	14.91	27.13

SUMMARY OF AVERAGES FOR TWO YEARS.

Date of seeding.		Rate of yield per acre, in bushels.		
1896.	1895.	Total average.	1896.	1895.
April 20	April 18	36.99	41.10	32.88
" 24	" 25	34.81	37.95	31.67
May 1	May 2	36.97	40.64	33.30
" 8	" 9	30.30	39.84	30.76
" 18	" 16	28.03	31.07	25.00
" 25	" 23	24.70	30.78	18.62
" 29	" 30	23.60	27.13	20.08

II. AMOUNT OF CULTIVATION.

This experiment was located on the old farm, adjoining the preceding one. The ground had been broken shallow in the fall of 1895, and was in the spring plowed with the "Secretary" plow to the depth of 12 to 14 inches. Shallow furrows were opened with the lister for planting, and two kernels were dropped every 16 inches and covered with a hoe. Where both kernels grew, one plant was removed shortly after the first cultivation. The plats were one-twentieth of an acre, containing four rows three feet apart and 156 feet long. There were 24 plats in this experiment, four plats under each method of treatment. They were cultivated from one to six times during the season, not on any fixed dates, but at the time the work would do the most good. The purpose of the experiment is to ascertain how much cultivation it is profitable to give the corn-field, and to be well within the limit of necessity the extremes must obviously show less cultivation than the crop would require on the one hand and more than was necessary on the other. The results are shown in table II. While the averages of these series of four plats each show the greatest yield from the plats cultivated six times, still the yield is only .4 of a bushel more from the plats cultivated six times than from those cultivated four times, while the average of the plats cultivated five times is less than either four or six times. The inference would be that, cost of labor considered, four cultivations during the season is more profitable than either a greater or less number. In the averages for the three-year period, four times have produced the best yields. This agrees also with experiments in former years when the plats were cultivated from once in four weeks to three times a week. The results show that it is possible to cultivate corn too much as well as too little. The Leaming was the variety used.

III. METHODS OF CULTURE.

This experiment was likewise located on the old farm. For want of available ground, it occupied only 12 plats. Six methods of culture were employed and each method tested with two plats. As in the preceding cases, the plats contained four rows each, being 14 feet wide and 156 feet long. The Leaming was the variety used. The ground was broken shallow in the fall and plowed to the depth of 12 to 14 inches by the "Secretary" plow.

The methods of culture require some explanation. On the listed plats the furrows were opened with a lister in the usual way, and those plats which were given deep culture were cultivated with a

Table II.
 AMOUNT OF CULTIVATION. Plats, one-twentieth of an acre.

No. of plat.	Times cultivated during the season.	Yield of plat.		Rate per acre.		
		Good ears, lbs.	Nub-bins, lbs.	Good ears, bus.	Nub-bins, bus.	Total, bus.
36	One time	107	26	30.57	7.42	37.99
37	Two times	128	32	36.57	9.14	45.71
38	Three times	147	23	42.00	6.57	48.57
39	Four times	174	20	49.71	5.71	55.42
40	Five times	160	20	45.71	5.71	51.42
41	Six times	140	23	40.00	6.57	46.57
42	One time	110	33	31.42	9.42	40.84
43	Two times	120	31	34.28	8.85	43.13
44	Three times	119	30	34.00	8.57	42.57
45	Four times	145	27	41.57	7.71	49.28
46	Five times	158	23	45.14	6.57	51.71
47	Six times	140	21	40.00	6.00	46.00
48	One time	89	40	25.42	11.42	36.84
49	Two times	130	28	37.14	8.00	45.14
50	Three times	118	27	33.71	7.71	41.42
51	Four times	150	19	42.85	5.42	48.27
52	Five times	133	22	38.00	6.28	44.28
53	Six times	178	23	50.85	6.57	57.42
54	One time	100	22	28.57	6.28	34.85
55	Two times	123	30	35.14	8.57	43.71
56	Three times	125	24	35.71	6.85	42.56
57	Four times	130	20	37.14	5.71	42.85
58	Five times	136	24	38.85	6.85	45.70
59	Six times	144	22	41.14	6.28	47.42
Averages	One time			28.99	8.63	37.62
	Two times			35.73	8.64	44.37
	Three times			36.35	7.42	43.77
	Four times			42.81	6.13	48.94
	Five times			41.92	6.35	48.27
	Six times			42.99	6.35	49.34

SUMMARY OF AVERAGES FOR THREE YEARS.

Times cultivated during the season.	Rate of yield per acre, in bushels.			
	Total averages.	1896.	1895.	1891.
One time	30.52	37.62	23.42	.....
Two times	47.77	44.42	30.88	68.03
Three times	35.11	43.77	26.45	.....
Four times	48.59	48.94	20.77	76.06
Five times	34.39	48.27	20.51	.....
Six times	45.50	49.34	17.03	70.03

large four-shovel cultivator, and those which were given shallow culture were cultivated with a spring-tooth cultivator.

On the surface-planted plats the rows were marked out with a small single shovel. Deep and shallow culture were in like manner cultivated with a large four-plow cultivator for the deep culture and with a spring-tooth cultivator for shallow culture, the deep culture being given early in the season before the roots spread far into the row, and the shallow culture in the latter half of the season. The surface culture was given with a Towers surface cultivator. All plats were cultivated four times, and all at the same date. Table III gives the results.

The listed plats gave better yields than other methods of culture the past year, and the average is in favor of listing and shallow culture. There is, however, but little difference in the results between deep and shallow culture of listed plats in the averages of four years. In three out of four years given in the table, listing produced better results than surface planting. Surface planting and shallow culture produced the best yields in 1892. For surface-planted corn, the method of plowing deep the first two times it is cultivated and then shallow for the last of the season gave better results both the past year and on the average of four years than the other methods of cultivating surface-planted corn that we have tried. Much will, of course, depend upon the nature of the soil, the nature of the season as to rainfall, and also whether the ground is foul with weeds or reasonably clean, and it is, therefore, impossible to say just when a given method is the most desirable to follow. The decision is left to the farmer's own judgment, but the results show that these methods of culture influence the yield, and that here, under our conditions, listing is in the majority of cases to be preferred to surface planting. Our experience also seems to indicate that it is not best to pin one's faith strictly to the shallow culture that we see advocated by some writers with much persistence in the agricultural press—that a judicious mixture of deep and shallow culture gives better results than to continue either one or the other through the entire season.

Table III.

METHODS OF CULTURE. Plats, one-twentieth of an acre.

No. of plat.	Treatment of plat.	Yield of plat.		Rate per acre.		
		Good ears, lbs.	Nubbins, lbs.	Good ears, bus.	Nubbins, bus.	Total, bus.
60.....	Listed, deep culture.....	172	16	49.14	4.57	53.71
61.....	Listed, shallow culture.....	161	22	46.00	6.28	52.28
62.....	Surface planted, deep culture.....	122	23	34.85	6.57	41.42
63.....	Surface planted, shallow culture.....	103	30	29.42	8.57	37.99
64.....	Surface planted, deep and shallow culture.....	117	25	33.42	7.14	40.56
65.....	Surface planted, surface culture.....	90	30	25.71	8.57	34.28
66.....	Listed, deep culture.....	107	33	30.57	9.42	39.99
67.....	Listed, shallow culture.....	128	24	36.57	6.85	43.42
68.....	Surface planted, deep culture.....	89	26	25.42	7.42	32.84
69.....	Surface planted, shallow culture.....	75	37	21.42	10.57	31.99
70.....	Surface planted, deep and shallow culture.....	102	28	29.14	8.00	37.14
71.....	Surface planted, surface culture.....	99	30	28.28	8.57	36.85
Averages...	Listed, deep culture.....			39.85	6.99	46.84
	Listed, shallow culture.....			41.28	6.56	47.84
	Surface planted, deep culture.....			30.13	6.99	37.12
	Surface planted, shallow culture.....			25.42	9.57	34.99
	Surface planted, deep and shallow culture.....			31.28	7.57	38.85
	Surface planted, surface culture.....			26.99	8.57	35.56

SUMMARY OF AVERAGES FOR FOUR YEARS.

Treatment of plat.	Rate of yield per acre, in bushels.				
	Total average.	1896.	1895.	1893.	1892.
Listed, deep culture.....	29.69	46.84	18.37	30.33	23.22
Listed, shallow culture.....	29.25	47.84	15.91	26.13	27.14
Surface planted, deep culture.....	27.33	37.12	17.94	26.25	28.02
Surface planted, shallow culture.....	26.99	34.99	13.80	29.16	30.02
Surface planted, deep and shallow culture.....	28.15	38.85	16.17	28.87	28.74
Surface planted, surface culture.....	23.02	35.56	10.31	28.60	17.62

IV. SUBSOILING vs. SURFACE PLOWING FOR CORN.

The following experiments, detailed in table IV, have been carried out during the last few years:

First: In the spring of 1894 three plats were subsoiled, alternating with three surface-plowed plats. Each plat measured a little over .15 of an acre. The subsoiling was done by first plowing a furrow with an ordinary turning plow, and following this furrow with the old-fashioned shoe subsoiler. The subsoiler was run 15 inches deep on the land side, and the loose earth measured 18 inches in depth after it was smoothed down with a harrow. This was planted to corn, but the severe drought of that season caused an entire crop failure, and we had therefore nothing to report. In the spring of 1895 these same plats were again planted to corn without being resubsoiled, but with the ordinary plowing and preparation of corn land. The crop was a light one. It is shown in the averages for the 1895 crop in the table below. The average yield of the three surface-plowed plats was at the rate of 14.32 bushels per acre, and of the three subsoiled plats 15.21 bushels per acre.

Second: In the fall of 1894 three more plats were subsoiled, alternating with three plowed plats. These six plats lay alongside of the plats subsoiled in the spring of 1894, and the ground was of the same character and the plats of the same size. These were also planted to corn in the spring of 1895, with the result that the surface-plowed plats gave an average yield per acre of 22.11 bushels and the subsoiled an average yield per acre of 23.75 bushels, which will be seen agrees with the yield obtained the same year on the soil subsoiled in the spring of 1894. In both cases there was a slight increase in favor of the subsoiling.

Third: In the spring of 1895 three more plats were subsoiled, alternating with three plowed plats. Each of these plats measured a little over .12 of an acre in extent. They were not located in the same field with those above mentioned, but in field No. 5, west of

the main College building. The soil differs somewhat from that previously referred to. It is richer and more porous in character. The subsoil is not so compact. The results of the crop in 1895 on these plats are in like manner shown in the averages of the table. The surface-plowed plats averaged 35.26 bushels per acre and the subsoiled plats 32.18 bushels, which disagrees with the previous results in that the surface-plowed plats averaged about three bushels per acre more than the subsoiled. The cause may possibly be that the soil was naturally porous, and did not need subsoiling. These facts have all been reported in Bulletin 56.

Fourth: In the fall of 1895 three more plats were subsoiled on the same piece of ground where the plats were located which were subsoiled in the spring and fall of 1894, and they, in like manner, alternated with three surface-plowed plats, and the subsoiling was done in the same manner. These were cropped in corn in 1896, and the result shown in the third division of the accompanying table.

Fifth: In the fall of 1895 we also subsoiled three large plats on the old farm, a mile west of the College. This work was done with a new "Secretary" plow, which operates about as follows: It is provided with a large disc, 26 inches in diameter, which turns on a pivot in the center, and being set at an angle it turns a furrow on the same principle that a disc harrow works. This disc can scoop out a furrow about 8 inches deep and 12 to 14 inches wide. Immediately back of this disc is placed a subsoiler, which can be raised or lowered so as to subsoil deep or shallow, as may be desired. The plats in question were plowed with this implement. The ground was hard, having been in pasture for five years previous. There was no sod, however, because the sod had been destroyed by drought. It took six good horses to pull this plow, but the work was satisfactorily done. It stirred the ground to the depth of 14 to 15 inches, and the only soil not moved at this depth was a little ridge about four inches wide between the tracks of the subsoiler. The plats were 38.5 feet wide by 362 feet long, or a little less than a third of an acre in extent. This was cropped in corn the past season, and the results shown in the fourth division of the table.

Sixth: In the spring of 1896 three more plats were subsoiled in field 5, the results of which are shown in the sixth division of the table. The work was done this time with a Perine subsoiler, and without first plowing a furrow with a turning plow. The ground was moderately loose, and the subsoiler was run 15 inches deep and 14 inches between the furrows. It required six good horses to pull it. This plow did not loosen the soil as thoroughly as the old

shoe subsoiler. A ridge some 10 inches wide was left solid in the bottom between the furrows. The work was done the latter part of April, and the corn was planted soon after.

The above is a condensed review of the subsoiling for corn. We will now give our attention to the crop of 1896, as shown in the six divisions of table IV, and first to the three divisions in the Williston field, subsoiled respectively in the spring of 1894, fall of 1894, and fall of 1895. The three divisions were planted April 27, 1896, to St. Charles corn, a white medium-early variety which has been grown in this region for many years. The rows were 3.5 feet apart and the corn dropped by hand 16 inches apart in the row, two kernels in a place, and later thinned to a stand. The corn was planted in shallow furrows, which were made with a lister. In addition to the weights of grain and fodder, data were also taken as to the average height of the stalk and the average height of the ears from the ground. The height of the stalk is the height from the ground to the base of the tassel. There is some variation in the yield of the several plats, but the averages of similar plats in the first division are almost exactly alike. In the second division the subsoiled plats averaged two bushels per acre less than the surface-plowed plats, and in the third division the subsoiled plats are likewise nearly three bushels behind the surface-plowed plats in the yield. The first two divisions which were in corn in 1895 gave yields which slightly favor the subsoiling. On the average, the surface-plowed plats of the three divisions have yielded 1.68 bushels more per acre than the subsoiled plats.

In the fourth division, comprising the plats of the old farm, the corn was planted May 6. The rows were 3.5 feet apart and the stalks 16 inches apart in the row, as in other cases. The variety used was the Leaming. There is no great variation in the yield of the several plats. The average of the surface-plowed plats shows a yield of 56.42 bushels per acre and the subsoiled plats a yield of 55.45 bushels per acre. This is again slightly in favor of surface plowing and against subsoiling. The plats in field No. 5, comprising the fifth and sixth divisions of the experiment, were planted April 29 with St. Charles corn. The rows, as in former cases, were 3.5 feet apart and the stalks 16 inches apart in the row. There is much uniformity in the yields of the plats. In test of plats subsoiled in the spring of 1895 the average was 51.34 bushels per acre for surface-plowed plats and 50.71 bushels for subsoiled plats, and in test of those subsoiled in the spring of 1896 the average was 45.22 bushels for the surface-plowed plats and 44.75 for the subsoiled plats. The average in both divisions is 48.28 bushels for the surface-plowed

plats and 47.73 bushels for the subsoiled plats. The average for the whole season's experiments is 45.43 bushels for the surface-plowed plats and 44.25 bushels for the subsoiled plats, and the average of all plats for both 1895 and 1896 is 34.02 bushels for surface-plowed plats and 33.43 bushels for subsoiled plats.

Are we to conclude from this that subsoiling is a failure? By no means. The results which numerous earnest, careful farmers have attained in many places throughout the state attest the contrary, but the experiments do show that the results during the past two years at this Station have not warranted the trouble and expense which have been incurred in subsoiling these plats. Possibly it can be accounted for in part: First, by the fact that the subsoil on the Station farm is a rather porous clay loam, without hard-pan, and, with the exception of a few spots, also without gumbo, or soil of similar impervious nature. Investigations on the growth of roots of corn and other crops show that there is practically no difference in the depth to which they penetrated in subsoiled and surface-plowed ground. In the second place, we must bear in mind that one of the benefits from subsoiling is the fact that more of the rainfall can be absorbed and stored in the soil for the use of the crops, and hence a crop on subsoiled ground should stand drought better than a crop on surface-plowed ground; but it so happens that the seasons of both 1895 and 1896 furnished sufficient rainfall for the needs of the corn crop under almost any kind of treatment, and there has therefore not been a chance to test the value of subsoiling from that standpoint. The writer has but little doubt that where the subsoil is compact, and pervious to water to but a slight degree, subsoiling is a benefit. On the other hand, these experiments show that there are also soils which are not always benefited by subsoiling.

Table IV.

SUBSOILING *versus* SURFACE PLOWING FOR CORN.

Subsoiled spring of 1894. FIRST DIVISION. Plats in the Williston field.

No. of plat.	Treatment.	Height of stalk, in feet.	Height of ear from ground, in feet.	Height of ear from ground, in feet.	Area of plat, square feet.	Yield of plat.			Rate per acre.			
						Fodder, lbs.	Good ears, lbs.	Num-bins, lbs.	Fodder, tons.	Good ears, bus.	Num-bins, bus.	Total, bus.
7	Surface plowed.....	7.7	4.7	4.7	6,860	445	414	62	1.41	37.55	5.62	43.17
8	Subsoiled.....	7.5	4.7	4.7	6,860	440	460	57	1.39	41.72	5.17	46.89
9	Surface plowed.....	7.4	4.8	4.8	6,860	428	352	70	1.35	31.93	6.35	38.28
10	Subsoiled.....	7.4	4.6	4.6	6,860	420	376	62	1.33	34.10	5.62	39.72
11	Surface plowed.....	7.8	4.6	4.6	6,860	440.	382	61	1.39	34.65	5.53	40.18
12	Subsoiled.....	7.7	4.6	4.6	6,860	350	387	51	1.11	30.57	4.62	35.19

V. BUTT, MIDDLE AND TIP KERNELS FOR SEED.

We have carried on this experiment for several years, the average results of which are given in the table herewith. In 1896 we devoted nine plats to this experiment, each plat a little less than one-tenth of an acre in extent. There were three plats planted with each kind of seed. The experiment was located on the old farm. The ground was plowed and subsoiled with the "Secretary" plow in April. The plats were planted May 7. The seed was selected from the crop of 1895, i.e., the butt kernels were taken from ears raised from butt kernels in 1895, and the middles and tips in like manner selected from ears raised from middle and tip kernels. By the butt and tip kernels are meant only those at the extremes of the ear which, because of their situation, are for the most part stunted in size and distorted in shape. The seed was planted as in other cases, by hand, two kernels every 16 inches; but in the case of the tips three kernels were dropped, in order to make sure of a stand. The seed was covered with a hoe. On June 1, when the plants were well established, the number of plants were counted, to ascertain the per cent. of germination, with the following results: Of the butts, 85.9 per cent. germinated; of the middles, 90.3 per cent., and of the tips, 72.9 per cent. They were at the same time thinned to one plant in a place, leaving almost a perfect stand. All plats were treated alike in every respect during the summer. On October 23 the corn was husked and weighed, with the result given in table V.

The average of the three plats planted with each kind of seed is in favor of the butt kernels to the extent of a bushel and a peck over middle kernels and to the extent of three bushels over the tip kernels, but in an average of five years, shown in the table, the butts are only .7 of a bushel ahead of the tips, while there is nearly a bushel and a peck difference between the butts and the middles in favor of the former. If the experiment shows anything, it is that it is not necessary to select the kernels from the middle of the ear, as is sometimes advocated, in order to get a fair yield. The results have varied in several years. Out of the five years we have tried the experiment, the butt kernels have given the best yield three years, the middle kernels one year, and the tip kernels one year. While the results are thus in favor of the butt kernels, the writer would not go so far as to say that they ought to be selected for seed; but it is safe to say that there does not appear to be any reason for rejecting them.

Table V.

BUTT, MIDDLE AND TIP KERNELS OF CORN FOR SEED. Plats. 4,158 square feet.

No. of plat.	Nature of seed.	Yield of plat.		Rate per acre.		
		Good ears, lbs.	Nubbins, lbs.	Good ears, bus.	Nubbins, bus.	Total bus.
84.....	Butt kernels.....	339	31	50.73	4.63	55.36
85.....	Middle kernels.....	343	30	51.33	4.48	55.81
86.....	Tip kernels.....	300	32	44.89	4.78	49.67
87.....	Butt kernels.....	324	31½	48.48	4.71	53.19
88.....	Middle kernels.....	310	22	46.39	3.29	49.68
89.....	Tip kernels.....	306	3½	45.79	4.56	50.35
90.....	Butt kernels.....	355	31	53.12	4.63	57.75
91.....	Middle kernels.....	339	27	50.73	4.04	54.77
92.....	Tip kernels.....	349	38½	52.23	5.77	58.00
Averages...	Butt kernels.....			50.77	4.65	55.42
	Middle kernels.....			49.48	3.93	53.41
	Tip kernels.....			47.63	5.03	52.66

SUMMARY OF AVERAGES FOR FIVE YEARS.

Nature of seed.	Rate of yield per acre, in bushels.					
	Total average.	1896.	1895.	1893.	1892.	1891.
Butt kernels.....	39.74	55.42	18.82	30.96	27.40	66.11
Middle kernels.....	38.52	53.41	16.85	28.19	31.64	62.51
Tip kernels.....	39.04	52.66	16.14	34.73	30.57	61.14

VI. FALL vs. SPRING PLOWING FOR CORN.

The land on which this experiment was tried was in navy beans in 1895, which crop left it clean and in excellent condition. Six plats were laid out in the fall, three of which were plowed eight inches deep November 23, and the other three were left until April 4, when they were plowed eight inches deep and harrowed down. Shallow furrows were opened with a lister. All plats were planted to St. Charles corn April 27. The stalks were thinned to 16 inches apart in the row, and the plats treated alike in all respects. On October 26 the corn was husked and weighed, with the results as given in the table.

Table VI.

FALL vs. SPRING PLOWING FOR CORN. Plats. 8,477 square feet.

No. of plat.	Treatment.	Yield of plat.		Rate per acre.		
		Good ears, lbs.	Nubbins, lbs.	Good ears, bus.	Nubbins, bus.	Total bus.
1.....	Fall plowed.....	732	40	53.73	2.93	56.66
2.....	Spring plowed.....	705	43	54.75	3.15	57.90
3.....	Fall plowed.....	686	43	50.35	3.15	53.50
4.....	Spring plowed.....	684	49	50.21	3.59	53.80
5.....	Fall plowed.....	722	40	53.00	2.93	55.93
6.....	Spring plowed.....	707	47	51.89	3.45	55.34
Averages..	Fall plowed.....			52.36	3.00	55.36
	Spring plowed.....			51.88	3.39	54.67

The yield, it will be seen, is slightly in favor of fall plowing, probably because the soil has had more time to settle, and does not dry out so readily as spring-plowed ground. The probability is that the difference would have been more marked had the season been unfavorable.

VII. COMPARISON OF YIELDS BETWEEN EARLY, MEDIUM AND LATE VARIETIES.

Twelve plats, each nearly one-tenth of an acre in size, were laid off on the old farm for this experiment. The ground, like all the rest of that field, was in grass from 1890 to 1895, inclusive. It was subsoiled with the "Secretary" plow, and on May 12 seeded to the varieties of corn named in table. The object of the experiment is to ascertain whether an early, a medium or late maturing variety will give the best returns, one season with another, for a series of years. Farmers are usually advised to plant early corn, which will have attained its growth before the dry season sets in in July and August. While this is undoubtedly true in some years, it is equally true that in a favorable season the late-maturing varieties give the best yields. The furrows were opened with a lister, and the corn planted 16 inches apart in the rows. The varieties grew well from the start, and scarcely any difference could be seen in height or vigor between the plats until early in July. By July 11 the Extra Early Huron Dent had fully tasseled, while the Mastodon had just begun to show a few tassels and came into full tassel some few days later, and the Golden Beauty began tasseling July 18. By August 10 the Huron Dent was in the hard dough, and ripe August 17, when it was cut and shocked. The Mastodon was ripe August 25 and the Golden Beauty ripe September 3, and both of the latter were cut and shocked September 4. On October 22 all plats were husked and weighed, with results as given in table VII.

The yield of each variety on the several plats is quite uniform, and while there is but little difference in yield between the medium and late varieties, the early variety averages about 16 bushels less per acre than the medium and 17 bushels less than the late variety. During the two years we have grown these same varieties in comparison, the Extra Early Huron Dent averages 29.62 bushels per acre, the Mastodon 38.49 bushels, and the Golden Beauty 40.38 bushels. In 1895 the season was less favorable than in 1896, and the difference in yield between the early and late is less marked.

Table VII.
EARLY, MEDIUM AND LATE VARIETIES. Plats. 4,158 square feet.

No. of plat.	Variety.	Date of tasseling.	Date of ripening.	Yield of plat.			Rate per acre.			
				Good ears, lbs.	Nub-bins, lbs.	Fod-der, tons.	Good ears, bus.	Nub-bins, bus.	Total, bus.	
72....	Ex. E'rly Huron Dent.	July 11	Aug. 17	221	32	.....	33.07	4.78	37.85
73....	Early Mastodon	" 14	" 25	342	36	.....	51.18	5.38	56.56
74....	Golden Beauty	" 18	Sept. 3	367	31	.....	54.92	4.63	59.55
75....	Ex. E'rly Huron Dent.	" 11	Aug. 17	222	35	.....	33.22	5.23	38.45
76....	Early Mastodon	" 14	" 25	315	31½	.....	47.14	4.71	51.85
77....	Golden Beauty	" 18	Sept. 3	335	27½	.....	50.13	4.11	54.24
78....	Ex. E'rly Huron Dent.	" 11	Aug. 17	218	41	.....	32.62	6.13	38.75
79....	Early Mastodon	" 14	" 25	327½	33½	.....	49.01	5.01	54.02
80....	Golden Beauty	" 18	Sept. 3	338	28	.....	50.58	4.19	54.77
81....	Ex. E'rly Huron Dent.	" 11	Aug. 17	228	29	.....	34.12	4.34	38.46
82....	Early Mastodon	" 14	" 25	328½	30½	.....	49.16	4.56	53.72
83....	Golden Beauty	" 18	Sept. 3	327	29	.....	48.93	4.33	53.26
Averages: Extra Early Huron Dent89	33.24	5.12	38.36
Early Mastodon							1.72	49.12	4.91	54.03
Golden Beauty							2.35	51.14	4.31	55.45

SUMMARY OF TWO YEARS' AVERAGES.

Variety.	Rate of yield per acre, in bushels.		
	Total average.	1896.	1895.
Extra Early Huron Dent	29.62	38.36	20.88
Early Mastodon	38.49	54.03	22.96
Golden Beauty	40.38	55.45	25.31

VIII. TEST OF VARIETIES.

Forty-five varieties were tested the past season. They were grown on plats one-twentieth of an acre in extent each. Instead of the usual long and narrow plats that we use for the most part in testing corn, we in this instance used nearly square plats. This was to lessen the evil, if possible, of cross-fertilization between adjoining varieties. The experiment was located in field D. The land was manured in the fall of 1893. It was seeded to grass in 1894, but the grass proved a failure. In 1895 it was in millet. It was plowed that fall and put in corn in the spring of 1896. The seed was planted May 8 and 9, in rows 3.5 feet apart and 16 inches between the stalks in the row. Two kernels were dropped in each place, and thinned to a stand after the first cultivation. The stand was not perfect, but, owing to the fact that when stalks are missing those which are left have more room in which to grow, and therefore develop under more favorable conditions than where the stand is perfect, it is not possible to make an exact estimate of what the yield ought to be, and the figures given in table VIII are those which each plat yielded. The table shows when each va-

Table VIII.

TEST OF VARIETIES OF CORN Plots, one-twentieth of an acre.

No. of plat.	WHITE VARIETIES.	When sown.	When ripe.	Height of stalk, in feet.....	Height of ear from ground, in feet.....	Yield of plat.		Ratio per acre.			Seed from.	
						Fod-der, lbs.	Good ears, lbs.	Fod-der, tons.	Good ears, bus.	Nub-bins, bus.		Total, bus.
1	Blount's Prolific	July 16	Aug. 24	7 2	4 6	185	155	1 85	41 28	3 42	47 70	Suffern.
2	Leaming*	" 13	" 22	7 2	3 9	452	180	1 52	51 42	4 00	55 42	Kansas Exp. Sta.
3	Boone County White...	" 16	" 24	7 5	4 0	285	182	2 63	52 0	1 00	56 00	Kansas Exp. Sta.
4	Clampson White Pearl.	" 14	" 21	7 0	4 0	480	187	1 60	53 92	2 00	53 42	Suffern.
5	Dekand's Improved...	" 16	" 25	7 6	4 2	211	156	1 91	44 71	3 14	46 57	Delano Bros.
6	First Premium White Dent	" 16	" 25	8 2	4 8	914	167	2 14	17 00	14 57	30 85	Everitt.
7	Possydt's Favorite.	" 16	" 27	8 4	4 9	199	160	1 99	35 71	7 14	54 37	Suffern.
8	Hickory King	" 16	" 29	7 7	4 0	176	125	1 76	55 71	12 00	50 00	Healey.
9	Honley White	" 23	Sept. 1	8 4	4 2	325	153	3 25	58 50	6 00	52 81	Kansas Exp. Sta.
10	Hannan's Early White	" 15	Aug. 17	8 4	4 0	155	173	1 90	52 57	3 42	52 81	Kansas Exp. Sta.
11	Leaming*	" 13	" 17	7 8	4 0	325	161	3 25	49 42	5 57	29 42	Mosby.
12	Extra Early	" 15	Aug. 4	10 0	6 0	325	163	1 80	46 57	5 14	51 71	Delano Bros.
13	Nebraska Prize..	" 20	Aug. 24	7 5	4 0	269	161	2 05	49 00	10 00	56 00	Suffern.
14	St. Charles	" 15	" 31	8 9	5 2	269	161	2 05	49 00	10 00	56 00	Suffern.
15	Thoroughbred White Flint.....	" 6	" 11	6 3	2 5	143	124	1 45	39 42	10 28	45 70	Phillips Seed Co.
YELLOW VARIETIES.												
16	Chester County Mammoth..	July 16	Aug. 24	7 4	3 8	405	136	1 05	38 85	6 57	45 42	Suffern.
17	Champion Yellow Dent.	" 11	" 17	7 3	4 0	455	148	1 55	42 28	10 00	52 28	Suffern.
18	Clarae Yellow..	" 16	" 24	6 7	3 5	426	161	1 26	46 00	4 67	50 57	Phillips Seed Co.
19	Capital	" 6	" 12	7 1	4 4	180	133	1 50	43 71	8 00	51 71	Kansas Exp. Sta.
20	Dakota Dent.	" 16	" 24	6 2	2 3	426	165	1 26	30 28	10 28	40 56	Suffern.
21	Early Buteba	" 6	" 12	5 6	3 0	95	135	1 45	39 14	8 28	46 85	Suffern.
22	Early Mustang	" 6	" 25	6 2	4 0	145	137	1 45	38 14	8 28	47 42	Suffern.
23	Extra Early Hyvon Dent	" 6	" 12	5 6	3 3	75	113	1 75	32 28	8 85	41 13	Suffern.
24	Early Yellow Rose	" 16	" 22	6 2	4 3	195	138	1 95	45 14	10 57	55 71	Delano Bros.
25	Early Thompson	" 13	" 22	6 2	3 7	146	151	1 55	43 71	5 71	49 71	Delano Bros.
26	Everitt's Mortgage Lifter	" 17	" 24	7 1	4 1	135	153	1 45	44 00	5 14	48 85	Everitt.
27	Fowler's Favorite	" 16	" 25	7 5	4 0	170	111	1 70	40 28	7 14	47 42	Kansas Exp. Sta.
28	Golden Beauty	" 16	" 24	7 4	4 4	170	169	2 10	48 28	6 85	55 13	Suffern.
29	Improved Reming	" 11	" 17	7 5	4 5	160	181	1 60	51 71	6 00	57 71	Suffern.
30	King Gold Mine.	" 13	" 21	6 7	4 1	140	162	1 40	46 28	6 00	52 28	Delano Bros.
31	King of the Earliest	" 6	" 11	5 8	3 0	100	140	1 85	49 14	8 28	48 28	Kansas Exp. Sta.
32	Legal Tender	" 11	" 25	7 9	4 5	485	172	1 85	49 14	5 14	54 28	Suffern.
33	Manuce Valley..	" 12	" 17	6 6	3 5	100	136	1 00	38 85	8 28	47 13	Phillips Seed Co.
34	Minnesota King.	" 10	" 17	6 8	3 5	90	112	1 90	32 00	6 85	38 85	Leonard.
35	Nebraska Iron Clad	" 14	" 25	7 0	3 5	120	146	1 20	41 71	4 00	45 71	Delano Bros.

36	Prasa Queen	July 20	Aug. 28	7 8	4 8	190	06	34	1 90	30 28	9 71	39 99	Kansas Exp. Sta., Leonard
37	Prude of the North, Leaming	" 16	" 17	7 2	4 0	140	99	22	1 40	28 28	6 28	34 56	
38	Prude of Kansas, University No. 13..	" 14	" 28	7 4	4 2	150	147	30	1 50	42 29	5 51	47 71	Kansas Exp. Sta., Minn. Exp. Sta.
39	University No. 13..	" 17	" 11	8 0	4 6	220	118	26	2 20	42 28	8 28	50 56	
40	University No. 26..	" 6	" 8	6 3	3 2	190	136	27	1 90	38 53	7 71	46 56	Minn. Exp. Sta.
41	University No. 57..	" 5	" 6	5 3	2 0	110	95	38	1 10	27 14	19 85	37 99	Minn. Exp. Sta.
42		" 4	" 6	4 0	1 3	110	74	49	1 10	21 14	11 00	35 14	Minn. Exp. Sta.

MIXED VARIETIES.

43	Honley Red..	July 17	Aug. 28	8 6	4 8	245	191	30	2 45	37 42	8 57	45 99	Honley, Bush.
44	Bush's Calico King	" 14	" 17	7 0	4 2	175	171	22	1 75	49 71	6 28	55 99	
45	King Philip	" 10	" 21	6 3	3 7	153	132	22	1 50	52 00	6 28	58 28	Kansas Exp. Sta., Minn. Exp. Sta.
46	University No. 45..	" 9	" 12	6 3	3 0	103	132	21	1 05	43 42	6 85	50 27	
47	Leaming*	" 13	" 21	6 8	3 2	180	181	14	1 80	51 71	4 00	55 71	Kansas Exp. Sta.
48	White Cap Yellow Dent	" 10	" 17	6 6	3 6	117	130	23	1 17	37 14	6 57	43 71	Delano Bros.
	Average of similar plats: Leaming..	" 13	" 19	7 3	3 9	139	170 1	15	1 59	48 64	4 28	52 92	Kansas Exp. Sta.

*A yellow variety.

riety tasseled, when it was ripe, the height of the stalk in feet, the height of the ear from the ground, the yield per plat, the rate of yield per acre, and the last column gives the name of the seedsman from whom the seed was obtained.

Table IX gives a summary of the yields of those of the varieties which have been grown here several years, arranged according to the rate of yield.

Seed received from the following sources, as indicated in the table:

- C. W. Bush, Grandville, Ill.
- Delano Bros., Lee Park, Neb.
- J. A. Everitt, Indianapolis, Ind.
- Frederick Henley, Gradley, Kas.
- Kansas Experiment Station, Manhattan, Kas.
- S. F. Leonard, Chicago, Ill.
- Minnesota Experiment Station, St. Anthony Park, Minn.
- J. K. Mosby, Lockhart, Miss.
- Henry Philips Seed Company, Toledo, Ohio.
- J. C. Suffern, Voorhies, Ill.

SUMMARY OF RESULTS.

Time of Planting Corn: We have obtained the best results from corn planted early in May or the last of April. Successive weekly plantings from the first to the last of May show a successive decrease in yield corresponding with the lateness of planting.

Amount of Cultivation: In an experiment to ascertain the amount of cultivation most profitable for a corn crop, the results seem to indicate that four cultivations would, under the conditions of our experiments, be more profitable than either a greater or less number. The amount of cultivation that a crop requires must, of course, depend on several things, as the nature of the soil, the nature of the season, whether the soil is foul with weeds or reasonably free from weeds, as well as on the thoroughness of the work.

Methods of Culture: In a comparison between listing and surface planting, the average of four years' trials is in favor of listing. As between deep and shallow culture, deep plowing while the corn is small, before the shovels can tear the roots, and shallow plowing in the later cultivations, have given better results than either deep culture throughout the season or shallow culture throughout the season.

Subsoiling Compared with Surface Plowing: A somewhat thorough test of this question fails to show an increase in yield of corn on subsoiled ground. The average of all trials is slightly in favor of

Table IX.

VARIETIES OF CORN, ARRANGED ACCORDING TO AVERAGE YIELD.

VARIETY.	Average of 5 years.		1896.		1895.		1893.		1892.		1891.	
	Rate per acre, in bushels	Rank	Rate per acre, in bushels	Rank	Rate per acre, in bushels	Rank	Rate per acre, in bushels	Rank	Rate per acre, in bushels	Rank	Rate per acre, in bushels	Rank
Early Thompson.....	57.68	1	49.71	22	65.65	1	.....	.....	.....	.....	.....	.....
Bush's Calico King.....	.....	.....	55.99	6	.....	.....	.....	.....	.....	.....	.....	.....
Hartman's Early White.....	55.77	2	58.57	1	.....	.....	26.13	10	50.13	7	88.28	1
Pride of Kansas.....	54.56	3	50.56	19	.....	.....	23.85	15	63.14	2	80.69	4
Boone County White.....	53.99	4	56.00	4	.....	.....	29.28	4	52.99	6	77.70	6
Early Yellow Rose.....	52.16	5	55.71	7	48.61	5	.....	.....	.....	.....	.....	.....
King Philip.....	51.94	6	58.28	2	.....	.....	.....	.....	27.71	17	69.85	8
Nebraska Prize.....	.....	.....	51.71	15	.....	.....	.....	.....	.....	.....	.....	.....
Champion Yellow Dent.....	51.21	7	52.28	13	50.15	4	.....	.....	.....	.....	.....	.....
First Premium White Dent.....	.....	.....	50.85	17	.....	.....	.....	.....	.....	.....	.....	.....
Piasa Queen.....	50.52	8	39.99	40	.....	.....	21.99	16	56.57	4	88.56	2
Blount's Prolific.....	50.51	9	47.70	25	24.33	18	32.28	1	71.27	1	76.99	7
University No. 15.....	.....	.....	50.27	20	.....	.....	.....	.....	.....	.....	.....	.....
Henley White.....	.....	.....	50.00	21	.....	.....	.....	.....	.....	.....	.....	.....
Maumee Valley.....	49.70	10	47.13	28	.....	.....	.....	.....	.....	.....	52.27	19
Legal Tender.....	49.49	11	54.28	11	.....	.....	28.13	7	35.42	13	80.14	5
Golden Beauty.....	49.43	12	55.13	9	46.49	8	.....	.....	33.28	15	62.85	14
Leaming.....	48.94	13	52.92	12	47.38	6	28.57	6	34.71	14	81.13	3
Iowa Gold Mine.....	48.78	14	52.28	14	45.28	9	.....	.....	.....	.....	.....	.....
Capital.....	48.67	15	51.71	16	.....	.....	29.85	3	47.42	8	65.71	11
Chester County Mammoth.....	48.44	16	45.42	35	55.69	2	25.70	12	46.28	10	51.56	20
Clarage Yellow.....	47.47	17	50.57	18	.....	.....	.....	.....	39.42	12	52.42	18
Farmer's Favorite.....	47.13	18	47.42	26	.....	.....	.....	.....	28.42	16	63.56	12
University No. 13.....	.....	.....	46.56	31	.....	.....	.....	.....	.....	.....	.....	.....
Thoroughbred White Flint.....	46.48	19	45.70	34	.....	.....	24.84	13	46.99	9	68.42	9
Nebraska Iron Clad.....	46.48	20	43.71	33	47.26	7	.....	.....	.....	.....	.....	.....
Henley Red.....	.....	.....	45.59	32	.....	.....	.....	.....	.....	.....	.....	.....
Early Mastodon.....	45.90	21	47.42	27	51.54	3	24.27	14	41.13	11	65.14	13
St. Charles.....	45.06	22	56.00	5	23.13	15	.....	.....	.....	.....	45.06	25
Pride of the North.....	42.32	23	34.56	44	.....	.....	25.71	11	54.28	5	37.13	16
Champion White Pearl.....	42.05	24	55.42	8	42.46	12	32.13	2	14.42	23	65.85	10
Hickory King.....	40.85	25	42.85	37	31.72	14	.....	.....	.....	.....	47.99	23
White Cap Yellow Dent.....	40.45	26	43.71	36	42.82	11	.....	.....	17.99	22	57.29	15
Forsyth's Favorite.....	40.42	27	54.57	10	.....	.....	26.27	9	.....	.....	.....	.....
King of the Earliest.....	39.89	28	43.28	34	.....	.....	.....	.....	18.70	21	52.70	17
Early Butler.....	39.81	29	46.85	29	37.11	13	.....	.....	26.99	18	48.28	22
University No. 26.....	.....	.....	37.99	42	.....	.....	.....	.....	.....	.....	.....	.....
Everitt's Mortgage Lifter.....	37.78	30	48.85	23	.....	.....	26.71	8	.....	.....	.....	.....
Deland's Improved.....	37.31	31	46.57	30	28.05	16	.....	.....	.....	.....	.....	.....
Dakota Dent.....	36.57	32	40.56	39	.....	.....	28.88	5	26.56	19	50.28	21
Minnesota King.....	35.46	33	38.85	41	.....	.....	.....	.....	21.85	20	45.70	24
University No. 57.....	.....	.....	35.14	43	.....	.....	.....	.....	.....	.....	.....	.....
Improved Leaming.....	34.92	34	57.71	3	.....	.....	12.13	19	.....	.....	.....	.....
Extra Early Huron Dent.....	34.57	35	41.13	38	43.18	10	19.42	18	.....	.....	.....	.....
Mosby's Prolific.....	33.54	36	29.42	45	25.77	17	20.85	17	60.71	3	30.99	26

surface plowing. This, of course, can apply only to soils similar to that on the Station farm; but the experiments do show that there are soils on which subsoiling does not benefit the corn crop. The soil on the Station farm is classed as a clay loam.

Butt, Middle and Tip Kernels for Seed: The average of five years' trials show that there is no material difference in yield between kernels selected from the butt, middle and tip of the ear. The results do not indicate that the tip and butt kernels ought to be rejected and only perfect-shaped kernels used for seed—theories to the contrary notwithstanding.

Fall Plowing Compared with Spring Plowing for Corn: This ex-

periment has been tried but one season. The results from this one trial are slightly in favor of fall plowing.

Early, Medium and Late Varieties: In a comparison between three varieties, ripening at different periods, the early corn yielded much less both of corn and fodder than either the medium or late maturing varieties the past season. An average for the two years of 1895 and 1896 likewise shows that the late variety yielded the best. Both seasons were favorable to the corn crop. It is doubtless true that in a dry year an early variety may sometimes yield a light crop while a late variety will be a total failure.

Test of Varieties: In an average of three or more years the following varieties have yielded over 50 bushels, ranking in the order named: Early Thompson, Hartman's Early White, Pride of Kansas, Boone County White, Early Yellow Rose, King Philip, and Champion Yellow Dent.