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CORN AND OATS EXPERIMENTS, 1893.

EXPERIMENTS WITH CORN.

This bulletin gives the results of some experiments with field corn in 1893, together with the summary of the results obtained in the same experiments in 1888, 1889, 1890, 1891, and 1892.

The following are reported:

No. 1. Test of varieties.
No. 3. Time of planting.
No. 4. Depth of planting.
No. 5. Thickness of planting.
No. 6. Planting in hills or drills.
No. 8. Frequency of cultivation.
No. 9. Depth of cultivation.
No. 10. Effect of root-pruning.
No. 23. Continuous cropping with corn contrasted with rotation of crops.
No. 71. Corn fodder, effect of ripeness.
No. 89. Cross fertilization.
No. 90. Growth of the corn plant; increase of its dry matter.

SUMMARY.

The experiments were tried on the dark colored, fertile, prairie soil common to central Illinois. The surface soil is about 18 inches deep, underlaid with yellow clay. The land on which the tests of varieties were conducted had been in corn in 1892. It was plowed in the spring, no fertilizers being applied. The land used for most of the other experiments had been in clover in 1892, and was plowed in the spring after a liberal application of stable manure. The corn was planted by hand and covered with the hoe, the rows being 3 ft. 8 in. apart, and the hills, generally, the same distance apart in the rows.

The season was characterized by extreme drought during the summer months. The rainfall for the five months from May to Sept., inclusive, was 10.65 in.; but that from June 11th to Sept. 11th was only .94 of an inch. The mean temperature for the five months and for each month was not materially different from the average for the past five years. The yields of corn and of stover were less in all the experiments, as well as in the other field crops on the University farm, than in any year since 1887. The exceptional character of the season reduces the value of the results obtained in most of the experiments. This is believed to be especially true of the results in the tests of varieties. But the conclusions reached from a comparison of the results of experiments tried for six successive years are probably the more valuable because they include this unusually unfavorable year.

The results of the experiments for the six years, from 1888 to 1893, well illustrate the fact that the soil and climate of central Illinois is admirably adapted to the production of Indian corn. Eleven different varieties have been cultivated in each of these six years without exceptionally good care or treatment of any kind, and without the application of other than stable manure. The average yield of air-dry corn of these eleven varieties has been almost 63 bu. per acre.

The division of varieties into early, medium, and late maturing is necessarily somewhat arbitrarily made. The average yield of all early varieties has been 54, of medium, 65, and of late maturing, 59 bu. per acre. The largest average yield of any one variety for the six years has been slightly under 70 bu. per acre.

The average yield of air-dry stover for five years, from the medium maturing variety, Burr's white, when planted in rows 3 ft. 8 in. apart, is 4.5, 3.5, 3, and 2.8 tons per acre, when planted at the rate of one kernel every 3, 6, 9, 12, and 15 in., respectively. As corn is ordinarily planted, 3 tons per acre is a good yield of stover.

The tests at the Station indicate the advisability of the selection of medium rather than either early or late maturing varieties; those with ears above the average, but not remarkably large in size, and those which combine as many good qualities as possible. But some of the most profitable varieties have been faulty in some respects. The largest yields of shelled corn have not been secured from varieties with the smallest cobs, or with deepest kernels, or, in all cases, with symmetrical ears. As a rule, it is not advisable to select for the main crop a variety which has been produced far north or south of the latitude in which it is to be planted. A small acreage of some early maturing variety may be profitably planted for use in the early autumn. Such varieties are also valuable if corn must be planted exceptionally late.

No one variety has been shown to be greatly superior to all others. There are many varieties much resembling each other. It has not been shown that the yield depends upon either the color of the kernel, or on the exact shape of either the ear, or the kernel. Large numbers of

excellent varieties have been obtained from different sources, often when they have had little more than a neighborhood reputation. The claims made for many varieties advertised by seedsmen have not been sustained. In many cases there seems little reason for Illinois farmers to send out of their own county for seed corn. Corn obtained from different sources under the same name often differs materially. Corn obtained with differing names is often much alike.

The results of experiments with cross-bred corn suggest the importance of thorough trials of the practice of crossing desirable varieties. Uniformity of type is sacrificed, but in a large majority of the trials made at the Station the yields from cross-bred seed have been larger than those from the pure bred parent seed.

Contrary to the opinion and practice of the large majority of Illinois farmers, the results of the experiments as to thickness of planting, almost without exception, indicate that thicker planting than is ordinarily practiced will give larger yields of both corn and stalks. In five years out of six, planting at the rate of at least 12,000 kernels per acre, which is equivalent to 4 kernels per hill in the rows at the usual distances for planting in Illinois, has given larger yields of corn than thinner plantings. In the exceptionally dry year, 1893, somewhat thinner planting gave better results. The thicker planting produces smaller ears, and reduces the average weight of the stalks. The result of all trials at the Station clearly indicates that in average seasons, in central Illinois at least, a lessened yield may be expected if the number of stalks is less than 3 a hill.

In no year out of the six was any material difference shown in the yield of corn, whether planted in hills or drills, where an equal number of kernels was planted, and the ground kept equally free from weeds.

The date of planting, within reasonable limits, has not materially affected the yield. The largest average yields have been secured by planting from May 10th to 15th, with no material variation in yield, if the planting was done at any time from May 1st to 25th. If the ground was in equally good condition at the time of planting, less cultivation has usually been necessary for the later than for the earlier plantings.

Uniformly shallow covering has been found somewhat better than deep covering; but it is probable that the corn is more carefully, covered by the use of the hoe than it is where machines are used.

Shallow cultivation has uniformly given better results than has deep. Purposed root-pruning has in all cases decreased the yield. It has not been proved that comparatively deep culture, while the corn is small, would be injurious. Unusually frequent cultivation has in some cases decreased the yield, and in no case been profitable. No one implement has been shown to be clearly superior to all others. It is believed the best results can be secured with the smallest expenditure of time and labor by having the ground in good condition at the time of planting beginning cultivation before grass or weeds have made much growth,

and stirring the entire surface of the soil as nearly as practicable to the depth of not more than 2 or 3 in., often enough to keep the surface well pulverized and to prevent the growth of weeds and grass. Each year yields of corn not much below the average have been secured without any cultivation subsequent to planting, except scraping the surface with a sharp hoe to prevent the growth of weeds. On soils of different texture other methods of cultivation may be better.

Repeated observations show that the percentage of dry matter in the corn plant, both stalk and ear, increases up to the time of maturing. It has not been shown that the digestibility is decreased as maturity increases. In many cases the palatability of both stalk and ear does decrease. Leaving the stalks uncut until they reach full maturity increases probability of loss from storms, and often makes it necessary to harvest the crop in less favorable weather. It seems clearly proved, however, that there often has been a considerable loss in the total food value of the crop by cutting it at too early a stage, whether designed for ensilage or for dry fodder. The percentage of water in the young corn plant is surprisingly large, while the quantity of dry matter and the food value is very much less than that found as the plant approaches full maturity.

Characteristics of the Season.

The year 1893 was exceptionally unfavorable for corn in Illinois, especially in the central eastern portion. The rainfall was above the average in April and May, but was almost unprecedentedly light for a period of three months beginning June 11th. As stated before, from this date to September 11th, the total rainfall at the Station was only .94 of an inch. The temperature during all the growing season was somewhat below the average, but in no month noticeably different from it. The unusual drought greatly interfered with the growth of the corn and reduced the yields in all cases, both of grain and of stover. The later varieties were more seriously affected than those ripening earlier. Varieties which in former years gave remarkably large yields, but which usually did not mature sufficiently early to be counted desirable for central Illinois, in 1893 were almost total failures so far as the yield of grain was concerned. In one case there was 69 per cent of the stalks without any ears. Most of the varieties ordinarily classed as late ripened at such a date as to be classed with the medium, and some varieties, usually classed as medium, had to be put with the early maturing varieties.

In view of these unfavorable conditions much less importance should be attached to the varying yields of different varieties than to their average yields for the series of years during which they have been tested by the Station.

The table gives the mean temperature and the rainfall in inches from May to September, inclusive, for each year from 1887 to 1893.

The records for 1887 and 1888 are those of the Illinois Weather Service for central Illinois. For the remaining years the records are those of the observations made at the Station.

TEMPERATURE AND RAINFALL DURING THE CORN SEASON OF YEARS NAMED.

	Mean temperature, F.					
Year	May.	June.	July.	August.	Sept.	Average.
1887	67.9°	73.6°	80.4°	75.2°	66.4°	72.7°
1888	59.4°	71.3°	77°	72.4°	62.4°	68.5°
1889	59.2°	65.5°	72.7°	69.2°	61.3°	65.6°
1890	58.3°	74.6°	73°	68.7°	60.5°	67°
1891	58.4°	72°	70°	70.2°	69.2°	68°
1892	57.9°	70.6°	73.3°	71.5°	63.9°	67.4°
1893	57.4°	70.5°	76.4°	71.1°	66.5°	68.4°
Average, 1889–93	58.2°	70.6°	73.1°	70.1°	64.3°	67.3°
	Rainfall, inches.					Aggregate
1887	3.84	1.62	1.65	2.56	3.68	13.35
1888	6.84	5.75	5.34	3.14	1.95	23.02
1889	5.52	6.81	5.84	.6	2.74	21.51
1890	3.56	3.8	2.83	1.93	1.19	13.31
1891	.89	2.08	1.41	2.86	.41	7.65
1892	7.86	5.36	2.5	2.43	.93	19.08
1893	4.83	1.55	.59	.06	3.62	10.65
Average, 1889–93	4.53	3.92	2.63	1.57	1.78	14.44

Experiment No. 1. Corn, Testing Varieties.

Tests of varieties of dent corn have been made for seven consecutive years, reports of which may be found in bulletins No. 4, 8, 13, 20, and 25.

The land used in 1893 was the same as that used for this experiment the preceding year. The stalks were removed, the land plowed about five inches deep, harrowed twice, and marked a few days before planting. The corn was planted by hand, six kernels a hill, in checks 3 ft. 8 in. apart, and was covered about two inches deep with a hoe.

The planting was done May 19th to 23d. The plats, 119 in number, each one-fortieth of an acre, 2 rods or 9 hills square, were so planted that corn grew on every side. June 9th to 24th the corn was cultivated three times with surface cultivators, the first time with the "Superior" and the second and third times with the "Tower." July 18th to 24th the remaining weeds were removed with a hoe. Soon after the first cultivation the corn was thinned to four plants a hill. Plats 31, 87, 89, 90, 93, and 100 failed and were again planted, this time with Murdock, but no account is made of them in what follows. The number of barren stalks and the average height to tips of tassels and butts of ears

were ascertained for each plat. Observations were made on the time of ripening. October 7th to 13th the plats were husked by thirds and the weight and number of ears ascertained for each third. The middle third was at once shelled, the number and weight of both good ears and nubbins, and the weight of both shelled corn and cobs, being ascertained. A pint jar of shelled corn from each plat was sent to the laboratory for the determination of water. Eleven per cent is taken as the average water content of air-dry corn.

Duplicate Plats.

While the attempt was to have uniform soil and like treatment throughout, the differences in yield, as in former years, of plats planted with the same variety were considerable. There were four plats each of Leaming and Murdock, and two plats each of fourteen other varieties, as shown in the table. The greatest difference in yield per acre between two plats of the same variety was with Murdock, 15 bu.; Leaming, 13.8 bu.; the average difference, Murdock, 8.2 bu.; Leaming, 7.5 bu.; and the least difference, Murdock, 4.2 bu.; Leaming, 1 bu.

These differences, though considerable, are somewhat less than those found between different varieties of even the same class. For example, the greatest difference between two plats of the 49 planted with early maturing varieties was 26.9 bu. an acre, and of the 49 medium maturing, 29.4 bu.

Yield per Acre of Air-dry Corn upon Duplicate Plats, 1893.

Variety.	a	b	c	d	Average.
Murdock	43.4	33.5	37.7	28.4	35.7
Leaming	30.7	29.7	43.5	34.5	34.6
Edmonds	24.7	32.9	.....	.....	28.3
Dunlap's white	28.4	28.1	.....	.....	28.2
Steward's improved	29.7	36.2	.....	.....	33
Riley's favorite	38.6	37.6	.....	.....	38.1
Boone county white	32.9	34.6	.....	.....	33.8
Burr's white	35.2	42	.....	.....	38.6
Hess white	40.8	29.5	.....	.....	35.2
Hughes	31.6	37.1	.....	.....	34.4
Clark's Onarga	37.7	34.3	.....	.....	36
Thomas	31.5	29.2	.....	.....	30.4
Log cabin	22.7	31.8	.....	.....	27.3
Bickerdike's early mammoth	21.1	29	.....	.....	25.1
Helms improved	11.6	20.4	.....	.....	16
Yellow [no name]	30.6	30	.....	.....	30.3

When the variation of yield of different varieties does not exceed that of different plats of the same variety the results are inconclusive. A greater variation may properly be attributed, in part at least, to the variety. If single plats are used, it is only after varieties have been tested for a series of years that we can conclude which are the most prolific; but other things can be ascertained in a single year, such as time of maturity, size, ratio of ears to stalks, ratio of shelled corn to cobs, and the general characteristics of stalk and ear. If several plats,

widely distributed over the tract, are used for each variety and the average yields ascertained, these form a better basis for a comparison of the varieties in respect to yield; for in this way the effect of differences in the conditions of the test is much diminished.

Mixtures.

Four plats were planted, each with equal parts of two varieties of corn, and one with equal parts of four varieties. The accompanying table gives the number of ears and bushels an acre for each variety planted separately, and their average as compared with the result of the mixture. In four out of the five cases the mixtures gave larger yields than the average of the varieties composing them. This is contrary to the results of 1892, when in four out of five cases the yields were smaller for the mixtures. In 1892, the average difference in yield was 3.7 bu. an acre in favor of the varieties grown separately; in 1893, 2.4 bu. in favor of the mixtures.

Results of Mixtures, 1893.

Plat No.	Name of Variety.	Yield per acre.	
		No. of ears.	Bu. air-dry corn.
45 & 110	Hughes	8520	34.3
63 & 111	Thomas	7620	30.4
	Average	8700	32.3
101	Mixture of Hughes and Thomas	9000	20.5
13 & 115	Burr's white	10200	38.6
12 & 114	Boone county white	8690	33.8
	Average	9445	36.2
102	Mixture	8760	36.7
57 & 97	Riley's favorite	6300	38.1
34 & 107	Bickerdike's early mammoth	8280	25.1
11 & 106	Hess white	9660	35.2
10 & 86	Dunlap's white	7980	28.2
	Average	8055	31.6
103	Mixture	9600	37.5
	Murdock (average of 4 plats)	9600	35.7
58 & 98	Edmonds	7740	28.3
	Average	8670	32
104	Mixture	9120	37.3
	Leaming (average of 4 plats)	8070	34.6
56 & 96	Clark's Onarga	9240	36
	Average	8655	35.3
105	Mixture	9360	47.3

Classification of Varieties.

The table on page 340 gives a classification of the varieties tested this year, and the yield of air-dry corn by each variety. It is based upon the time of ripening, color, and smoothness or roughness of the outer end of the kernels. Varieties maturing before Sept. 13th are classed as early; those maturing Sept. 13th to Sept. 30th, as medium; and those maturing after Oct. 1st, as late. The varieties that are very near the

SYNOPSIS OF VARIETIES, 1893.

- Corn
  - Early
    - Yellow
      - Smooth
        - Leaming (av. 4 plats) 33.3
        - Star 27.3
        - Woodhull 22
        - Bickerdike's early mammoth 21.1
        - Clarage 22.1
        - Yellow (no name) 22.3
        - Munns 30.3
        - Clark's Iroquois 30.7
        - B. O. E. ensilage 40
        - Queen of the field 33.4
        - Thomas corn 31.5
        - Minnesota king 26.8
        - Early Huron 37.6
        - Early Butler 35.5
        - Cuban queen 40.4

        30.3
      - Rough
        - Murdock (av. 4 plats) 35.7
        - Chester county mammoth 17.3
        - Log cabin 22.7
        - Eclipse 16.1
        - Yellow (no name) 34.5
        - Edmonds (av. 2 plats) 28.8
        - Legal tender 33.8
        - Pride of the north 30.1
        - Yellow (no name) 21.8
        - Pride of Columbia 34.6
        - King of the earlies 31.7
        - Wisconsin yellow 33.9
        - Leaming 34.5

        28.9
    - White
      - Smooth
        - White (no name) 19.5
        - Champion white pearl 42
        - White (no name) 30.4
        - Mills county white 33.2
        - White (no name) 35.2
        - Baker's white 26

        31
      - Rough
        - Ohio white dent 26.8
        - Dunlap's white (av. 2 plats) 28.2
        - Ivory dent 28.9
        - Wisconsin white 34.9
        - Van's early 31.6
        - White (no name) 39.2
        - Callaway's white 32

        31.7
  - Smooth
    - Pride of Kansas 35.5
    - Golden beauty 36.4
    - Fisk's yellow 19.5
    - Yellow (no name) 27.1
    - Hughes (av. 2 plats) 34.3
    - Leaming 31.8
    - Sterling 22
    - Clark's Onarga (av. 2 plats) 36
    - 90-day 30.2
    - Arleus 33.2
    - Branson's climax 40.8
    - Nims prolific 31.8
    - Waterloo extra early 30.8
    - Early golden 19.3
    - Golden dent 30.6
    - Bickerdike's early mammoth 29
    - Log cabin 31.8
    - Thomas corn 29.2

    30.5

Medium	Yellow	Rough	Piasa queen	16	29.1
			Farmers' interest	29	
			Prentice corn	24.2	
			Champaign county prolific	22	
			Early mastodon	28.3	
			Cloud's early	30.5	
			Baker's yellow	26	
			California yellow	30.4	
			Yellow (no name) (av. 2 plats)	30.3	
			Steward's improved (av. 2 plats)	32.9	
			Riley's favorite (av. 2 plats)	38.1	
			Little boss	25.5	
			Leaming	43.5	
	Mixed	Rough	Blue River	45.2	
	White	Smooth	Hess white (av. 2 plats)	35.1	
		Rough	Piasa king	23.6	32
			Fisk's white	41.2	
			Boone Co. white (av. 2 plats)	33.7	
			Burr's white (av. 2 plats)	38.6	
			White beauty	34.8	
			Champion white pearl	37.3	
			Clark's favorite	15.8	
			Short stalk	31.1	
Late	White	Smooth	Helms improved (av. 2 plats)	16	

dividing lines as to time of maturity and smoothness or roughness, are subject from year to year to change from one class to another, hence we see that the classification for 1893 differs considerably from that of former years. The fact that so many varieties which have heretofore been classed as medium, fall this year into the early class, can be accounted for by the dryness of the season.

Results.

The number of plats in each of the three classes, early, medium and late, and the results for each class for each of six years, are shown in the table on page 343. In each of the years 1888 to 1892, inclusive, there has been an average of from four-fifths to seven-eights of a full stand, reckoning four stalks in each hill as a full stand. In 1893, however, the stand was more nearly perfect, it being over 93 per cent. The better stand was due to the fact that the corn was planted thicker than usual, and afterward thinned to four plants a hill.

For 1888, 1890, 1891, and 1892 the per cent of barren stalks was comparatively uniform, averaging about eleven; while in 1889 it dropped to about 1.5 per cent, and in 1893 went up to 22, 23, and 50 per cent for the three classes, early, medium, and late, respectively. Only one variety was classed as late, and it has made some very good yields in former years. The noticeable barrenness in 1893, is probably due, chiefly, to the severe drought and the fact that the corn was planted thicker than formerly.

Though varying much from year to year, owing to the nature of the season, in general the height of both stalks and ears increased with lateness of maturity, as did also the length and circumference of ears.

In general the weight of 100 ears has increased, and the number of ears per acre decreased with the lateness of maturing. The pounds of ear corn, as weighed when husked, which must be taken to make a bushel of air-dry shelled corn, invariably increase with the lateness of maturity. This is due largely to the fact that the per cent of water is greater in the late maturing varieties when husked.

Each year, excepting 1892, the medium maturing varieties have made the largest average yields; the average of air-dry shelled corn for the six years being as follows: Medium, 65.3 bu.; late, 59.5 bu.; and early, 54.4 bu. per acre.

The following table gives the yield for each of eight varieties for seven years, and of eleven for six years, arranged in the order of the average yields. Of these varieties, champion white pearl, Burr's white, and Helms improved, are white; the others are yellow. Murdock and Edmonds are early maturing, Helms improved, late, and the others, medium. The average yield of the eleven varieties for six years is 62.9 bu. per acre. Other varieties of considerable merit, that have been tested for three or more years, are Dunlap's white, Clark's Onarga, California yellow, and ivory dent.

YIELD OF AIR-DRY CORN OF VARIETIES TESTED FOR YEARS NAMED.

Eight varieties tested in	1887.	1888.	1889.	1890.	1891.	1892.	1893.	Av.
Leaming	29.6	86.6	80.6	69.4	67.3	70.1	34.6	62.6
Champion white pearl	20.2	70	94.8	74.9	76.5	65	37.3	62.4
Burr's white	30	85.9	75.7	67.7	67.7	64.2	38.6	61.4
Steward's improved yellow	32.4	91.2	68.7	54.7	58.4	74.4	33	59
Riley's favorite	30.8	81.8	66.1	53.3	56.1	74.1	38.1	57.2
Murdock	33.3	80.3	65	61.6	59.8	57.6	35.7	56.2
Legal tender	25.8	84.2	68.9	60	56.8	60.3	33.8	55.7
Edmonds	27.7	83.7	66.3	55.9	58.6	58.4	28.3	54.1

Eleven varieties tested in	1888.	1889.	1890.	1891.	1892.	1893.	Av.
Champion white pearl	70	94.8	74.9	76.5	65	37.3	69.7
Leaming	86.6	80.6	69.4	67.3	70.1	34.6	68.1
Burr's white	85.9	75.7	67.7	67.7	64.2	38.6	66.6
Steward's improved yellow	91.2	68.7	54.7	58.4	74.4	33	63.4
Clark's Iroquois	68.5	81.9	59	65.4	72.9	30.7	63.1
Riley's favorite	83.7	66.3	55.9	58.6	74.1	38.1	62.8
Helms improved	84.8	102.6	51.1	39	79.2	16	62.1
Fisk's yellow	76.6	79.5	61.7	57.4	60.1	19.5	59.1
Legal tender	84.2	68.7	60	56.8	60.3	33.8	60.6
Murdock	80.3	65	61.6	59.8	57.6	35.7	60
Edmonds	81.1	66.1	53.3	56.1	58.4	28.3	57.2

A comparison of the white and yellow varieties for 1893, shows an average yield of 30.5 bu. an acre for the white and 30.4 bu. for the yellow. A comparison of the rough and smooth ones, gives an average yield of 30.6 bu. an acre for the rough and 30.3 bu. for the smooth. The average yield per acre for six years is 61.6 bu. for the white, and 60.4 bu. for the yellow.

SUMMARY OF RESULTS WITH THE THREE CLASSES—EARLY, MEDIUM, AND LATE MATURING—FOR EACH OF SIX YEARS.

	Per cent.				Average.							Weight, lb.			Lb. ears.		Yield per acre, bu.				Loss per acre in drying, bu.	Per cent water in corn as husked.
	Kernels germinating in apparatus.	Kernels germinating in field.	Of full stand.	Of barren stalks.	Height stalks, ft.	Height butt of ear, feet.	Length 3 specimen ears, in.	Circum. 3 specimen ears, in.	Circum. 3 specimen cobs, in.	Number good ears per acre.	Number nubbins per acre.	Total number ears per acre.	100 good ears.	100 nubbins.	100 average ears.	As husked per bu.	As husked per bu. air-dry.	From good ears.	From nubbins.	Total, as husked.	Total air-dry.		
Av. of Plats, 1888—																						
27 early	96	84	88	8	9.8	4.5	8.3	6.3	3.7	7597	2948	10545	60	35	53	67.2	73.3	67.5	15.1	82.6	75.6	7	18.3
32 medium	97	80	87	11	11.5	5.5	9	7	4	7482	2741	10223	74	33	68	68.4	78.1	84	18	102	89.8	12.2	21.8
15 late	90	74	85	13	12.2	6.2	9.7	7.2	4.2	6263	2745	9008	93	51	80	71.4	87.8	81.2	20.4	101.6	83.2	18.4	27.2
Av. of plats, 1889—																						
3 early	93	70	84	1.7	6.9	2.8	7.4	6.2	3.4	6520	3360	9880	46	26	39	66.1	70.6	45.8	13.5	59.3	55.6	3.7	16.6
42 medium	97	68	80	1.2	8.9	4.2	8.1	6.4	3.9	6695	3535	10230	72	40	61	69.6	81.1	68.8	19.7	88.5	75.4	13.1	23.8
22 late	96	65	78	.5	9.9	4.7	9.6	7.2	4.3	6055	3840	9895	81	43	67	72	90.2	70	22.2	92.2	73.5	18.7	28.8
Av. of plats, 1890—																						
14 early	96	81	79	10	8.1	3.5	8.1	6.4	3.7	5374	3610	8984	55	28	44	66.2	70.4	44.5	14.8	59.3	55.6	3.7	16.5
29 medium	94	86	83	12	9.6	4.5	8.3	6.6	3.8	5292	3749	9041	61.3	31.9	50	67.2	73.3	50	17.7	67.7	62	5.7	18.4
8 late	93	81	79	13	10.1	5.2	8.4	6.2	3.3	4651	3806	8457	60.1	34.1	48.7	67.1	78	47.1	18.5	65.6	56.6	9	23.2
Av. of plats, 1891—																						
13 early	....	87	86.1	10.4	6.8	3.4	7.6	6.2	3.7	5464	4088	9552	49.6	28.5	40.2	*66.3	72	....	....	*58.2	56.1	....	*14.3
19 medium	....	88.4	86.4	12.6	7.7	4.2	8	6.6	3.9	6334	3400	9734	58.6	31.6	48.8	*69.3	75.8	....	....	*69.9	66.1	....	*15.9
6 late	....	87	84	14.8	8.6	4.3	7.5	6.2	3.9	5112	3400	8513	61.3	33	49.8	*67.7	86.8	....	....	*63.9	57.4	....	*20.3
Av. of plats, 1892—																						
16 early	96	91	81	8	8.1	3.7	7.7	6.1	3.5	5242	4681	9922	53	25	41	68.1	77.4	....	....	60	52.8	7.2	21.6
67 medium	89	87	82	9	8.8	4.3	8.4	6.6	3.9	5438	4473	9858	66	35	53	68.4	76.6	....	....	75.8	68	7.8	20.5
9 late	93	85	80	10	10.2	5.4	8.8	7	4	5011	4064	9075	81	47	69	71	89.9	....	....	88.1	70.2	17.9	29.3
Av. of plats, 1893—																						
49 early	96	....	94	22	7.3	3.3	....	....	....	2258	6448	8706	48	24	30	71.4	84	....	....	35.8	30.7	5.1	23.7
49 medium	95	....	92	23	7.7	3.6	....	....	....	2385	5542	7927	55	27	35	73.7	91.9	....	....	39.1	31.5	7.6	28.4
2 late	96	....	98	50	8	4.3	....	....	....	1320	3060	4380	49	25	33	77	108.8	....	....	22.6	16	6.6	37.2

*When shelled.

VARIETY OF CORN; SOURCE OF SEED; GERMINATION; STAND; BARREN STALKS; HEIGHT OF STALKS AND EARS, 1893.

Plat.	Name of Variety.	Seed received from,		Per cent germinat'g in Geneva apparatus.	Per cent of full stand of stalks.	Per cent of barren stalks.	Date of ripening.	Height, ft. Stalks.	Height, ft. Ears.
1	Leaming	University farm		96	89	16	Sep. 13	8.3	3.9
2	Helms improved	Fred Helms	Belleville, Ill.	96	102	69	Oct. 5	8.1	4.4
3	Piasa queen	E. P. Kellenberger	Godfrey, Ill.	100	107	54	Sep. 25	8.3	4
4	Piasa king	" "	" "	92	98	41	" 25	8.7	4.4
5	Murdock	University farm		100	91	17	" 13	7.7	3.5
6	Blue River	J. Percival	Champaign, Ill.	100	86	10	" 25	8.2	4.5
7	Fisk's white	E. C. Fisk	Havana, Ill.	98	91	21	" 25	8.5	3.9
8	Ohio white dent	M. H. Smith & Son	De Soto, Neb.	84	90	28	" 13	7.7	4.2
9	White variety (no name)	William Sieck, Jr.	Greenville, Ill.	100	105	26	" 13	7.2	3.4
10	Dunlap's white	H. M. Dunlap	Savoy, Ill.	96	93	28	" 13	7.3	3.3
11	Hess white	Agricultural Experimental Station	Columbus, Ohio	92	89	19	" 25	7.7	3.7
12	Boone county white	James Riley	Thorntown, Ind.	98	90	22	" 25	7.8	3.4
13	Burr's white	University farm		88	94	25	" 25	7.4	3.4
14	Champion white pearl	E. P. Kellenberger	Godfrey, Ill.	100	105	14	" 13	7.8	3.7
15	Ivory dent	R. H. Vanderhoof	Newton, Ill.	98	90	22	" 13	7.5	3.6
16	White corn (no name)	J. C. Sweet	Fairbury, Ill.	....	94	30	" 13	7.3	3.5
17	White beauty	R. H. Vanderhoof	Newton, Ill.	98	92	15	" 25	8.4	4.3
18	Mills county white	Nims Bros	Emerson, Iowa	96	87	22	" 13	7.6	3.3
19	White corn	John Ramseyer	Congerville, Ill.	96	96	24	" 13	6.7	2.8
20	Champion white pearl	W. W. Barnard	Chicago	....	82	25	" 25	7.6	3.2
21	Farmers' interest	Geo. T. Leatherman	Burlington, W. Va.	100	93	31	" 25	6.9	3.2
22	Star corn	S. P. Campbell	Loami, Ill.	100	85	29	" 13	7.7	3.7
23	Prentice corn	Geo. Prentice	Hallock, Ill.	98	88	34	" 25	6.6	3.1
24	Woodhull	Samuel Wilson	Mechanicsville, Pa.	98	95	44	" 13	7.2	3
25	Pride of Kansas	" "	" "	94	105	19	" 25	7.7	3.6
26	Chester county mammoth	J. C. Vaughan	Chicago	92	93	51	" 13	7.7	3.6
27	Champaign county prolific	" "	"	100	100	38	" 25	7.2	3 3

28	Early mastodon	Currie Bros	Milwaukee	76	63	22	Sep.	25	7	2.9
29	Golden beauty	W. W. Barnard	Chicago	....	74	19	"	25	8.1	3.8
30	Cloud's early	Henry A. Dreer	Philadelphia	78	85	23	"	25	7.6	2.7
32	Log cabin	C. N. Butt	Knoxville, Ill	100	98	34	"	13	7.7	3.6
33	Fisk's yellow	E. C. Fisk	Havana, Ill	96	94	39	"	25	6.6	3.1
34	Bickerdike's early mammoth	James Bickerdike	Griggsville, Ill	96	104	38	"	13	7	3.2
35	Clark's favorite	James B. Martin	Atwood, Ill	....	104	28	"	25	7.1	3.2
36	Clarage	Agricultural Experiment Station.	Columbus, Ohio	....	96	33	"	13	7.6	3.6
37	Eclipse	E. P. Kellenberger	Godfrey, Ill	100	108	49	"	13	7.8	3.9
38	Yellow (no name)	J. A. Foote	Terre Haute, Ind	....	95	35	"	13	7.4	3.7
39	Baker's yellow	G. W. L. Baker	Payson, Ill	100	101	30	"	25	7.9	4.2
40	California yellow	J. C. Vaughan	Chicago	96	97	15	"	25	8.1	3.8
41	Yellow (no name)	B. S. Tyler	Decatur, Ill	92	86	35	"	25	8.1	3.9
42	Yellow (no name)	W. C. Gibbs	Winchester, Ill	100	98	23	"	25	7.7	3.6
43	Munns	Jas. Riley	Thorntown, Ind	94	80	29	"	13	8	3.4
44	Yellow (no name)	Thomas Stephens	Sadorus, Ill	88	96	20	"	13	7.3	3.5
45	Hughes	Agricultural Experiment Station.	Columbus, Ohio	....	99	21	"	25	7.8	4.1
46	Steward's improved	L. W. Steward	Amanda, Ohio	100	96	29	"	25	8.2	4.2
47	Leaming	University farm		96	100	26	"	13	7.9	3.8
48	Clark's Iroquois	H. H. Clark	Onarga, Ill	96	96	24	"	13	6.9	2.9
49	Murdock	University farm		100	97	15	"	13	7.2	3.4
50	Burr Oaks Leaming	J. H. Beagley	Sibley, Ill	94	96	16	"	13	7.6	3.4
51	Short stalks	J. B. Martin	Atwood, Ill	....	98	26	"	25	7.2	3.7
52	B. O. E. Ensilage	J. H. Beagley	Sibley, Ill	92	93	17	"	13	7.6	3.6
53	Leaming	E. P. Kellenberger	Godfrey, Ill	94	101	20	"	25	7.1	3.4
54	Sterling	T. J. Groves	Dana, Ill	96	92	28	"	25	7.3	3.5
55	Improved Leaming	Currie Bros	Milwaukee	98	97	18	"	13	6.9	3.2
56	Clark's Onarga	H. H. Clark	Onarga, Ill	84	93	11	"	25	8	3.8
57	Riley's favorite	James Riley	Thorntown, Ind	100	60	9	"	25	8.3	4.1
58	Edmonds	Fruit & Edmonds	Taylor, Ill	98	95	33	"	13	7.5	3.3
59	Legal tender	Nims Bros	Emerson, Ia	100	103	25	"	13	7.2	3.5
60	90-day	J. W. Babb	Ashland, Ill	98	101	25	"	25	7.3	3.6
61	Queen of the field	J. C. Vaughan	Chicago	100	101	2	"	13	8.2	3.7
62	Arleus	Clement Freeman	Princeton, Ill	92	95	27	"	25	7.7	3.6
63	Thomas corn	Agricultural Experiment Station.	Lincoln, Neb	96	92	36	"	13	6.8	3.1
64	Branson's climax	W. T. Branson	Ipava, Ill	98	90	11	"	25	7.8	3.8
65	Pride of the north	J. C. Vaughan	Chicago	68	53	11	"	13	7.1	3.2
66	Steward's improved	L. W. Steward	Amanda, Ohio	100	97	14	"	25	7.2	3.5
67	Nims prolific	Nims Bros	Emerson, Ia	100	92	28	"	25	7.2	3.5

VARIETY OF CORN; SOURCE OF SEED; GERMINATION; STAND; BARREN STALKS; HEIGHT OF STALKS AND EARS, 1893.—Continued.

Plat.	Name of Variety.	Seed received from,		Per cent germinat'g in Geneva apparatus.	Per cent of full stand of stalks.	Per cent of barren stalks.	Date of Ripening.	Height, ft.	
								Stalks.	Ears.
68	Yellow (no name)	E. C. Fisk	Havana, Ill	100	94	15	Sep. 13	6.7	3
69	Pride of Columbia	J. H. Beagley	Sibley, Ill	100	96	16	" 13	7.1	2.9
70	Baker's white	G. W. L. Baker	Payson, Ill	100	92	13	" 13	6.4	2.6
71	Waterloo extra early	Burpee & Co	Philadelphia	....	92	27	" 25	7.5	3.4
72	Minnesota king	N. B. & G. Co	Minneapolis	....	91	15	" 13	6.8	2.6
73	Early Huron	Storrs & Harrison Co	Painesville, Ohio	88	92	11	" 13	6.2	2.8
74	Early Butler	" "	" "	92	91	17	" 13	6.5	2.7
75	King of the earlies	" "	" "	88	98	23	" 13	6.2	2.6
76	Little boss	J. B. Martin	Atwood, Ill	....	104	23	" 25	8.3	4.3
77	Cuban queen	Nims Bros	Emerson, Ia	92	96	15	" 13	6.5	3.2
78	Wisconsin yellow	J. C. Vaughan	Chicago	96	95	16	" 13	6.7	2.5
79	Wisconsin white	" "	"	100	86	7	" 13	7.2	3
80	Van's early	R. H. Vanderhoof	Newton, Ill	98	94	21	" 13	6.2	2.6
81	Early golden	" "	" "	96	96	27	" 25	7.7	3.7
82	Golden dent	" "	" "	100	104	38	" 25	7.5	3.7
83	Murdock	University farm		100	98	13	" 13	7.6	3.3
84	White (no name)	G. G. Hunt	Bristol, Ill	....	104	14	" 13	7	3.1
85	Callaway's white	S. H. Callaway	Orion, Ill	92	93	14	" 13	7.3	3.4
86	Dunlap's white	H. M. Dunlap	Savoy, Ill	96	98	18	" 13	7.2	3.3
88	Leaming	University farm		96	91	16	" 25	7.5	3.2
91	Helms improved	Fred Helms	Belleville, Ill	96	95	31	Oct. 5	7.9	4.2
92	Champion W. pearl—B. W. cross	Ear No. 35g, 1892		....	96	34	Sep. 25	7.9	3.5
94	Leaming—Burr's white cross	" " 6e, 1892		....	94	13	" 25	6.7	3.1
95	Edmonds—Murdock cross	" " 16c, 1892		....	98	15	" 13	6.8	2.8
96	Clark's Onarga	H. H. Clark	Onarga, Ill	84	81	22	" 25	8.2	4.1
97	Riley's favorite	James Riley	Thorntown, Ind	100	91	28	" 25	8.3	3.9
98	Edmonds	J. C. Vaughan	Chicago	....	99	14	" 13	7.2	3.5

99	Edmonds-Burr's white cross	Ear No. 20c, 1892		....	92	13	Sep. 13	7.5	4
101	Mixture *a*			....	91	24	" 25	6.9	2.9
102	Mixture *b*			....	91	14	" 25	8	3.2
103	Mixture *c*			....	85	13	" 13	7.7	3.6
104	Mixture *d*			....	88	14	" 13	7.7	3.4
105	Mixture *e*			....	93	13	" 25	6	3.8
106	Hess white	Agricultural Experiment Station	Columbus, Ohio	92	96	22	" 25	8.2	3.6
107	Bickerdike's early mammoth	James Bickerdike	Griggsville, Ill	96	105	20	" 25	8.3	3.8
108	Yellow (no name)	W. C. Gibbs	Winchester, Ill	100	70	12	" 25	7.8	4.1
109	Log cabin	C. N. Butt	Knoxville, Ill	100	91	8	" 25	7.8	3.1
110	Hughes	Agricultural Experiment Station	Columbus, Ohio	....	101	19	" 25	8	3.4
111	Thomas	" " "	Lincoln, Neb	96	64	13	" 25	6.9	2.7
112	Leaming	University farm		96	82	21	" 13	8 2	3.8
113	Murdock	" "		100	94	21	" 13	7.2	3.1
114	Boone county white	James Riley	Thorntown, Ind	98	95	18	" 25	7.8	3.7
115	Burr's white	University farm		88	95	23	" 25	7.2	3.2
116	Self-husking	Currie Bros	Milwaukee	100	60	32	" 13	4.9	1.4
117	Golden dew drop	Peter Henderson & Co	New York	90	88	47	" 13	4.6	1.5
118	Brazilian flour	Jno. A. Salzer Seed Co	La Crosse, Wis	....	108	26	Oct. 5	7.2	3.7
119	Longfellow	Henry A. Dreer	Philadelphia	82	65	43	Sep 13	5.2	1.6

Number of Ears per Acre, and Weight of 100 Ears, 1893.

Plat.	No. ears per acre.			Wt. 100 ears, lb.		
	Good ears.	Nubbins.	Total.	Good ears.	Nubbins.	Av. ears.
1	2,400	4,440	6,840	68	28	30
2	1,080	2,160	3,240	58	24	32
3	840	4,080	4,920	43	24	30
4	2,640	4,200	6,840	55	30	35
5	4,080	5,520	9,600	46	25	32
6	2,520	5,400	7,920	58	29	41
7	2,280	2,400	4,680	58	34	38
8	3,000	8,280	11,280	48	25	40
9	3,000	8,280	11,280	48	25	28
10	1,440	6,600	8,040	50	24	29
11	2,760	7,320	10,080	58	30	36
12	1,320	6,120	7,440	68	36	37
13	2,884	6,840	9,724	53	25	34
14	2,160	7,560	9,720	50	27	32
15	1,200	8,400	9,600	50	25	29
16	2,160	5,520	7,680	65	25	33
17	720	7,560	8,280	71	33	38
18	2,160	7,560	9,720	53	23	30
19	3,600	6,720	10,320	53	21	32
20	3,000	4,680	7,680	56	29	38
21	1,440	6,240	7,680	56	25	29
22	2,280	4,680	6,960	63	27	41
23	1,440	5,400	6,840	56	26	33
24	2,160	4,080	6,240	43	21	21
25	3,840	5,040	8,880	55	25	38
26	960	5,160	6,120	50	26	28
27	1,320	4,800	6,120	57	24	32
28	2,400	3,000	5,400	65	25	42
29	4,440	3,000	7,440	57	25	45
30	2,400	4,320	6,720	58	29	41
32	1,200	6,360	7,560	48	21	26
33	1,080	5,280	6,360	44	22	29
34	1,200	6,600	7,800	55	21	26
35	1,080	5,400	6,480	50	22	28
36	1,200	5,280	6,480	43	21	23
37	1,200	4,320	5,520	40	24	25
38	960	5,160	6,120	44	23	27
39	2,400	6,240	8,640	44	23	28
40	2,640	6,600	9,240	48	21	30
41	1,800	6,600	8,400	50	20	30
42	2,160	7,680	9,840	49	22	30
43	2,760	4,320	7,080	52	25	33
44	1,680	7,560	9,240	50	28	30
45	2,280	6,000	8,280	54	29	37
46	2,640	5,160	7,800	50	26	31
47	1,680	6,840	8,520	52	25	31
48	2,520	6,120	8,640	48	24	27
49	3,480	6,120	9,600	43	24	28
50	3,840	5,760	9,600	52	27	35
51	2,160	4,920	7,080	53	29	35
52	3,360	5,640	9,000	48	28	35
53	1,920	6,720	8,640	39	25	31
54	2,040	5,640	7,680	60	23	28
55	2,640	6,000	8,640	60	24	33
56	3,000	6,840	9,840	48	30	33
57	3,480	1,920	5,400	57	38	59
58	1,920	3,360	5,280	64	25	33
59	3,000	4,320	7,320	48	29	36
60	2,760	6,480	9,240	50	25	31
61	1,920	9,480	11,400	39	22	22
62	2,640	4,920	7,560	52	27	34
63	2,640	5,520	8,160	48	26	34
64	1,800	8,040	9,840	53	29	35
65	2,640	3,720	6,360	52	26	35
66	2,040	7,920	9,960	53	27	31
67	3,120	5,040	8,160	50	27	34
68	840	6,720	7,560	32	22	22
69	2,160	6,120	8,280	44	30	29
70	840	8,280	9,120	39	20	20
71	3,720	5,520	9,240	48	24	36
72	3,840	6,240	10,080	34	20	25
73	3,360	7,440	10,800	36	18	28
74	2,760	7,200	9,960	40	22	31
75	2,400	7,560	9,960	33	17	23
76	1,560	4,200	5,760	69	24	31
77	2,640	7,200	9,840	44	28	37
78	1,560	9,360	10,920	40	19	25
79	1,440	8,880	10,320	33	20	28
80	2,400	6,960	9,360	40	22	27
81	2,280	4,200	6,480	43	25	29
82	2,280	5,400	7,680	57	29	33
83	1,920	7,560	9,480	58	26	28
84	3,600	6,840	10,440	47	26	35
85	2,400	6,720	9,120	45	25	31
86	840	6,840	7,680	57	25	26
88	3,360	5,520	8,880	55	32	41
91	1,560	3,960	5,520	40	27	34
92	3,240	3,840	7,080	50	21	34
94	5,040	4,440	9,480	48	26	37
95	2,640	7,200	9,840	51	26	32
96	3,000	5,640	8,640	55	26	36
97	3,480	3,720	7,200	57	38	40
98	2,160	8,040	10,200	42	22	27
99	1,440	7,920	9,360	44	27	29
101	1,200	7,800	9,000	45	21	26
102	3,000	5,760	8,760	54	30	39
103	3,000	6,600	9,600	50	25	33
104	1,920	7,200	9,120	48	26	31
105	5,040	4,320	9,360	55	28	41
106	2,400	6,840	9,240	44	22	28
107	1,800	6,960	8,760	60	31	34
108	2,400	3,720	6,120	66	25	48
109	960	8,040	9,000	47	26	35
110	3,720	5,040	8,760	65	31	42
111	3,000	4,080	7,080	62	27	37
112	3,120	4,920	8,040	51	26	35
113	1,920	7,800	9,720	42	18	22
114	1,440	8,400	9,840	71	26	35
115	4,200	6,480	10,680	60	22	41
116	1,200	3,600	4,800	13	9	10
117	2,400	4,800	7,200	24	9	15
118	2,640	3,960	6,600	39	23	23
119	2,400	3,600	6,000	28	11	18

VARIETY TESTS, YIELD, 1893.

Plat.	Name of variety.	Per ct. water in shelled corn as husked.	Lb. per acre ear corn as husked.	Lb. ear corn per bu. as shelled.	Lb. as husked to make bushel air-dry.	Bu. shelled corn per acre.		
						As shelled.	Air-dry.	Loss drying.
1	Leaming	25	2420	66.4	78.8	36.4	30.7	5.7
2	Helms improved	37.5	1250	76	107.8	16.4	11.6	4.8
3	Piasa queen	31.2	1540	74.7	96.2	20.6	16	4.6
4	Piasa king	34 4	2370	74.1	100.4	32	23.6	8.4
5	Murdock	18.1	3200	67.8	73.7	47.2	43.4	3.8
6	Blue River	25	4160	77.5	92	53.7	45.2	8.5
7	Fisk's white	18.2	3240	72.3	78.6	44.8	41.2	3.6
8	Ohio white dent	24.2	2520	80.2	94.1	31.4	26.8	4.6
9	White variety (no name)	24.2	1840	80.2	94.4	22.9	19.5	3.4
10	Dunlap's white	19	2300	73.1	81	31.5	28.4	3.1
11	Hess white	27.6	3600	71.8	88.2	50.1	40.8	9.3
12	Boone county white	31.8	3290	76.6	100	42.9	32.9	10
13	Burr's white	23.4	2950	72.2	83.8	40.9	35.2	5.7
14	Champion white pearl	21.9	3520	73.5	83.8	47.9	42	5.9
15	Ivory dent	28	2690	75.2	93.1	35.8	28.9	6.9
16	White variety (no name)	25.6	2710	74.4	89.1	36.4	30.4	6
17	White beauty	32.4	3480	76	100	45.8	34.8	11
18	Mills county white	21.6	2670	70.9	80.4	37.6	33.2	4.4
19	White variety (no name)	27.6	3200	74	90.9	43.2	35.2	8
20	Champion white pearl	24 7	3200	72.5	85.8	44.1	37.3	6.8
21	Farmers' interest	22	2250	68.1	77.6	33.1	29	4.1
22	Star corn	28.3	2630	77.5	96.3	33.9	27.3	6.6
23	Prentice corn	27.8	2240	75.3	92.6	29.7	24.2	5.5
24	Woodhull	24.5	2100	80.6	95.2	26.1	22	4.1
25	Pride of Kansas	31.3	3590	78.1	101.1	46	35.5	10.5
26	Chester county mammoth	26.5	1530	73	88.4	20.9	17.3	3.6
27	Champaign county prolific	31.5	2050	71.7	93.2	28.6	22	6.6
28	Early mastodon	22.4	2370	73.1	83.7	32.4	28.3	4.1
29	Golden beauty	28.4	3290	72.7	90.4	45.3	36.4	8.9
30	Cloud's early	27.9	2850	76.1	93.4	37.4	30.5	6.9
32	Log cabin	26.1	2040	74.7	89.9	27.3	22.7	4.6
33	Fisk's yellow	31	1900	75.6	97.4	25.1	19.5	5.6
34	Bickerdike's early mammoth	28.9	2040	77.3	96.7	26.4	21.1	5.3
35	Clark's favorite	31.5	1760	85.5	111.4	20.6	15.8	4.8
36	Clarage	19	1670	68.7	75.6	24.3	22.1	2.2
37	Eclipse	30.2	1470	71.8	91.3	20.5	16.1	4.4
38	Yellow variety (no name)	23 7	1870	72	83.9	26	22.3	3.7
39	Baker's yellow	29.7	2260	68.5	86.9	33	26	7
40	California yellow	29.5	2730	71.2	89.8	38.3	30.4	7.9
41	Yellow variety (no name)	27.8	2300	68.9	84.9	33.4	27.1	6.3
42	" " "	29.2	2880	74.9	94.1	38.4	30.6	7.8
43	Munns	21.9	2390	69.2	78.9	34.5	30.3	4.2
44	Yellow variety (no name)	24.4	2890	71.1	83.8	40.7	34.5	6.2
45	Hughes	29.2	3110	78.4	98.4	39.7	31.6	8.1
46	Steward's improved	26	2580	72.2	86.9	35.7	29.7	6
47	Leaming	26.3	2570	71.6	86.5	35.9	29.7	6.2
48	Clark's Iroquois	22 6	2440	69.2	79.5	35.2	30.7	4.5
49	Murdock	29.2	2850	67.8	85.1	42.1	33.5	8.6
50	Burr Oaks Leaming	22.9	3390	72	83.1	47.1	40.8	6.3
51	Short stalk	27	2770	73.2	89.1	37.8	31.1	6.7
52	B. O. E. Ensilage	22.1	3250	71.5	81.3	45.4	40	5.4
53	Leaming	26.2	2850	74.4	89.6	38.3	31.8	6.5

VARIETY TESTS, YIELD, 1893—*Continued.*

Plat.	Name of variety.	Per ct. water in shelled corn as husked.	Lb. ear corn per acre as husked.	Lb. ear corn per bu. as shelled.	Lb. as husked to make bushel air-dry.	Bu. shelled corn per acre. As shelled.	Bu. shelled corn per acre. Air-dry.	Bu. shelled corn per acre. Loss drying.
54	Sterling	28.9	2260	82.1	102.7	27.5	22	5.5
55	Improved Leaming	21.7	3160	72.5	98.4	36.5	32.1	4.4
56	Clark's Onarga	24.7	3150	70.6	83.6	44.6	37.7	6.9
57	Riley's favorite	19.8	3040	71	78.8	42.8	38.6	4.2
58	Edmonds	29.6	2010	64.4	81.4	31.2	24.7	6.5
59	Legal tender	26.3	2980	73	88.2	40.8	33.8	7
60	90-day	30.2	2830	73.5	93 7	38.5	30.2	8.3
61	Queen of the field	17.9	2510	69.4	75.1	36.1	33.4	2.7
62	Arleus	22.3	2700	71	81.3	38	33.2	4.8
63	Thomas corn	22.7	2630	72.5	83.5	36.3	31.5	4.8
64	Branson's climax	27.1	3530	70.8	86.5	49.9	40.8	9.1
65	Pride of the north	23.3	2350	67.2	78.1	35	30.1	4.9
66	Steward's improved	28.8	3180	70.3	87.8	45.2	36.2	9
67	Nims prolific	27.6	2830	72.4	89	39.1	31.8	7.3
68	Yellow variety (no name)	21	1900	77.3	87.2	24.6	21.8	2.8
69	Pride of Columbia	22.1	2670	67.5	77.2	39.6	34.6	5
70	Baker's white	16.9	1840	66.2	70.8	27.8	26	1.8
71	Waterloo extra early	29 2	2690	69.5	87.3	38.7	30.8	7.9
72	Minnesota king	32.1	2540	72.4	94.8	35.1	26.8	8.3
73	Early Huron	17.8	2690	66.1	71.5	40.7	37.6	3.1
74	Early Butler	21.4	2760	68.3	77.7	40.4	35.5	4.9
75	King of the earliest	16.7	2110	62.2	66.6	33.9	31.7	2.2
76	Little boss	23.6	2210	74.3	86.7	29.7	25.5	4.2
77	Cuban queen	26.6	3430	70	84.9	49	40.4	8.6
78	Wisconsin yellow	18.8	2520	67.9	74.3	37.1	33.9	3.2
79	" white	21.2	2850	72.4	81.7	39.4	34.9	4.5
80	Van's early	22.7	2390	65.6	75.6	36.4	31.6	4.8
81	Early golden	35.1	1980	74.7	102.6	26.5	19.3	7.2
82	Golden dent	35.4	3110	73.9	101.6	42.1	30.6	11.5
83	Murdock	23.7	3060	69.7	81.2	43.9	37.7	6.2
84	White variety (no name)	27.6	3770	78.3	96.2	48.2	39.2	9
85	Callaway's white	25	2910	76.6	90.9	38	32	6
86	Dunlap's white	23.4	2260	69.3	80.4	32.6	28.1	4.5
88	Leaming	29.9	3820	69.2	87.8	55.2	43.5	11.7
91	Helms improved	37	2240	77.9	109.8	28.8	20.4	8.4
92	Champion white pearl—Burr's white cross	24.8	2630	78.2	92.6	33.6	28.4	5.2
94	Leaming—Burr's white cross	26.8	3680	72.6	88.2	50.7	41.7	9
95	Edmonds—Murdock cross	21.1	3180	68.1	76.8	46.7	41.4	5.3
96	Clark's Onarga	30	2990	68.7	87.1	43.6	34.3	9.3
97	Riley's favorite	29	3280	69.5	87.2	47.2	37.6	9.6
98	Edmonds	25.9	2700	68.3	81.9	39.6	32.9	6.7
99	Edmonds—Burr's white cross	24.6	3020	67.6	79.9	44.7	37.8	6.9
101	Mixture *a*	33.7	2120	77	103.4	27.5	20.5	7
102	" *b*	34.7	3650	73	99.5	50	36.7	13.3
103	" *c*	25.6	3170	70.7	84.5	44.9	37.5	7.4
104	" *d*	23.9	2990	68.5	80.2	43.6	37.3	6.3
105	" *e*	26.7	3960	69	83.7	57.4	47.3	10.1
106	Hess white	27.2	2520	69.8	85.4	36.1	29.5	6.6
107	Bickerdike's early mammoth	35.7	3060	76.3	105.5	40.1	29	11.1
108	Yellow variety (no name)	28.2	2780	74.7	92.7	37.2	30	7.2
109	Log cabin	28.3	3090	78.4	97.2	39.4	31.8	7.6
110	Hughes	33.6	3870	77.8	104.3	49.7	37.1	12.6

VARIETY TESTS, YIELD, 1893—*Continued.*

Plat.	Name of variety.	Per ct. water in shelled corn as husked.	Lb. ear corn per acre as husked.	Lb. ear corn per bu. as shelled.	Lb. as husked to make bushel air-dry.	Bu. shelled corn per acre.		
						As shelled.	Air-dry.	Loss drying.
111	Thomas	28.3	2610	72	89.4	36.3	29.2	7.1
112	Leaming	26.8	2970	70.7	86.1	42	34.5	7.5
113	Murdock	20.3	2150	67.7	75.7	31.7	28.4	3.3
114	Boone county white	30.4	3620	81.7	104.6	44.3	34.6	9.6
115	Burr's white	31.8	3930	71.8	93.6	54.8	42	12.8
116	Self-husking	16.3	580	68.9	73.4	8.4	7.9	.5
117	Golden dew drop	17.7	1010	68	73.7	14.9	13.7	1.2
118	Brazilian flour	35.2	1920	77.9	107.3	24.6	17.9	6.7
119	Longfellow	16.8	1030	67.6	72.5	15.2	14.2	1

Experiment No. 3. Corn, Time of Planting.

Experiments to test the effect of time of planting on yield and growth have been conducted for the past six years. The land used in 1893 was in clover during 1891 and 1892. The last of April and first of May it was treated with barnyard manure, at the rate of about thirty loads an acre, and plowed about five inches deep. The plats, seven in number, were each 6 x 60 hills in area. They were planted by hand with Burr's white corn, in hills 3 ft. 8 in. apart each way, six kernels a hill. The first plat was planted May 6th, and one plat was planted each week thereafter, till June 17th. After the corn was well up, it was thinned to four plants a hill. Plats 5 and 6 were cultivated four times, the others three times. The cultivation was done with surface cultivators and the remaining weeds removed with a hoe. Beginning June 13th, the height of each plant of two rows, running across the seven plats, was measured each week during its growth. The average weekly height in inches to the tip of tassel and upstretched leaf, for each plat, is given in the table.

September 23d, plats 1, 2, 3, and 4 were cut and shocked, and Oct. 11th the others were cut and shocked. When cut, the leaves and stalks of plat 7 were mostly green. When husked Oct. 28th to Nov. 1st, the number and pounds of ears were ascertained for each plat. Twenty-five pounds of ears from each plat was shelled, the cobs weighed, and a sample of the shelled corn sent to the laboratory for the determination of moisture.

The largest yield of air-dry corn, is from planting May 13th, with nearly as good results from planting May 6th. Taking the average of six years, the largest yield is from planting May 11th to 16th, with but little decrease in yield from planting any time from April 27th to May 23d. Corn planted May 27th, matured in 115 days. This is

RESULTS WITH CORN FROM PLANTING AT DIFFERENT DATES, 1893.

Plat No.....	Date of planting....	Date of ripening....	When husked.			Per cent. water.....	Lb. ears when husked to make bu. shelled.....	Lb ears when husked to make bu. shelled air-dry.	Bu. per acre, air-dry.
			No. of ears per acre.....	Lb. of ear corn per acre.....	Bu. shelled corn per acre.....				
1	May 6	Sept. 16	8631	3548	50.7	16.7	70	73.4	47.4
2	" 13	" 17	8118	3512	51.4	16.9	68.3	73.2	48
3	" 20	" 18	8181	3035	43.4	18.4	70	76.3	39.8
4	" 27	" 19	7920	2844	39.6	18	71.8	77.9	36.5
5	June 3	Oct. 6	6300	2792	38.4	21.4	72.7	82.4	33.9
6	" 10	" 10	7731	3172	44.2	23.9	71.8	83.9	37.8
7	" 17	" 15	6219	1899	25.8	25.8	73.6	88.3	21.5

AVERAGE HEIGHTS TAKEN WEEKLY IN INCHES TO TIP OF TASSEL AND LEAF, 1893.

Plat.		June 13	June 20	June 27	July 4	July 12	July 18	July 25	Aug. 1	Aug. 8	Aug. 23	Aug. 30	Sept 19
1	Leaf....	16.5	31	44.5	61	76	85.5	92.5	93	92	91.5	90.5	88
	Tassel..	.....	.....	.....	.....	.....	.....	88	91.5	91	89.5	89.5	90.5
2	Leaf....	14.5	29	43.5	58	73.5	82.5	93.5	95	95.5	94.5	95	90
	Tassel..	.....	.....	.....	.....	.....	.....	86.5	93.5	94.5	92.5	92.5	92
3	Leaf....	9.5	20	34	46	63.5	72	81.5	84	86	84.5	85	81.5
	Tassel..	.....	.....	.....	.....	.....	.....	76.5	81	84	83.5	83.5	81.5
4	Leaf....	7	14	28	37	49.5	60	70	74	78	77.5	77.5	75
	Tassel..	.....	.....	.....	.....	.....	.....	.....	73	79	78	77	77
5	Leaf....	3.5	10	20.5	32.5	41.5	51.5	60	66.5	72	75.5	75	73.5
	Tassel..	.....	.....	.....	.....	.....	.....	.....	56	68.5	75	75	75
6	Leaf....	.....	6	14	23	35	47.5	59	66.5	74.5	78.5	78.5	78.5
	Tassel..	.....	.....	.....	.....	.....	.....	.....	62	71	79.5	80.5	80
7	Leaf....	.....	.....	7	12	23	33	40	46	54.5	66.5	69	67
	Tassel..	.....	.....	.....	.....	.....	.....	.....	.....	.....	65.5	68	67.5

RESULTS WITH CORN FROM PLANTINGS AT DIFFERENT DATES, 1888—1893.

Dates.	Bu. air-dry corn per acre.						
	1888.	1889.	1890.	1891.	1892.	1893.	Av.
April 22—25	.....	52	.....	51	.....	.....	51.5
April 27—May 2	80	44	67	50	72	.....	62.6
May 4—9	87	51	71	48	70	47	62.3
" 11—16	86	56	75	50	63	48	63
" 19—23	87	50	71	52	66	40	61
" 26—June 1	83	55	74	34	59	37	57
June 1—8	81	50	61	37	68	34	55.2
" 8—13	50	50	60	19	49	38	44.5
" 17—20	.....	.....	.....	.....	30	22	26

less time than required by either earlier or later planting. This, together with the fact that the first three plantings reached their maximum height about the same time, shows the more rapid growth of corn planted later in the season when the ground is warm, over that planted earlier when the ground is cold.

By very early planting, if a good stand is secured and the corn kept equally free from weeds, we may expect as large yields as from later planting. But for this locality the extra labor required to remove the weeds and the risk of a poor stand, will not justify planting earlier than about May 1st.

Experiment No. 4. Corn, Depth of Planting.

May 24, 1893, six rows, each 220 ft. in length, were planted with Burr's white corn, four kernels a hill, the hills and rows each being 3 ft. 8 in. apart. Row one was planted one inch deep, and each succeeding row one inch deeper than the preceding. The land was adjacent to that used for Experiment No. 5, and was in every way treated the same. As in former years, the shallow planting gave best results. From the table giving results for five years, it will be seen that the average number of ears per acre uniformly decreases from the shallowest to the deepest planting, and that, in general, the bushels per acre also decreased.

RESULTS WITH CORN FROM PLANTINGS AT DIFFERENT DEPTHS.

Depth in.	Ears per acre.						Bushels per acre.						Ears in a bushel.					
	1888.	1889.	1890.	1892.	1893.	Av.	1888.	1889.	1890.	1892.	1893.	Av.	1888.	1889.	1890.	1892.	1893.	Av.
1	11,070	10,530	9,608	8,280	8,316	9,561	109.7	83	77.8	65.8	51.3	77.5	101	127	124	126	162	128
2	9,630	10,080	9,385	8,640	7,992	9,145	88.4	83	72.8	64.7	48.7	71.5	109	121	129	133	164	131
3	10,440	8,190	9,831	8,910	6,750	8,824	100.8	51	70.3	62.7	40.7	65.1	104	161	140	142	166	143
4	9,630	9,540	7,485	9,450	7,236	8,668	88	87	58.4	70.3	40	68.7	109	110	128	135	181	133
5	8,280	8,820	8,491	7,020	5,886	7,699	73.1	81	62.3	56.5	33.4	61.3	113	109	136	124	176	132
6	5,940	10,440	8,389	7,290	4,590	7,330	60.3	92	60.3	58.5	29	60	98	113	139	125	158	127
7	.....	.....	.....	5,130	.....	5,130	.....	.....	.....	40.5	.....	40.5	.....	.....	.....	127	.....	127

Experiment No. 5. Corn, Thickness of Planting.

The land used was in clover in 1891 and 1892 and was treated with barnyard manure, at the rate of about 30 loads an acre, just before plowing. The plowing was done about two weeks before planting. May 24th, twenty rows, each 220 ft. in length, were planted with the varying number of kernels a hill and at the distance shown in the table.

In general, the ratio of stalks harvested to kernels planted, and the ratio of ears to stalks, increases as the thickness of planting decreases. The noticeably larger yield by the row having one kernel every three inches, was due to the fact that no corn was planted next to it till June 17th. This gave it a more favorable exposure. Excepting with this row the number of kernels a hill, from one to four, seemed to have little influence on the yield, the difference being due to the number of plants on a given area.

The yield of stover is greatest for the thickest rate of planting, but the bushels of corn is greater for thinner rates. Taking the average for

five years, there seems to be but little difference between planting anywhere from 11,880 to 23,760 kernels per acre. If grown chiefly for the grain, the fewer the ears required to make the maximum yield the less the work in harvesting; but if much value is attached to the stover, the larger amount obtained by planting thicker might more than pay for the extra labor required to harvest the grain. If stover and corn are to be fed together, then it is pretty certainly better to plant thickly. This

RESULTS WITH CORN FROM PLANTINGS AT DIFFERENT RATES OF THICKNESS, 1893.

Kernels in a hill.	Inches between hills.	Per acre. Kernels planted.	Stalks harvested.	Ears harvested.	Lb. stover.	Lb. ears.	Ratio of stalks harvested to kernels planted.	Av. wt. 100 stalks.	Av. wt. 100 ears.	Ears harvested to 100 stalks.	Bu. per acre air-dry corn. 1888.	1889.	1890.	1892.	1893.	Average.
1	3	47520	35316	17550	6507	3726	.74	16	21	50	73	46.4	24.4	105.3	45.3	58.9
2	6	47520	34074	8802	6237	1377	.72	18	16	26	87.4	46.2	23.2	84.1	16.7	51.5
3	9	47520	34020	7344	6426	1174	.72	19	16	22	81.7	53.5	23.1	87	14.3	51.9
4	12	47520	33480	7722	6345	1444	.73	19	19	23	76.5	45.3	21.2	97.7	17.5	51.6
Av.		47520	34222	10354	6378.75	1930.2	.727	18	18	30	79.6	47.8	22.9	93.5	23.5	53.5
1	6	23760	18522	8478	4698	2241	.78	25	26	46	88.5	68.8	39.9	90.9	27.6	63.1
2	12	23760	17982	8424	4739	2241	.76	26	27	47	87.3	74	41.5	98.6	27.6	65.8
3	18	23760	19116	9882	5252	2646	.80	27	27	52	75.2	70.4	43.9	103.3	32.5	65.1
4	24	23760	17388	8856	5062	2511	.73	29	28	51	81.3	76.4	43.6	100.8	30.9	66.6
Av.		23760	18252	8910	4937.7	2409.7	.767	27	27	49	83	72.4	42.2	98.4	29.6	65.2
1	9	15840	10692	6480	3294	2525	.68	31	39	61	84.4	78.7	49.8	87.2	32.1	66.4
2	18	15840	12150	9018	4590	3645	.77	38	40	74	76	81.9	50.2	89.4	46.3	68.8
3	27	15840	11610	8802	4509	3321	.73	39	38	76	75.6	78.8	45.3	82.5	42.2	64.9
4	36	15840	11880	9342	4428	3821	.75	37	41	79	81.7	71.4	45.7	89.5	48.5	67.4
Av		15840	11583	8410	4205.2	3328	.732	36	40	73	79.4	77.7	47.7	87.1	42.3	66.9
1	12	11880	9936	7884	3119	3537	.84	31	45	79	81.7	74.4	60.7	80	44.9	68.3
2	24	11880	8856	7452	2673	3051	.75	30	41	84	79.5	81.5	61.4	76.1	38.7	67.4
3	36	11880	9936	7398	3483	3510	.84	36	47	74	76	77.9	57.1	86.6	44.6	68.4
4	48	11880	9936	8424	3780	3915	.84	38	48	85	70.4	80.6	60.7	86	49.7	69.5
Av		11880	9666	7789	3263.7	3503.2	.817	34	45	81	76.9	78.6	59.9	82.2	44.5	68.4
1	15	9504	9866	7344	4320	4172	1.04	44	57	74	71.9	67.2	57.6	75.2	53	65
2	30	9504	9126	5832	4064	3119	.96	45	53	64	61.7	69.6	54.9	72.3	39.6	59.6
3	45	9504	8478	6588	3875	3875	.89	46	59	78	57.9	72.8	58.9	75.4	49.2	62.8
4	60	9504	8154	6048	2957	3024	.86	36	50	74	....	....	....	72.3	38.4	55.3
Av.		9504	8906	6453	3804	3547.5	.937	43	55	73	63.8	69.8	57.1	73.8	45.1	60.7
1	Av.	21701	16866	9547	4388	3240	.82	29	38	62	79.9	67.1	46.5	87.7	39.4	64.1
2	Av.	21701	16438	7906	4461	2687	.79	31	35	59	78.4	70.6	46.2	84.1	38	63.5
3	Av.	21701	16632	8003	4709	2905	.80	33	37	60	73.3	70.7	45.7	87	42.1	63.8
4	Av.	21701	16168	8078	4514	2943	.78	32	37	62	77.5	68.4	42.8	89.3	41.9	64

experiment would indicate that, as corn is ordinarily planted, there is less danger of getting too many plants than of getting too few. One chief reason why smaller yields are obtained from corn planted thickly is probably because many small ears are not husked.

Experiment No. 6. Corn, Planting in Hills or Drills.

The land used consisted of seven half acre plats. It was plowed in early May and planted May 12th to 18th with Burr's white corn. The corn was dropped by hand and covered with a hoe. The west half of each plat was planted four kernels per hill, 3 ft. 8 in. apart each way, and the east half, one kernel every 11 in., in rows 3 ft. 8 in. apart. The cultivation was the same on both parts, each being cultivated three times, and the weeds remaining were removed with a hoe. Sept. 6th to Oct. 23d the corn was cut and shocked. Oct. 21st to 28th the corn was husked and the yield ascertained. The stover was weighed as fed during November, December, and January. The accompanying table gives the yield per acre for each plat. As to the difference in the yields of corn, two plats are slightly in favor of drills and the other five in favor of hills, while the average is 1.6 bushels in favor of hills. The average yield of stover is slightly in favor of drills.

This experiment, like No. 5, both for this and previous years, seems to indicate that there is practically no difference between hills and drills, so far as yields are concerned.

RESULTS WITH CORN PLANTED IN HILLS AND DRILLS, 1893.

Plat No.	Yield per acre. (75 lb. per bu.)		Yield per acre, lb. stover.	
	Hills.	Drills.	Hills.	Drills.
1	25.9	22.1	3104	3040
2	19.7	18.9	1640	1944
3	23.7	19.7	2240	1920
4	28.6	30.7	1808	1784
5	33.9	34.4	2120	2312
9	43.2	40.8	2408	2592
10	50.9	48.3	2120	2276
Av.	32.3	30.7	2206	2267

Experiment No. 8. Corn, Frequency of Cultivation.

The land used for experiments No. 8, 9, and 10 was in clover during 1892, and was plowed, harrowed, and marked during the latter part of May. June 2d it was planted with Burr's white corn, four kernels a hill, the hills being 3 ft. 8 in. apart each way. The tract was divided into eleven plats, each 6 by 25 hills in area, which were cultivated as follows: Plats 1 and 7 had the weeds removed by scraping the surface lightly with a hoe and without other disturbance of the soil; 2 and 8 were cultivated shallow, ordinary; 3 and 9 deep, ordinary; 4 and 10 shallow, fre-

quent; 5 and 11 deep, frequent, and 6 had no cultivation, the weeds being allowed to grow. The shallow cultivation was done with the "Tower" and the deep with a one-horse double shovel. For dates and frequency of cultivation see table.

The number of ears and the bushels per acre are given in the table for each mode of cultivation. In both shallow and deep cultivation, ordinary frequency gave better results than did very frequent cultivation.

RESULTS WITH CORN FROM SHALLOW AND DEEP CULTIVATED PLATS, 1893.

Kind of cultivation.	Yield per acre.		
	No ears.	Bu. corn	Av. bu. for 5 yr.
None, scraped with a hoe (2 plats)	8881.6	28.7	68.3
Shallow, ordinary "	9108.9	36.3	70.3
Deep, " "	8938.4	33.6	66.7
Shallow, frequent "	8881.6	35.9	72.8
Deep, " "	7616.8	30.6	64.5
None, weeds allowed to grow	None.	None.	.....
Frequent, (average 4 plats)	8249.2	33.2	68.6
Ordinary, " "	9023.6	34.9	68.5
Shallow, (average 4 plats)	8995.2	36.1	71.5
Deep, " "	8277.6	32.1	65.6

CULTIVATION OF PLATS.

Date, 1893.	Plats 1 and 7.	Plats 2 and 8.	Plats 3 and 9.	Plats 4 and 10.	Plats 5 and 11.
June 15	.....	Shallow	.....	Shallow	.....
" 17	.....	.....	.....	.....	*Deep
" 19	.....	.....	Deep	Shallow	†Deep
" 22	Scraped	Shallow	.....	Shallow	Deep
" 26	.....	.....	Deep	Shallow	Deep
" 29	.....	Shallow	.....	Shallow	Deep
July 3	.....	.....	Deep	Shallow	Deep
" 11	.....	Shallow	Deep	Shallow	Deep
" 17	.....	.....	.....	Shallow	Deep
" 20	Scraped	.....	.....	.....	.....

*Plat No. 11 only. †Plat No. 5 only.

Experiment No. 9. Corn, Depth of Cultivation.

For care of crop see report on *Experiment No. 8.* By consulting the table in the same report it will be seen that shallow cultivation gave four bushels per acre more than deep. Contrary to results in former years, scraping the surface to kill the weeds failed to give as large yields as did deep cultivation. No cultivation, allowing the weeds to grow at will, failed to produce any corn, excepting two small cobs, having one kernel each. Taking the average of five years, shallow cultivation produced 5 9 bu. per acre more than deep, and scraping the surface 2.7 bu. more than deep.

Experiment No. 10. Corn, Effect of Root-pruning.

Every other row of 6 rows running across the west end of the 11 plats used in *Experiments No. 8 and 9* was root-pruned four inches deep. The pruning was done three times—June 23d, July 11th, and 24th—by placing a frame 12 inches square on the outside, over each hill, and drawing a guaged knife around the edge of it. When husked, the number and pounds of ears for each row of each plat were ascertained. The table gives 30 weights, involving 15 comparisons. In 12 of these, the unpruned gave larger yields than the pruned. Taking the total yield of each row running across the eleven plats, every comparison gives the largest yield for the unpruned, and the sum of the pruned and unpruned is in favor of unpruned for each of the five sets of two plats.

The average yield per acre is 7.2 bu. greater for the unpruned rows.

These experiments and similar ones in previous years suggest that shallow culture is better than deep; that the injury to the roots, which necessarily results from deep culture, reduces the yield; that good crops may be secured in this soil without other cultivation than scraping the surface to destroy weeds, and that the gain from unusually frequent cultivation usually does not equal the extra cost of such cultivation.

RESULTS WITH CORN IN PRUNED AND UNPRUNED ROWS, 1893.

	Row.	Yield of ear corn, pounds.							
		Plats 1 & 7	Plats 2 & 8	Plats 3 & 9	Plats 4 & 10	Plats 5 & 11	Sum of ten plats.		Yield per acre bu.
							No. ears.	Lb. ears.	
3	Unpruned	5.87	12	5.62	11.5	8.5	132	43.5	26.9
4	Pruned	5.87	8.25	6.87	10.12	7.5	121	38.62	23.9
5	Unpruned	8.25	14.75	8.25	14.25	10.75	158	56.25	34.8
6	Pruned	6.25	8.75	8.87	9.37	7.75	118	41	25.4
7	Unpruned	9.75	15	11.62	14.87	11	176	62.25	38.6
8	Pruned	6.37	11.75	9.25	9.25	11	145	47.62	29.5
	Total Unpruned	23.87	41.75	25.49	40.62	30.25	466	162	100.3
	Total Pruned	18.49	28.75	24.99	28.74	26.25	384	127.24	78.8

Experiment No. 23. Continuous Corn Cropping contrasted with a Rotation of Crops.

For eighteen years tests have been made of the yields of corn on half acre plats. On three of these corn has been grown continuously; on one it has alternated with oats; and on six, to which no manure or commercial fertilizer has been applied, it has been grown for two successive years in a six years' rotation. On one of the plats continuously in corn, barnyard manure has been applied annually at

CONTINUOUS CROPPING WITH CORN AND ROTATION, 1888–1893.

In corn annually since 1876.

Year	Plat No. 1. Barn-yard manure applied annually. Grain, bu.	Stover, lb.	Plat No. 2. Comerc'l fertilizers applied annually. Grain, bu.	Stover, lb.	Plat No. 3. No fertilizers. Grain, bu.	Stover, lb.
1888	66.7	4640	57.4	3840	54.3	2575
1889	77.4	...	45.9	...	43.2	...
1890	55.1	3392	41.5	2680	48.7	2380
1891	44.1	3284	29.2	2400	28.6	2460
1892	60.5	2610	32.7	1530	33.1	1490
1893	24	3072	19.3	1792	21.6	2080

In rotation since 1876. No manure or commercial fertilizers of any kind.

Year	Plat No. 4. Corn and oats alternating. Crop.	Grain, bu.	Stover, lb.	Plat No. 5. Corn, oats, and clover. Crop.	Grain, bu.	Stover, lb.	Plat No. 6. Crop.	Grain, bu.	Stover. lb.	Plat No. 7. Crop.	Grain, bu.	Stover, lb.	Plat No. 8. Crop.	Grain, bu.	Stover, lb.	Plat No. 9. Crop.	Grain, bu.	Stover, lb.	Plat No. 10. Crop.	Grain, bu.	Stover, lb.
1888	Corn	49.5	3070	Oats	48.6	2145	Oats	48	1665	Cl'v'r	...	3030	Cl'v'r	...	3045	Corn	61.2	3120	Corn	46.4	3750
1889	Oats	37.4	1775	Cl'v'r	...	8080	Cl'v'r	...	6665	Cl'v'r	...	3060	Corn	56.4	...	Corn	50.3	...	Oats	59	3650
1890	Corn	54.3	1332	Cl'v'r	...	3010	Cl'v'r	...	2900	Corn	61.9	2988	Corn	58.2	2664	Oats	...	...	Cl'v'r	...	4680
1891	Corn	33.2	2100	Cl'v'r	...	2910	Corn	43.8	2554	Corn	33.9	2246	Oats	55.3	1930	Oats	54.4	1748	Cl'v'r	...	5180
1892	Oats	37.2	1710	Corn	67.6	2920	Corn	56.5	2636	Oats	41	2090	Cl'v'r	...	2812	Cl'v'r	...	3332	Cl'v'r	...	4450
1893	Corn	29.6	1802	Corn	34.1	2216	Oats	57.5	2160	Oats	29.8	1438	Oats	24	1334	Corn	42	2500	Corn	49.6	2198

the rate of 24 two-horse wagon loads an acre; on one commercial fertilizers of different kinds have been applied; and on one no fertilizing material of any kind has been applied. The corn has been cut, and the stalks removed each year. The table gives the yields of the ten plats for the last six years.

In general, the yields from the plat manured with barnyard manure are larger than those from the plats in rotation without manuring; but the yield from this plat in 1893 was much smaller than that from the rotation plats. A like result was recorded in the exceptionally dry year of 1887. The yields from the plat to which no fertilizers were applied have practically equalled those from that to which commercial manures have been applied; but they fall far short of those from the rotation plats, and somewhat below those from the plat on which the corn was grown in rotation with oats.

Experiment No. 71. Corn, Effect of Time of Harvesting.

Experiments to test the effect of time of harvesting on yield of both corn and stover have been conducted for each of five years. The harvesting has usually been done at three stages of maturity, the early cutting being when the grain was mostly in the roasting ear stage, with husks and leaves all green; the medium cutting when the kernels were mostly glazed and a few of the leaves and husks becoming dry; and the late cutting when the corn was fully ripe, the leaves and husks being practically all dead.

The crop has always been shocked in the usual manner at the time of cutting and allowed to remain until well cured, before the husking and weighing. In

addition to the results given in the table, for several years, the chemical composition and feeding value have been ascertained and will be given at some future time.

From the table we see that the yield of grain increases with lateness of harvesting in a marked degree, the average yields being to each other as 65, 83.5, and 100 for the early, medium, and late cuttings, respectively. The yield of stover has always been least for the medium cutting, and in three out of four cases greatest for the early cutting, the average yields being to each other as 100, 87.5, and 97 for the three cuttings, early, medium, and late, respectively.

YIELD PER ACRE FROM CORN CUT AT DIFFERENT STAGES OF RIPENESS.

Pounds ear corn per acre.

	1888	1889	1890	1891	1893	Average.
Cut early—Corn mostly in roasting ear stage, husks and leaves green.	2001	3081	3025	2216	2280	2521
Cut medium—Ears mostly glazed, a few husks and leaves becoming dry	3501	3160	4257	2640	2600	3232
Cut late—Fully ripe, leaves and husks usually all dry	4240	3696	4752	3322	3360	3874

Pounds stover per acre.

Cut early	4006	3615	2485	3240	3436
Cut medium	3454	3482	2130	2950	3004
Cut late	4051	3717	2447	3080	3324

Experiment No. 89. Corn, Cross-fertilization.

In 1893, ten of the most promising of the crosses grown in 1892 were planted on plats of considerable size and at such a distance from each other as to prevent much pollen being carried from one plat to another. There was some diversity in elevation and drainage and probably also in the fertility of the soil, so that not much importance was attached to the comparative yields. Three plats from self-fertilized ears (ears that were fertilized with pollen from the stalks on which they grew) were planted adjacent to three plats of the same size and from the same cross, but from ears cross-fertilized (fertilized with pollen from stalks other than those on which they grew). In every instance the cross-fertilized ear produced the larger yield, and the stalks were visibly larger. Naturally the corn from the self-fertilized ears was more uniform in character than that from the cross-fertilized ones. The greater the difference of the parent varieties the more variable was the product. It is thought that after some years of careful selection, after crossing, corn fairly uniform can be produced. For methods of crossing, see bulletin No. 25, p. 199.

Besides the above, five plats were planted, each from a different cross-bred ear, and four plats each from the first year's product of a different

cross-bred ear. The former failed to produce a stand, the seed having been injured by weevils and the plats were planted later with Murdock. These plats were planted in Experiment No. 1.

The accompanying table gives the number of ears and bushels an acre for the four plats of cross-bred corn as compared with the individual and average yield of the parent varieties. The first named variety is, in each case, the female parent. In three out of the four cases the yield from the cross is greater than the average from the parent varieties, the average increase being 2.3 bu. an acre in favor of the crosses. In 1892 five crosses gave in every instance a larger yield than the average of the parent varieties, the average increase being 9.5 bu. an acre. It seems that cross-bred corn gives larger yields at least for the first and second years after crossing than an average of the parent varieties, but how long this greater fruitfulness will last is undetermined.

Farmers can produce cross-bred seed in considerable quantities in the following manner: Plant with one variety in one planter box and another variety in the other. Remove the tassels of one variety before they begin to shed pollen and the shoots of the same will be fertilized with pollen from the other variety, thus producing a direct cross. The seed should be selected from the rows from which the tassels have been removed.

RESULTS FROM CROSS-BRED CORN.

Plat.	Variety.	Yield per acre.	
		No. of ears.	Bu. air-dry corn.
	Champion white pearl	7680	37.3
13 & 115	Burr's white	10200	38.6
	Average	8940	38
92	Champion white pearl—Burr's white cross	7080	28.4
	Leaming (average 4 plats)	8070	34.6
13 & 115	Burr's white	10200	38.6
	Average	9135	36.6
94	Leaming—Burrs' white cross	9480	41.7
58 & 98	Edmonds	7740	28.3
	Murdock (average 4 plats)	9600	35.7
	Average	8670	32
95	Edmonds—Murdock cross	9840	41.4
58 & 98	Edmonds	7740	28.3
13 & 115	Burr's white	10200	38.6
	Average	8970	33.5
99	Edmonds—Burr's white cross	9360	37.8

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RATE OF GROWTH AND CHEMICAL COMPOSITION OF THE CORN PLANT.

Experiment No. 90. Corn, Rate of Growth.

This article gives a record of observations on the rate of growth in height and weight and on the chemical composition of the corn plant, as well as on the rainfall and temperature at this Station during four seasons from May to October.

The field work and the weather observations have been in charge of the agricultural department of the Station. The writer is responsible for the chemical analyses in 1890, 1891, and 1892, and the writing of this report from the observations on record. The work has already been briefly discussed in bulletins Nos. 13, 20, and 25 of this Station.

It is quite well known that experienced corn growers have an unwritten knowledge of what is good and bad corn weather. They have learned by their own observations through a number of years the climatic or meteorological conditions that are favorable or unfavorable to growing corn. This information has been gained without measuring a single corn plant or recording the amount of rain and heat from year to year. It is not uncommon to hear the remark that a certain shower is worth more to the corn than two inches of rain at a given time, and that the corn needs two days of soaking rain is another statement that may be frequently heard sometimes. But, although the weather of the future seasons cannot be accurately predicted, it is of interest to note what has been in the past the relation between the development of the corn plant and the weather. This has been done by actually measuring and weighing corn plants every week of their growth and noting the rainfall and temperature during the same time. A record of such observations has been made at this Station through the corn growing season of four years, 1889, 1890, 1891, and 1892.

Plan of the Experiment.

Each season, when the corn plants were about ten inches high, measuring from the ground to the tip of the upstretched leaves, a number of hills of nearly uniform size, with three plants in each, were selected and numbered. Each week through the season the height of these plants was measured and two or three hills (of three plants each) were cut off close to the ground, taken to the laboratory and analyzed. Thus a weekly record was obtained of the increase in height and weight of the corn plant and also of some of the changes in composition. The changes in weight and composition of the plants through the season

were necessarily obtained from different plants each week. They could not be weighed and then left to grow again, as is done with animals in an experiment. The only thing possible was to begin with an even lot of plants and assume that those which were cut and analyzed each week were a fair sample of the whole and represented the general growth and development. Measurements of the height from the ground to the tip of the tallest leaf and to the top of the tassel, when present, were made of each plant. The number measured each week varied from 6 to 225 during the different years. The weight and composition per plant was obtained by analyzing the three plants in one hill as one sample. Excepting the first year, three hills of three plants each, making three samples, were cut and analyzed every week. From these analyses, including nine plants, the average composition per plant was calculated.

Very complete meteorological observations have been made daily at this Station since August, 1888. They are taken at 7 a. m., 2 p. m. and 9 p. m., and include the maximum, minimum, and mean temperature, height of barometer, direction and force of the wind, weather, as clear, fair, or cloudy, rainfall, and humidity. Some of these observations, particularly the temperature and rainfall, are given in this report for the purpose of comparing these meteorological conditions with the rate of growth of the corn during the different years.

The Soil.

The soil in which the corn was grown is the uniform black prairie soil of the University farm, tile drained. A different plat was used each of the four years the experiment was made.

The land used in 1889 had produced a crop of corn in 1888, with no manure; corn in 1887, with barnyard manure; and clover in 1886. The plat used in 1890 had produced crops of oats in 1888 and 1889. The corn of 1891 was planted on land which had raised a crop of corn in 1890, wheat in 1889, and clover in 1888, no manure. A plat of grass land which had produced a crop of hay in 1891, 1890, and 1889, was used for this experiment in 1892.

Time of Planting and Variety of Corn.

May 4th, 1889, Edmonds, yellow dent, was planted; May 5th, 1890, Burr's white; May 9th, 1891, Leaming; June 3d, 1892, Burr's white.

The influence of the soil and the variety of corn on the variations in the rate of growth during these four years cannot be exactly measured. The same variety of corn was planted in the two years 1890 and 1892. The varieties planted the other two years were similar, Edmonds being somewhat smaller and earlier.

The weekly observations giving the growth in height and weight, each year show that there was not the same rate of growth in any two

years, but quite similar in some years and very different in others. The greatest variation is noticed between the two years when the same variety of corn was planted, and this suggests than the rain and heat were more influential on the rate of growth, than the difference in the variety of corn, as there was a great contrast in the weather of these two years, 1890 and 1892.

Measurements and Analyses made of the Plants.

The measurements made of the plants included the height of each from the soil to the tip of the tallest upstretched leaf, and to the tip of the tassel when present. The analysis included the determination of dry matter only in 1889. In 1890, 1891, and 1892, each of the three samples of corn cut weekly was analyzed more completely. An estimation was made of the dry matter, mineral matter or ash, protein or flesh-forming, nitrogenous matter, fiber, nitrogen-free extract which includes the starch, sugars, gums, etc., and ether extract that contains the fats and oils. In addition to this, an estimation of water was made in the corn plants cut in 1892.

June 10, 1889, fifteen pairs of hills were selected and numbered consecutively. The corn in one pair of these selected hills, was measured and cut weekly, and the amount of dry matter determined in each of these two samples, which contained three plants each.

June 2, 1890, sixty-three hills, as nearly alike as it was possible to find, were selected. They were numbered and divided off into 21 lots, of three hills each. One lot of three hills was measured and cut as in 1889.

June 12, 1891, seventy-five hills were divided into 15 lots of five hills each. Four of these hills were cut every week. Chemical analyses were made of each of three hills, so that during the growing season these analyses were made of triplicate samples taken each week. The fifth hill in each lot was left to grow, and was measured each week during the season. Each plant in the 75 hills was measured every week until it was cut, making a total of 3,159 measurements that year.

The spring of 1892 was very wet, hence the planting of corn was about one month late. This year weekly observations were made of the growth of the corn from the time it was planted. One hundred plants, drilled about 18 inches apart in a row, were selected for measuring. They were not cut for analysis. The same analyses as in previous years were made weekly of three hills of corn in this same plat and very near to the plants measured.

Details Recorded in the Tables and Charts.

The tables show for each year the variety of corn planted, date of planting, number of plants measured each week, with the extremes and average height per plant; the weight of dry matter per plant each week,

RATE OF GROWTH OF FIELD CORN, AND CHEMICAL COMPOSITION.

Edmonds yellow dent corn, planted May 4, 1889.

Week ending.	Plants measured.	Height of plants, in.		Field notes.	Dry matter per plant, grams.	Rainfall, in.	Av. daily temp., F.			Percentage composition of dry matter.				
		Extremes.	Average.				Mean.	Maximum.	Minimum.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Ether, extract.
June 10	6	6–9	7	....	.2	1.56	58°	77°	40°	....	....	....	....	....
17	6	11–18	14	....	.8	2.44	62	78	46	....	....	....	....	....
24	6	24–28	27	....	3.4	2.69	71	86	52	....	....	....	....	....
July 1	6	37–44	41	....	11.3	....	67	88	48	....	....	....	....	....
8	6	46–58	53	....	25.1	.06	73	89	52	....	....	....	....	....
15	6	69–87	78	....	66.	2.31	75	90	63	....	....	....	....	....
22	6	73–100	92	(*a*)	107.6	.78	72	90	50	....	....	....	....	....
29	6	95–109	103	(*b*)	136	2.66	71	88	54	....	....	....	....	....
Aug. 5	6	110–119	111	....	196.3	....	68	83	49	....	....	....	....	....
12	6	102–117	110	(*c*)	227.2	.6	69	84	50	....	....	....	....	....
19	6	96–120	110	(*d*)	241.5	....	67	84	51	....	....	....	....	....
26	6	106–124	111	(*e*)	316.5	....	71	89	49	....	....	....	....	....
Sept. 2	6	96–117	107	(*f*)	302.1	1.3	67	87	45	....	....	....	....	....
9	6	106–114	108	(*g*)	344.8	....	70	88	47	....	....	....	....	....
16	6	91–140	108	(*h*)	392	....	53	73	35	....	....	....	....	....
										....	....	....	....	....

Burr's white dent corn, planted May 5, 1890.

June 2	9	13–15	14	....	.7	1.12	68	87	42	....	....	....	....	....
10	9	20–27	23	....	2.8	.05	72	88	51	17.4	27.9	....	....	3.6
17	9	32–43	38	....	10	2.41	68	84	47	14.4	24.5	21.3	36.4	3.4
24	9	57–68	61	....	32.3	1.34	74	90	62	14.7	17.7	25.2	40.1	2.3
July 1	9	73–92	87	....	58.1	....	81	96	64	14.9	15.8	34.6	33.3	1.3
8	9	90–105	98	(*a*)	136	....	72	94	45	9.8	11.4	28.8	49	1
15	9	95–120	111	....	179	2.04	73	97	50	8.2	11.4	29.9	49.2	1.3
22	9	104–123	119	....	229	....	72	94	55	7.9	10	30	51.2	1.2
29	9	103–126	114	....	289.6	.79	72	97	51	6.5	8.5	27.9	56.2	1
Aug. 5	9	100–130	112	....	298	.07	76	96	50	6.4	8.6	28.3	55.4	1.4
12	9	89–124	109	....	293	1.08	68	92	47	6.6	8.6	24.5	58.6	1.6
19	9	96–112	108	(*b*)	344.6	.38	68	88	45	6.4	7.3	22.1	62.1	2.1
26	9	97–128	117	....	393	.4	63	85	39	5.7	7.5	25.9	58.8	2.1
Sept. 2	9	99–126	114	(*c*)	385	.31	71	89	46	5.7	7.1	21.5	63.8	1.9
9	9	105–122	113	(*d*)	421	.51	59	78	33	5.3	7.3	19.9	64.9	2.5
16	9	94–120	106	(*e*)	344	....	57	78	35	5.8	7.8	22.6	61.5	2.3
23	9	100–118	114	....	349	.37	54	75	33	4.9	7.5	22.7	62.6	2.3
30	9	99–123	112	....	442	1.4	60	75	46	3.7	6.7	20.2	66.8	2.6

FIELD NOTES, 1889.

(*a*) Tassels showing.
(*b*) All in tassel, bloom and silk.
(*c*) Silks dead.
(*d*) Soft milk stage.
(*e*) Passed milk.
(*f*) All glazed.
(*g*) Milk to ripe.
(*h*) All ripe.

FIELD NOTES, 1890.

(*a*) Full tassel.
(*b*) Milk stage.
(*c*) Dented, husks drying.
(*d*) One-half leaves dry.
(*e*) Ripe.

RATE OF GROWTH OF FIELD CORN AND CHEMICAL COMPOSITION—*Continued.*

Leaming corn, planted May 9, 1891.

Week ending.	Plants measured.	Height of plants, in.		Field notes.	Dry matter per plant, grams.	Rainfall in.	Av. daily temp. F.			Percentage composition of dry matter.				
		Extremes.	Average.				Mean.	Maximum.	Minimum.	Ash.	Protein.	Crude fibre.	Nitrogen-free extract.	Ether extract.
June 10	225	11–26	16	....	.....	.5	66	90	50	....	....	....	....	....
17	225	23–43	31	....	4.5	.23	70	92	49	11.2	27.6	23.3	35.7	2.2
24	213	32–64	47	...	20	1.02	74	92	58	11.8	24.1	25.4	36.7	1.9
July 1	201	50–84	65	....	30.4	.33	75	93	53	11.5	19.1	28.1	39.4	1.9
8	189	57–91	73	....	50	.07	69	89	47	10.5	19.1	29.2	39.5	1.6
15	177	59–102	84	....	114.3	.38	71	93	45	9	15.7	30.6	42.8	1.9
22	165	64–111	96	(*a*)	161.6	.13	70	93	52	7.9	12.1	29.1	49.3	1.6
29	153	81–115	98	(*b*)	161.2	.83	69	93	42	7.1	11.3	28.1	51	2.4
Aug. 5	141	82–116	93	(*c*)	215.1	.01	71	93	51	6	10.8	26.7	54.6	1.8
12	129	82–118	98	....	165.4	1.35	74	99	54	6.9	10.8	28.6	51.2	1.5
19	117	82–118	97	(*d*)	257	1.28	75	96	64	6.2	10.3	27.5	53.9	2
26	105	82–115	97	(*e*)	295	.22	62	83	40	5.7	9.3	24.7	57.6	2.6
Sept. 2	93	81–114	97	(*f*)	349.5	.35	63	90	41	5.1	8.5	21.7	61 7	2.9
9	81	81–114	96	....	320	....	64	88	41	5.1	8.9	20.4	62.8	3
16	69	81–113	93	(*g*)	290	....	76	95	55	5.2	9.7	19.7	62.5	2.8
23	....	.....	....	....	324	.06	72	96	46	4.4	9	18.6	64.9	3.1

Burr's white corn, planted June 3, 1892.

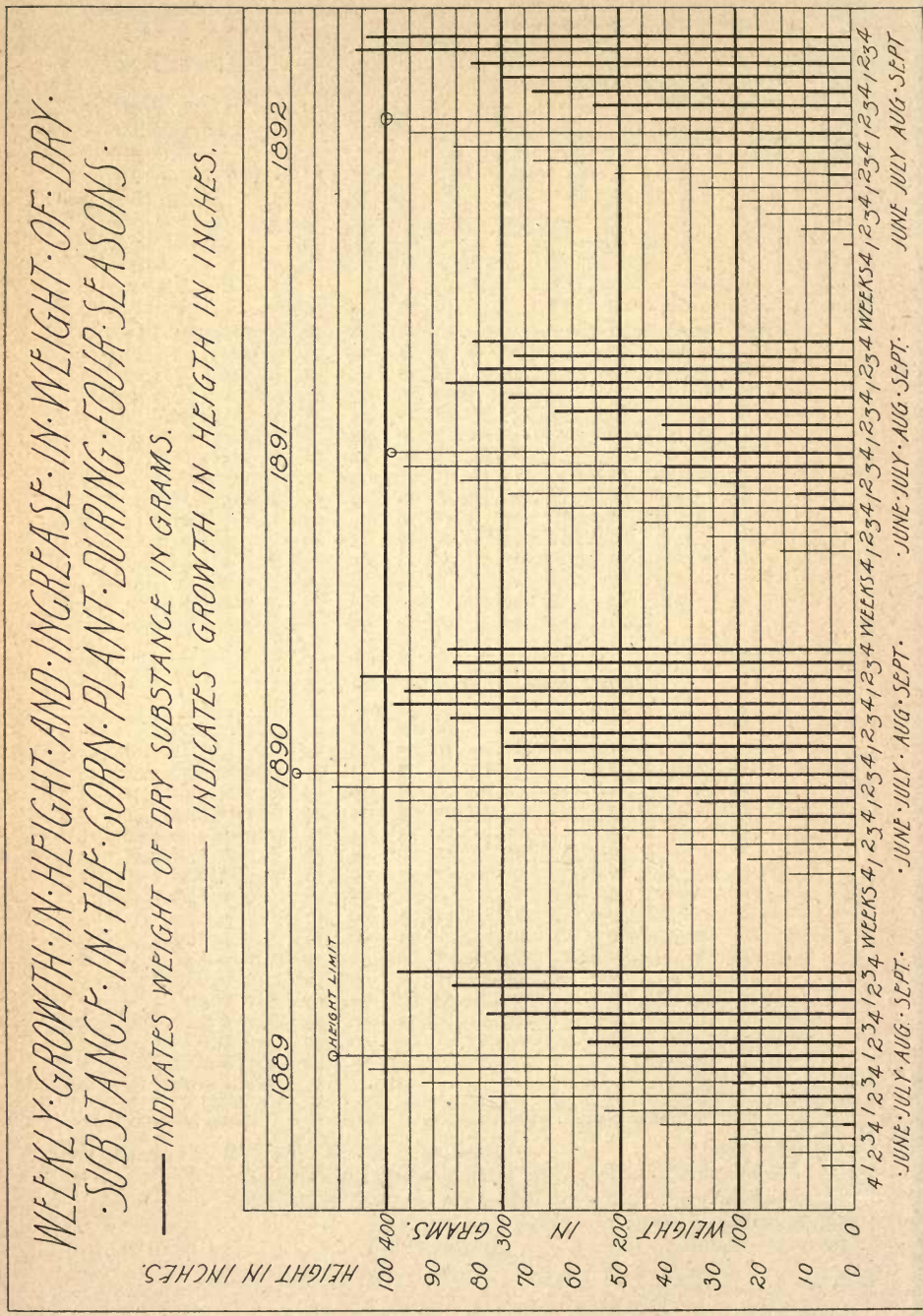
June 10	100	.....	2	....	.....	.30	66	82	42	....	....	...	....	....
17	100	2–17	11	....	.....	.18	73	62	40	....	....	....	...	....
24	100	7–24	17	....	1.7	4.02	75	84	37	17.4	26.3	18.4	35.9	....
July 1	99	10–34	24	....	3.3	.86	68	80	49	13.4	24.4	21.6	34.5	....
8	98	12–43	33	....	9.1	1.32	66	84	49	14.1	22.8	25.3	33.9	3.7
15	97	25–67	51	....	20.8	.09	73	91	52	11.4	20.1	26.5	38.3	3.6
22	96	36–90	68	....	49	.82	78	94	58	8.5	17.3	28.3	42.5	3.4
29	94	40–110	86	....	90.8	.27	77	90	51	7.3	12.2	28.8	48	3.7
Aug. 5	94	50–119	95	(*a*)	141.4	1.93	61	82	46	6.6	10.8	29.8	49.6	3.2
12	94	52–119	99	....	171	.42	74	90	61	6	9.5	29	52.9	2.5
19	94	54–119	100	....	221	....	71	92	51	5.9	9.1	27.7	54.2	2.4
26	93	53–119	89	....	274.7	.08	68	96	30	6.6	9.5	26.9	54.8	2.2
Sept. 2	92	51–124	86	....	300.4	.19	72	93	54	5.7	7.9	23.8	59.7	2.7
9	92	51–125	88	....	329.7	.74	62	94	56	5.7	8.7	22.9	60	2.6
16	...	.....	....	....	425.5	....	74	90	53	5.2	8.2	20.8	62.8	2.9
23	....	.....	....	....	417.5	....	66	90	47	4.9	7.8	19.3	64.9	3
30	....	.....	....	....	422.3	....	61	73	42	4.7	6.7	21	64.7	2.8
Oct. 7	....	.....	....	....	412	....	56	....	....	4.2	8	20.7	64	3

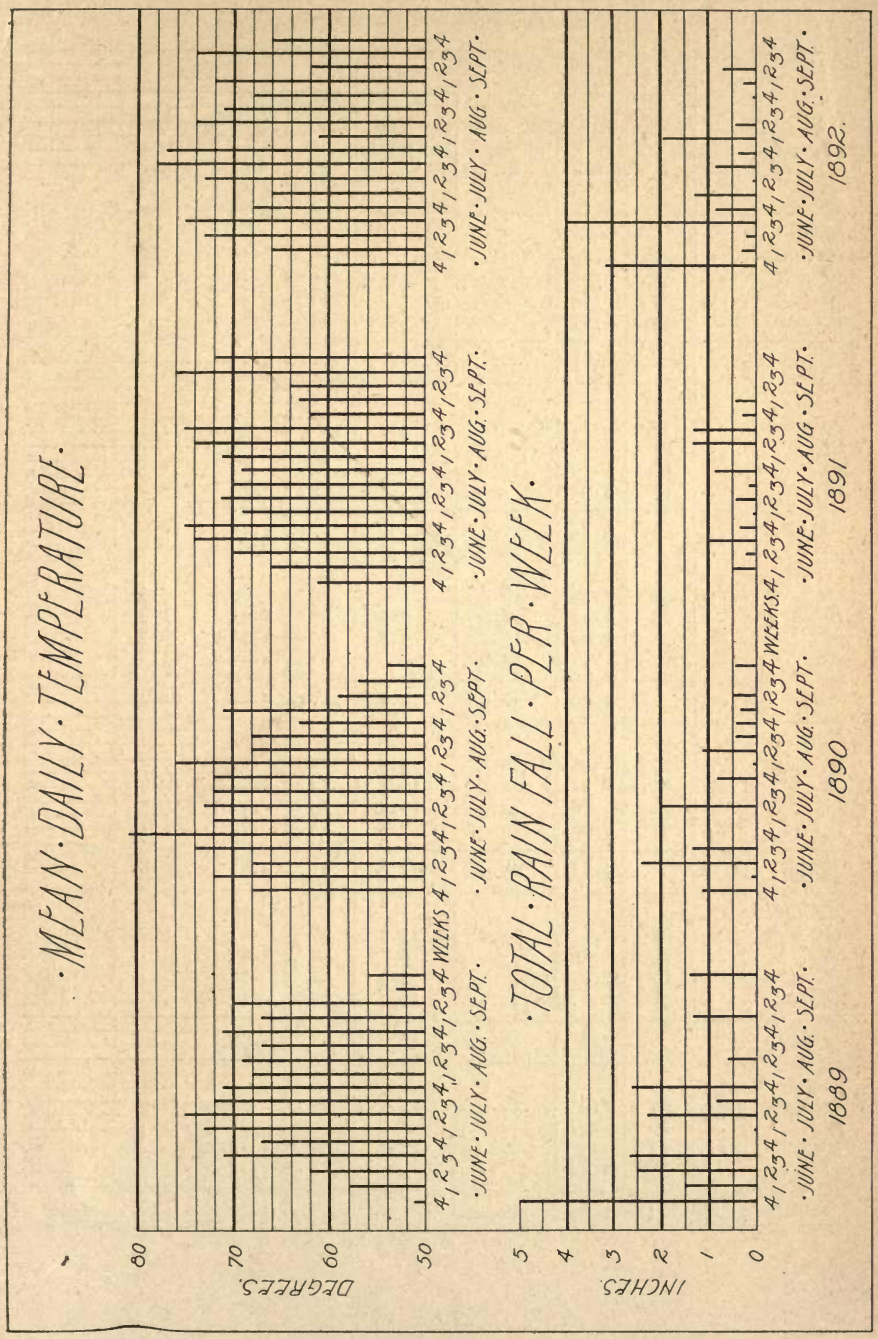
FIELD NOTES, 1891.

(*a*) Full tassel.
(*b*) Silk all out.
(*c*) Silk dead.
(*d*) Roasting ear stage.
(*e*) Denting.
(*f*) Husks turning brown.
(*g*) 50 per cent. dead.

FIELD NOTES, 1892.

(*a*) Full tassel.


WEEKLY GROWTH IN HEIGHT AND INCREASE IN WEIGHT OF DRY SUBSTANCE IN THE CORN PLANT DURING FOUR SEASONS.
INDICATES WEIGHT OF DRY SUBSTANCE IN GRAMS.
INDICATES GROWTH IN HEIGTH IN INCHES.
1889
1890
1891
1892
HEIGHT LIMIT
HEIGHT IN INCHES.
WEIGHT IN GRAMS.
0 10 20 30 40 50 60 70 80 90 100
0 100 200 300 400
4 WEEKS 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 WEEKS 1 2 3 4 1 2 3 4 1 2 3 4 WEEKS 1 2 3 4 1 2 3 4 1 2 3 4 WEEKS 1 2 3 4 1 2 3 4 1 2 3 4
JUNE JULY AUG SEPT
JUNE JULY AUG SEPT
JUNE JULY AUG SEPT
JUNE JULY AUG SEPT


MEAN DAILY TEMPERATURE.
DEGREES.
80
70
60
50
4,1,2,3,4,1,2,3,4,1,2,3,4,1,2,3,4 WEEKS 4,1,2,3,4,1,2,3,4,1,2,3,4
JUNE · JULY · AUG · SEPT.
JUNE · JULY · AUG · SEPT.
1889
4,1,2,3,4,1,2,3,4,1,2,3,4
JUNE · JULY · AUG · SEPT.
JUNE · JULY · AUG · SEPT.
1890
4,1,2,3,4,1,2,3,4,1,2,3,4
JUNE · JULY · AUG · SEPT.
JUNE · JULY · AUG · SEPT.
1891
4,1,2,3,4,1,2,3,4,1,2,3,4
JUNE · JULY · AUG · SEPT.
JUNE · JULY · AUG · SEPT.
1892.
TOTAL RAIN FALL PER WEEK.
INCHES.
5
4
3
2
1
0
4,1,2,3,4,1,2,3,4,1,2,3,4 WEEKS 4,1,2,3,4,1,2,3,4,1,2,3,4
JUNE · JULY · AUG · SEPT.
JUNE · JULY · AUG · SEPT.
1889
4,1,2,3,4,1,2,3,4,1,2,3,4
JUNE · JULY · AUG · SEPT.
JUNE · JULY · AUG · SEPT.
1890
4,1,2,3,4,1,2,3,4,1,2,3,4
JUNE · JULY · AUG · SEPT.
JUNE · JULY · AUG · SEPT.
1891
4,1,2,3,4,1,2,3,4,1,2,3,4
JUNE · JULY · AUG · SEPT.
JUNE · JULY · AUG · SEPT.
1892.

RELATION OF TEMPERATURE AND RAINFALL TO INCREASE IN HEIGHT AND DRY MATTER OF THE CORN PLANT.

	1889.				1890.			
	Temp. F.	Rain, in.	Per cent. of total ht.	Per cent of total wt.	Temp. F.	Rain, in.	Per cent. of total ht.	Per cent. of total wt.
April.								
1st week.....	45°	....	.....	.....	50°	1.10	.....	.....
2d "	55	.05	.....	.....	54	1.4	.....	.....
3d "	57	.54	.....	.....	48	....	.....	.....
4th "	52	.02	.....	.....	54	1.61	.....	.....
Sum	.....	.61	.....	.....	.....	4.11	.....	.....
May.								
1st week.....	57	.....	.....	.....	50	.45	.....	.....
2d "	66	.38	.....	.....	54	1.62	.....	.....
3d "	66	.12	.....	.....	56	.27	.....	.....
4th "	51	5.02	.....	.....	68	1.12	12	.....
Sum	.....	5.52	.....	.....	.....	3.44	12	.....
June.								
1st week.....	58	1.56	6.3	.....	72	.05	7.5	0.6
2d "	62	2.44	6.3	0.2	68	2.41	12.6	1.7
3d "	71	2.69	11.7	0.5	74	1.34	19.3	5.2
4th "	67	.....	12.6	2	81	.....	21.8	6.1
Sum	.....	6.69	36.9	2.7	.....	3.8	61.2	13.6
July.								
1st week.....	73	.06	10.8	3.5	72	.....	9.2	18.5
2d "	75	2.31	22.5	10.4	74	2.04	10.9	10.2
3d "	72	.78	12.6	10.5	73	.....	6.7	12
4th "	71	2.66	10	7.5	72	.79	.....	14.5
Sum	.....	5.81	65.9	31.9	.....	2.83	26.8	55.2
August.								
1st week	68	.....	7.2	15.3	76	.07	.....	2
2d "	69	.6	.....	8	68	1.08	.....	.....
3d "	67	.....	.....	3.5	68	.38	.....	10.9
4th "	71	.....	.....	19.2	63	.4	.....	3.8
Sum	.....	.6	7.2	46	.....	1.93	.....	16.7
September.								
1st week.....	67	1.3	.....	.....	72	.31	.....	.....
2d "	70	.....	.....	7.2	59	.51	.....	14.5
3d "	53	.....	.....	12.2	57	.....	.....	.....
4th "	56	1.44	.....	.....	55	.37	.....	.....
Sum	.....	2.74	.....	19.4	.....	1.19	.....	14.5

RELATION OF TEMPERATURE AND RAINFALL TO INCREASE IN HEIGHT AND DRY MATTER OF THE CORN PLANT.—*Continued.*

	1891.				1892.			
	Temp. F.	Rain, in.	Per cent. of total ht.	Per cent. of total wt.	Temp. F.	Rain, in.	Per cent. of total ht.	Per cent. of total wt.
April.								
1st week.....	36°	.15	.....	.....	56°	3.11	.....	.....
2d "	52	1.87	.....	.....	37	.83	.....	.....
3d "	63	1.47	.....	.....	47	.73	.....	.....
4th "	58	.15	.....	.....	52	1.78	.....	.....
Sum	.....	3.64	.....	.....	.....	6.45	.....	.....
May.								
1st week.....	51	.....	.....	.....	63	1.34	.....	.....
2d "	59	.46	.....	.....	53	1.21	.....	.....
3d "	62	.43	.....	.....	55	2.19	.....	.....
4th "	61	.....	12	.....	60	3.12	.....	.....
Sum	.....	.89	12	.....	.....	7.86	.....	.....
June.								
1st week.....	66	.5	7	.....	66	.3	2	.....
2d "	71	.23	13	1.1	73	.18	8	.....
3d "	74	1.02	17	4.6	75	4.02	7	.4
4th "	75	.33	19	2.8	68	.86	7	.3
Sum	.....	2.08	56	8.5	.....	5.36	24	.7
July.								
1st week.....	69	.7	9	5.7	67	1.32	9	1.4
2d "	71	.38	10	18.3	73	.09	18	2.8
3d "	71	.13	11	13.5	78	.82	17	6.6
4th "	69	.83	2	.....	77	.27	19	10
Sum	.....	2.04	32	37.5	.....	2.5	63	20.8
August.								
1st week.....	72	.01	.....	15.5	62	1.93	8	11.8
2d "	74	1.35	.....	.....	74	.42	4	7
3d "	75	1.28	.....	12	71	.....	1	11.8
4th "	63	.22	.....	11	69	.08	.....	12.5
Sum	.....	2.86	.....	38.5	.....	2.43	13	43.1
September.								
1st week.....	63	.35	.....	15.5	72	.19	.....	6.1
2d "	65	.....	.....	.....	62	.74	.....	7
3d "	76	.....	.....	.....	74	.....	.....	22.3
4th "	72	.06	.....	.....	66	.....	.....	.....
Sum	.....	.41	.....	15.5	.....	.93	.....	35.4

COMPARISONS OF OBSERVATIONS ON TEMPERATURE.

1889.	1890.	1891.	1892.
April.	*April.*	*April.*	*April.*
A gradual increase in temperature up to the last week, which was cooler than the two previous weeks.	Average temperature, higher than in 1889. The third week, the coolest in the month.	Unusually cold the first week, but grew warmer each week. Third week, warmer than usual for April.	Unusually warm the first week and cold the second and third weeks, with an average temperature in the last week.
Extremes, 25°–75°	Extremes, 29°-80°	Extremes, 22°-81°	Extremes, 26°-70°
May.	*May.*	*May.*	*May.*
First week, average temperature; second and third weeks, above average; last week, unusually cold.	First week, average temperature; second and third weeks, cool; last week, warm.	First week, below average. Some hot days in last three weeks, with about an average mean.	First week, warm. The remainder of the month cold. Highest in last week, 80°.
Extremes, 28°-91°	Extremes, 33°-87°	Extremes, 24°-91°	Extremes, 37°-94°
June.	*June.*	*June.*	*June.*
The whole month a little cooler than June of the other three years.	First week, warm; second and third weeks, about average temperature; last week, hot, temperature up 96°.	The weather was warm, but not excessively so.	Second week was warmest, and the last rather cool.
Extremes, 40°-88°	Extremes, 47°-96°	Extremes, 49°-93°	Extremes, 49°-94°
July.	*July.*	*July.*	*July.*
Average temperature for July, warmer in second than last week.	Temperature reached 97° in both second and third weeks.	Cool first week and a mean temperature, a little below average, with some hot days.	Cool the first week, very hot the third and fourth weeks, with an average temperature of 78°.
Extremes, 50°-90°	Extremes, 45°-97°	Extremes, 42°-93°	Extremes, 46°-97°
August.	*August.*	*August.*	*August.*
A little below average temperature, except last week.	First week hot, with average of 76°. Remainder of the month about average temperature.	Very hot in second and third weeks, but cool in last week to a mean temperature of 62°.	Mean temperature a little below average in first week, but above during remainder of the month.
Extremes, 50°-89°	Extremes, 39°-96°	Extremes, 40°-99°	Extremes, 47°-94°
September.	*September.*	*September.*	*September.*
First week, average temperature; second week, warm; last two weeks, cooler.	First week, warm; but cooler the remainder of the month.	First two weeks, about average temperature; the third and fourth weeks, very hot.	Temperature did not go to either extreme throughout the month.
Extremes, 32°-88°	Extremes, 33°-89°	Extremes, 41°-96°	Extremes, 35°-73°

COMPARISON OF RAINFALL AND HUMIDITY.

1889.	1890.	1891.	1892.
April. Clear and dry; one-half inch rain in third week only. *Humidity decreasing from first of month.	*April.* Average amount of rain, about 1½ in. per week, except third week clear and dry. Humidity decreased.	*April.* Average amount rain, but nearly all fell in two middle weeks. Humidity high.	*April.* Very wet, especially in first and last weeks, 3 in. first week and 2 in. fourth week. Humidity high.
May. No rain in the first three weeks, but in fourth week the largest rain in any one week of this record.	*May.* Average amount rain. The greatest fall, 1.6 in., during second week. Humidity high first week and decreased to low last week.	*May.* Very dry, less than 1 in. rain during the month. Low humidity in second week, but about average in other weeks.	*May.* Very wet, over 1 in. rain every week, with 2 and 3 in. during last two weeks. Very high humidity second and third weeks.
June. Very wet except last week. No rain. High humidity second week and about average the rest of the month.	*June.* No rain first and fourth weeks, but considerable in the second and third weeks. Very low humidity in first week, about average the remainder of the month.	*June.* Rather small amount of rain, about 2 in. quite evenly distributed through the month. Humidity high first week, low fourth, and average second and third weeks.	*June.* Very little rain first and second weeks, but a great deal in third, and average amount in last. Humidity high first week, average through the rest of the month.
July. No rain first week, but 2 and 3 in. in second and fourth weeks. Humidity about average for some years, though not high.	*July.* No rain in first and third weeks, 2 in. second, 1 in. fourth week. Rather under the average humidity, but quite uniform through the whole month.	*July.* Almost no rain, except 1 in. during fourth week. Humidity low in second week, but high in fourth week.	*July.* 1¼ in. rain in first week, and 1 in. in third week, but dry in second and fourth weeks. Humidity average in first and fourth weeks, high in second and low in third.
August. Only ½ in. rain during the month, in second week. Average humidity through the whole month.	*August.* About 2 in. rain, mostly in second week of month. Humidity rather low, except the last week.	*August.* About 2 in. rain in second and third weeks. Humidity low in first week and high in third week, with average during second and fourth weeks.	*August.* Two in. rain first week, ½ in. second week, and none in last two weeks. Humidity above average in first and fourth weeks.
September. One-half in. rain first and fourth weeks. Second and third weeks dry. Humidity above average, especially in fourth week.	*September.* Nearly ½ in. rain in each, first, second, and fourth weeks, but none in third. Humidity about average for September.	*September.* Less than ½ in. rain during the whole month. Humidity very low.	*September.* Less than 1 in. rain during first and second weeks, and none in third and fourth weeks. Humidity high in second and average the rest of the month.

*Humidity is the per cent of moisture in the air when rain equals 100 per cent.

together with the chemical composition of this dry matter. This shows the amount of ash, protein, fiber, nitrogen-free extract, and ether extract in 100 lbs. of dry matter of the plant each week of its growth. The tables also show the inches of rainfall, with the extremes and mean temperature observed every week, and some field notes made of stage of growth of the plant at various times in the season. These field notes were made by a different person each year, which fact accounts for the lack of uniformity in the number and wording of these observations.

A short summary of the weather in each of the six months of the four seasons is given on pp. 370-1. This affords an opportunity of comparing the temperature and rainfall of the same month in different years and of the different months of each year, and shows when sudden changes of temperature or rainfall occurred, the weather at the corresponding time in other years, and what influence it seemed to have on the corn plant, thus supplying evidence for judging the effect on corn growth of similar meteorological conditions in the future.

A summary of both weather and corn growth observations is given on page below. Also the temperature and rainfall for April as well as the corn growing months, the per cent of the total growth in height made each week, and the percentage of increase of dry matter gained by the plant every week.

Summary of Weather and Corn Growth.

1889.

The month of April was cool and dry; only about one-half an inch of rain fell. The corn was planted the first week in May. There was no rain, and about average temperature in May, until the last week, when it was unusually cool and 5 in. of rain fell. This was the largest rainfall in any one week of this four years' record. It so checked the corn growth that although seed had been planted four weeks the plants were only about 7 inches high on June 10th. The whole month of June was rather cool and very wet, except the last week. During June the plants reached a height of 41 in., which was about 37 per cent of their total height. At this time they contained but about 3 per cent of their total growth in dry matter. No extremes of temperature occurred in July, but nearly 6 in. of rain fell. The plants grew about 56 per cent of their total height and gained 32 per cent of their total dry weight. The weather in August was rather cool and dry, with only one-half an inch of rain. The corn reached its total growth in height the first week in August, when it grew 7 per cent of its total height. The increase in weight of dry matter amounted to 46 per cent of its total dry weight. September had about the average temperature and rainfall for that month. The corn plant reached its greatest weight of dry matter in the third week of September, the increase being during the month 19 per cent of its total weight of dry matter.

Briefly stated, the season of 1889 was cool and dry before planting, cold and wet just after planting, with nearly average meteorological conditions the remainder of the season. The corn plant reached its greatest height the first week in August, making about one-third this growth in June and two-thirds in July. It continued to increase in weight of dry matter until the last week in September, gaining about 3 per cent of it in June, 32 per cent in July, 46 per cent in August, and 10 per cent the first week in September.

1890.

The rain in April and May was quite evenly distributed through the months. The temperature was warmer than in 1889. Corn was planted the first week in May, as in 1889, but it had reached a height of 23 in. June 10th, while in 1889 it was only 7 in. tall at this date. The weather in June, 1890, was hot and the rainfall nearly 4 in. Corn grew 61 per cent of its total height and gained nearly 14 per cent of its dry weight, as compared with 37 per cent and 3 per cent, respectively, in 1889, although the seed had been in the ground the same number of days each of the two years. In July there was some very hot weather and about 3 in. of rain. The corn plant reached its maximum height the third week in July and grew about 27 per cent of its total height during the first three weeks of this month. It increased each week in dry weight 10 to 18 per cent, making a growth of about 55 per cent of its total weight of dry matter in July. August and September were hot and dry. There was a gain of about 17 per cent of dry matter in the corn plant in August and 15 per cent in September. The maximum weight of dry matter was reached the second week in September.

1891.

In rainfall and temperature during the corn growing season, 1891 resembled 1890. Corn was planted May 9th. The temperature was about the average for May, but less than 1 in. rain fell during the month. Through June, July, and August rain was quite evenly distributed, amounting to 2 in. each in June and July, and 3 in. in August. No extremes in temperature were observed until the second and third weeks of August when 99° F. was recorded. A much greater number of corn plants was measured each week in this season than any other. The plants were 16 in. tall June 10th. They got 56 per cent of their total growth in height in June, 32 per cent in July, and reached their maximum height August 1st. They continued to grow in weight of dry matter until the second week of September. When the corn plant had reached its maximum growth in height, it had attained only 46 per cent of its total growth in dry matter. During the excessively hot August, with about 3 in. rain, the plants gained 38.5 per cent of their total growth in dry weight.

1892.

The months of April and May were excessively wet. Nearly three-eighths the annual rainfall, 14¼ in., came in these two months. June was also very wet; 5½ in. rain fell. This caused a very late planting of corn, so that June 10th plants were only 2 in. tall, while in 1890 they were 23 in. high on this date. In June, 1892, the plants grew 24 per cent of their total height, while in June, 1890, plants of the same variety of corn made a growth of 61 per cent of their total height. The temperature and rainfall were very favorable for corn growth in July, 1892, and the plants gained 63 per cent of their total growth in height, reaching their maximum height the second week in August, which was only one week later than former years, although there was a difference of four weeks in the date of planting seed. The plants also reached their maximum growth in dry weight the third week in September, which was no later than in 1889, and only one week later than in 1890; but the greater part of this growth was made in August and September, while in former years a much larger proportion of the growth in dry weight was made in July.

Growth at Different Stages of Development.

The tables give data by which the growth of corn and the weather conditions for any week in the season can be compared with those of the corresponding week of the other three years. The plants were at such different stages of development, especially in the early months of the seasons, that in the discussion of the relation between weather and rate of growth of the corn plant, each year may be divided into two parts: First, before, and second, after, corn is one foot high. Climate and soil conditions have a great influence in accelerating or retarding the sprouting and start of corn. Assuming that the plants are on an equal footing when they have reached a certain height, we can trace from this second point the influence of meteorological conditions.

The corn was planted the first week in May in 1889, 1890, 1891, but not until June 3, in 1892, because of the great amount of rain in both April and May of that year. Between the date of planting and the time when the corn was one foot high there elapsed in 1889, 6 weeks; in 1890, 4 weeks; in 1891, 3½ weeks; and in 1892, two weeks. This shows that corn may reach one foot in height from 2 to 6 weeks after planting. The slow growth for six weeks in 1889 was evidently caused by the extreme dryness in April and three weeks in May, with a change to the greatest rainfall and lowest mean temperature recorded during the four years in the last week of May and three weeks in June. Both extreme drought and rain retarded the starting of the corn this year.

In 1890 and 1891 corn made almost exactly the same start each year. About the average amount of rain fell in April of each year and in May of 1890, but May, 1891, was rather dry, though apparently not dry enough to affect the corn that month. About the average mean

temperature was also observed in April and May of these two years. Corn reached one foot in height two weeks after planting in 1892. The soil had been previously soaked with rain, but the seed and young plant had a much higher temperature in which to grow than had been the case in any other year, and there was very little rain for two weeks after planting. These seemed to be ideal conditions for the sprouting and early growth of this plant. The table shows, however, that when the corn was one foot high it contained less than 0.5 per cent of its total growth in dry matter, although it had attained 10 to 12 per cent of its total height.

Beginning when the plants were about one foot high, regardless of the date, and tracing their growth in both height and weight, each week of the seasons gives the following figures:

PERCENTAGE OF TOTAL GROWTH IN HEIGHT AND IN DRY MATTER IN THE CORN PLANT MADE EACH WEEK AFTER THE PLANT WAS 12 INCHES HIGH. RAINFALL AND MEAN DAILY TEMPERATURE FOR SAME PERIODS.

Week.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Percentage of growth in height.															
1889.....	12.6	11.7	12.6	10.8	22.5	12.6	10	7.2	....	....	....	....	....	....	....
1890.....	12	7.5	12.6	19.3	21.8	9.2	10.9	6.7	....	....	....	....	....	....	....
1891.....	12	7	13	17	19	9	10	11	2	....	....	....	....	....	....
1892.....	10	7	7	9	18	17	19	8	4	1	....	....	....	....	....
Average...	11.6	8.3	11.3	14	20.3	12	12.7	8.2	....	...	....	....	....	....	....
Percentage of increase in dry matter.															
1889.....	.2	.5	2	3.5	10.4	10 5	7.5	15.3	8	3.5	19	0	7.2	12.2	....
1890.....	....	.6	1.7	5.2	6.1	18.5	10.2	12	14.5	2	0	10.9	3.8	0	14.5
1891.....	....	1.1	4.6	2.8	5.7	18.3	13.5	0	15.5	0	12	11	15.5	0	....
1892.....	....	.4	.3	1.4	2.8	6.6	10	11.8	7	11.8	12.5	6.1	7	22.3	....
Average...	....	.6	2.1	3 2	6.2	13.5	10.3	10	11.2	4.3	11	7	8.4	8.6	....
Rainfall, inches.															
1889.....	2.4	2.7	....	.06	2.3	.8	2.7	....	.6	....	....	1.3	....	....	1.4
1890.....	1.1	.05	2.4	1.3	....	....	2.04	....	.8	.07	1.08	.4	.4	.3	....
1891.....	....	.5	.23	1.02	.33	.07	.4	.13	.8	.01	1.35	1.28	.22	.35	....
1892.....	.2	4.02	.86	1.32	.09	.8	.3	1.9	.4	....	.08	.2	.74	....	....
Mean daily temperature, F.															
1889.....	62°	71°	67°	73°	75°	72°	71°	68°	69°	67°	71°	67°	70°	53°	56°
1890.....	68	72	68	74	81	72	74	73	72	76	68	68	63	72	59
1891.....	66	71	74	75	69	71	71	69	72	74	75	63	63	65	76
1892.....	73	75	68	67	73	78	77	62	74	71	69	72	62	74	66

This shows that there was quite a uniformity in the proportional part of the total height attained each week during the years 1889, 1890,

1891. In 1892 a greater percentage of the growth was made later in the season than in the other years.

Comparing the growth in height in three years, 1889, 1890, and 1891, with the rainfall during the same time shows that in the second week of 1889 corn grew 4 per cent more in height than in 1890 and 1891 and that there was 2 in. more rain. No rain fell in the fourth week of 1889 and the plants were 6 and 8 per cent behind those of 1890 and 1891, which had over one inch rain that week. The record of the eighth week shows that the corn of 1891 made greater growth, but did not have much more rain than in the other two years.

The table also shows that the third week after the plants were one foot high in both 1889 and 1891 there was about the same growth in height and amount of rainfall, but the mean temperature for this week was 7 degrees higher, and there was double the increase of dry matter in the plants in 1891 as compared with 1889. In the fourth week the plants grew 10 in. more in height in 1890 than in 1892. There was about the same rainfall, but the mean temperature was 7 degrees higher in 1890 than in 1892. Other comparisons also show that the higher the temperature the better the corn growth, and that according to the observations made heat seemed to be more beneficial than rain. The most rapid growth in height was made when the corn was between 3 and 6 ft. tall. It grew 2 ft. per week for two weeks in succession the last of June, 1890. The excessive rain of April, May, and June, 1892, prevented the same growth of corn as in the previous years during these months, but about 3 in. in height per day was made in the last week in July, 1892. The table shows that in the first three years the corn reached its maximum height eight weeks after it was one foot high, but in 1892 it kept on increasing in height for ten weeks from this time.

No uniform relation between growth of plant and meteorological conditions can be exactly traced from these figures, which cover a period of four years of observations. One important reason for this is the fact already mentioned, that, unlike animals, plants cannot be weighed each week and then allowed to grow again. All these weights were necessarily made of different plants. The average figures show the general rate of growth in height and weight, and uniformly indicate that when a corn plant has reached its total growth in height it has attained only about one-half the weight of dry substance it will gain if left to grow to maturity.

Composition of green Corn Plant.

The per cent of water and the composition of the fresh samples of corn cut weekly were determined only one year, but analyses were made of three samples taken weekly and the results doubtless represent the average composition of plants which are of the heights given, although they may attain these heights at different times in the different years.

This table is given especially to show the per cent of water in the plant from week to week. This changes from 90 to 55 from beginning to the end of the season, but, as before stated, it represents the general composition of corn plants of these heights rather than at the dates mentioned, because this particular season was about one month later in the spring.

ANALYSES OF GREEN CORN PLANTS.

Date when cut.	Average.		Chemical composition—percentages.					
	Height, n.	Weight, oz.	Water.	Ash.	Protein.	Fiber.	Starch, etc.	Ether extract.
June 10	2	.....	81.6	....	.....	.....	.....	.....
" 17	12	.....	85	....	.....	.....	.....	.....
" 24	23	.7	89.95	1.84	2.78	1.93	3.73	.54
July 1	28	1.1	88.86	1.48	2.69	2.37	3.9	.69
" 8	35	3.2	89.94	1.44	2.3	2.55	3.39	.37
" 15	48	8.2	91.64	.94	1.68	2.2	3.24	.29
" 22	67	12.1	86.82	1.12	1.29	3.76	5.55	.46
" 29	95	24.7	87.31	.93	1.54	3.66	6.09	.46
Aug. 5	100	29.4	82.76	1.13	1.85	5.14	8.55	.56
" 12	103	35.3	82.72	1.04	1.64	5	9.15	.43
" 19	111	41	80.78	1.13	1.73	5.34	10.54	.46
" 26	108	44	78.41	1.41	2.04	5.78	11.87	.47
Sept. 2	111	39.3	73.32	1.52	2.12	6.38	15.92	.73
" 9	107	41	71.65	1.63	2.48	6.49	17.01	.73
" 16	108	47	57.68	1.68	2.64	6.73	20.32	.93
" 23	105	41	63.72	1.77	2.81	7	23.57	1.11
" 30	110	37	59.96	1.88	2.7	8.37	25.93	1.15
Oct. 7	107	33	56.02	1.85	3.51	9.1	28.17	1.34

This table shows that the plants reached their total growth in height August 19th. There was an increase in the weight of water in the plant every week up to August 26th, when it reached its maximum, and then gradually decreased as the plant dried. The growth of the plant did not cease, however, at the time it stopped growing in height, or when it had accumulated the greatest weight of water. The gain of dry matter continued every week up to September 16th, four weeks after reaching its greatest height. The weight of dry matter in the plant after September 16th remained about the same up to October 7th. The slight difference is probably caused by loss of dried portions of the plant which may have been blown away by the wind.

The increase in weight of the ash, protein, etc., of the plant all followed the same course of the dry matter. They increased in amount up to the last of September. When the plant had reached its greatest height, 9 ft. 3 in., it contained 33 oz. water and 7.8 oz. dry matter. This dry matter contained about ½ oz. ash, ¾ oz. protein, 2¼ oz. fiber, 4¼ oz. nitrogen-free extract, and 1-5 oz. ether extract. After this time the plant continued to grow in weight until its maximum weight of dry matter was 15 oz., containing ash, 1 oz.; protein, 1½ oz.; fiber, 3 oz.; nitrogen-free extract, 9½ oz.; and ether extract, ¼ oz.

The analysis of the fresh samples shows that a given quantity (100 lb.) of young corn plants 2 ft. high contained as much protein and ash as the same quantity of fully mature corn, although the young corn plant has 90 and the ripe plant only 60 per cent of water. This does not hold true of the other constituents, however. The fiber, starch, etc., in 100 lb. of the ripe plant is nearly 10 times that in the young corn. The relation between the nitrogenous (protein) and carbonaceous (fiber, starch, etc.) constituents is as 1 to 3 in the young plant and as 1 to 13 in the ripe corn plant in September and October.

100 lb. corn 2 ft. high contained 1.8 lb. ash, 2.8 lb. nitrogenous matter, 6.2 lb. carbonaceous, and 89.2 lb. water.

100 lb. ripe corn 9 ft. high contained 1.8 lb. ash, 2.8 lb. nitrogenous matter, 35.4 lb. carbonaceous, and 60 lb. water.

Length of the growing Season.

The five months from May to September, inclusive, comprise the corn growing season. Some changes probably occur in the plant after September in certain seasons, but as a rule, corn gets its growth by the first of October. The temperature and rainfall in April have considerable influence on the time of planting corn in the spring, hence the consideration of the April weather is important when comparisons are made of the corn growth in different years.

In 1889, 1890, and 1891 it was four and one-half months from the time the corn was planted until the plant had reached its maximum weight of dry substance. The heavy rains in April and May of 1892 made the corn growing season of that year one month shorter than in the three previous years. The plants attained their weight of dry matter by the middle of September, as in the previous years. A comparison of the different years shows that corn was planted, reached its maximum height and gross weight of dry substance per plant at the following dates:

	1889.	1890.	1891.	1892.
Planted...	May 4.	May 5.	May 9.	June 3.
Tallest....	Aug. 5-111 in	July 22–119 in	July 28–98 in.	Aug. 19–100 in.
Heaviest..	Sept. 16–13.8 oz.	Sept. 9–14.8 oz.	Sept. 2–12.3 oz.	Sept. 16–14.8 oz.

Analyses of the corn plants were made up to the first week in October, but, from loss of leaves which dried and broke off, there was not so much dry matter in the plants as was found about the middle of September. There may be changes going on in the plant after this date, but during these four years no further increase in weight was observed.

Composition of the Dry Matter of the Corn Plant.

The average maximum weight of dry matter per corn plant and dates when this was reached each year were as follows, 1889, 14 oz.,

third week in September; 1890, 15 oz., second week in September; 1891, 12.5 oz., first week in September; 1892, 15 oz., third week in September; average 14 oz.

The composition of this dry matter as found by analyses made in the three years 1890, 1891, and 1892 was as follows:

COMPOSITION OF MAXIMUM WEIGHT OF DRY MATTER, PERCENTAGES.

	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Ether extract.
1890	5.3	7.3	19.9	64.9	2.5
1891	5.1	8.5	21.7	61.7	2.9
1892	5.2	8.2	20.8	62.8	2.9
Average	5.2	8	20.8	63.2	2.8

Assuming that there are 10,000 plants per acre, these analyses show that an acre of such corn, grown to maturity would contain about 8,750 lb. dry substance, composed of 455 lb. ash, 700 lb. protein and 7,595 lb. carbohydrates, including fiber, starch, sugar, etc.

When the plants were about 18 in. high, their water free substance contained about 17 per cent mineral matter, 27 per cent protein, 35 per cent nitrogen-free extract, and 20 per cent fiber. As the plant matured the percentages of ash and protein decreased, and the fiber, starch, sugar, gums, etc., increased. This change was most marked from the time when plants were a foot high until they reached the roasting ear stage, when the water free substance of the plant contained about 6 per cent mineral matter, 9 per cent protein, 58 per cent nitrogen-free extract, and 25 per cent fiber. After this time there was not so great a change in the proportion of these constituents.

The analyses of the corn plants through the three years show the same kind of a change each year in the composition of the dry matter of the plant at the same stage of its growth. All the analyses were made of the whole corn plant. No attempt was made to separate the ear, stalk and leaves, but the whole plant was chopped fine and the mixture analyzed.

COMPOSITION OF DIFFERENT PARTS OF THE CORN PLANT—PERCENTAGES.

	Water.	Ash.	Protein.	Fiber.	Nitrog'n free extract.	Ether extract.
Ears fresh	42.81	.99	3.51	5.15	45.1	2.44
Water-free	.....	1.74	6.13	9.01	78.86	4.26
Stalks fresh	74.45	.84	.62	8.84	14.82	.43
Water-free	.....	3.27	2.41	34.62	58.03	1.67
Leaves and husks fresh	57.89	4.4	1.93	12.47	22.24	1.07
Water-free	.....	10.45	4.59	29.62	52.8	2.54

The composition of the different parts of the plant, when the husks were dry and the kernels could be indented by the thumb nail with difficulty, is shown by the foregoing figures taken from Bulletin No. 4, p. 91 of this Station—variety, Burr's white.

Loss of Dry Matter by Sprouting of Corn Seeds.

When seeds sprout, a certain amount of their own substance is necessarily used to sustain the developing life until the plant can assimilate from other sources the necessary material for growth.

The following experiment was made to trace the gain and loss of material that occurred in the first stages of development of the corn plant.

April, 1892, the amount of water and dry matter was determined in a sample of seed corn. These results were used for estimating the weight of water and dry matter in the kernels which were taken from the same sample and sprouted. The first trial was made by placing six kernels in damp cotton where they were left to sprout in the dark for nine days. Four of these kernels partly sprouted, then moulded, failing to develop further. An analysis showed that they lost in this partial sprouting process 9 to 18 per cent of the dry matter in the original seed. Each one of the four was analyzed separately, and the adhering shell of the kernel was included in the estimated dry matter.

Two of the six kernels sprouted and developed a corn plant. The root and stem of these plants each measured two to three inches, and their weight was from three to three and one-half times that of the original kernel. It was found, however, that when the water was dried out of these young plants the dry matter in them was 20 to 31 per cent less than the seed contained.

Details of Weights in Grams.

	Dry matter.	Water.	Total.
Weight of seed before sprouting	0.271	0.042	0.313
Plant with seed attached after 9 days sprouting in damp cotton	0.187	0.747	0.934
Gain or loss of plant over seed	—0.084	+0.705	+0.621
Per cent gain and loss was of weight in seed	—31	+1680	+198
Duplicate trial gave	—19.80	+1945	+239

This shows that in sprouting the white plant had taken up a large amount of water but lost about one-fourth of the dry matter in the seed.

This experiment was repeated June 3, 1892, by sprouting the seed in the soil of a corn field instead of in cotton. Each kernel planted was weighed and the young plants dug up, weighed, and measured. The details of these weights are given in the table.

COMPARISON OF DRY MATTER IN SEED AND IN YOUNG PLANT.

Plant No.	Weight in grams.			Measurement of plant, in.			Dry matter.	
	Seed.		Green Plant.	Tip of leaf to seed.	Above ground.	Roots.	In plant, grams.	Per cent of that in seed.
	Dry matter.	Total.						
Plant and root, one week from planting.								
1	.416	.479	1.64	4	2	5	.331	79
2	.357	.412	1.45	4½	2	5	.210	59
3	.347	.450	1.55	3½	2	4	.273	78
4	.393	.457	1.45	1½	3½	4	.310	78
Plant above ground, two weeks from planting.								
5	.378	.437	3.23	.....	14	.....	.493	130.4
6	.346	.4	1.79	.....	9½	.....	.3	86.7
7	.395	.456	2.47	.....	11½	.....	.435	110.1
8	.404	.466	2.61	.....	11	.....	.348	86.1
9	.424	.49	3.54	.....	12	.....	.437	103
Plant above ground, three weeks from planting.								
10	.348	.402	16.6	.....	21½	.....	1.82	524.6
11	.413	.477	18.6		20½	.....	2.04	495.4

One week after planting the plants were dug up. They were from one to four inches above ground and each had two green leaves. The shell of the kernel still clung to the plant. The root was about 5 in. long, making a total length of about 10 in. from tip of leaf to end of root. The weight of these green plants (leaf and root) was about four times that of the seed planted, but when the water was dried out they contained less dry matter than the seed, from 58 to 79 per cent only of that in the original seed.

Two weeks after the seed was planted, five plants were cut at the surface of the soil and the weights and measurements of each plant above ground were compared with the weight of its seed.

The table shows that these corn plants, having a height of 10 to 14 in. above ground, weighed when fresh 4 to 8 times as much as their seed, but that this increase of weight came almost entirely from the water absorbed. The dry matter in some of these plants was less than that in the kernels planted.

The table also shows that a plant 20 inches high weighed over forty times as much as the seed but contained only about five times as much dry matter.

E. H. FARRINGTON, M. S., Chemist.

EXPERIMENTS WITH OATS, 1893.

This article reports results of the following experiments with oats conducted in 1893:

No. 12. Oats, quantity of seed per acre.

No. 14. Oats, time of sowing.

No. 15. Oats, depth of sowing.

No. 128. Oats, effect of time and manner of harvesting upon yield and chemical composition.

SUMMARY.

The trials were all made on the fertile, dark colored prairie soil of the Station grounds. The rainfall during April and May was large; in June, unusually small. For July the rainfall was .59 inches and the average temperature 74.6° F.

RAINFALL AND TEMPERATURE.

	1889.		1890.		1891.		1892.		1893.	
	Rain, in.	Temperature.	Rain, in.	Temperature.	Rain, in.	Temperature,	Rain, in.	Temperature.	Rain, in.	Temperature.
April.....	0.61	52°	4.11	52.3°	3.54	52.8°	6.45	48.6°	7.68	49.3°
May.....	5.52	59.2	3.56	58.3	0.89	58.4	7.86	57.9	4.83	57.4
June.....	6.81	65.5	3.8	74.6	2.08	72	5.36	70.6	1.55	70.5
	12.94		11.47		6.51		19.67		14.06	

Unforeseen circumstances affected the tests made with a large number of varieties to such an extent that it was thought that the results might be misleading rather than helpful, and they are not reported. In no other case did the experiments in the year 1893 materially modify the results obtained in former years, and the general suggested conclusions concerning oat culture may be restated in the following extract from bulletin No. 23, the only change being in the number of years the experiments have continued:

"The results of all the experiments with oats tried at this Station for the last six years suggest that on the fertile soil of central eastern Illinois, with simple methods, we may expect in a series of years an average yield an acre of a little over 50 bushels of grain and about one and one-half tons of straw, the oats weighing rather less than more than the standard weight of 32 lb. a bushel; that it is not advisable to plow the land in the spring if the crop follows corn, the use of the disk har

row giving better results; that the seed should be sown near the last of March or first of April; that if sown broadcast it is better to sow from two and one-half to three and one-half bushels per acre, covering the seed not more than one or two inches deep; that there is no one variety greatly superior to all others, so that it is not wise to put full credence in the claims often made for new varieties; that some varieties are, however, distinctly better than some others; that neither color nor plumpness of kernels, weight per bushel, nor the form of the head certainly determines value; but that, generally, varieties with long, slender, comparatively light kernels have the smallest percentage of husk and, probably, the greatest feeding value; that early maturing varieties are to be preferred to those ripening later; that it is desirable to harvest the crop before it has fully ripened; and that binding and shocking the sheaves at once is an advantage rather than a disadvantage, if the grain is in fit condition for cutting."

Experiment No. 12. Oats, Quantity of Seed per Acre.

The land used for this experiment was in corn in 1892, and the stalks had been removed. April 3, 1893, a series of seven plats, each one-fortieth of an acre, was sown broadcast with Pringle's progress oats, at the varying rates of 1, 1.5, 2, 2.5, 3, 3.5, and 4 bu. (32 lb.) per acre. The plats were disked twice with a light two-horse disk before sowing, and twice after, then harrowed once lightly, seeded with clover and timothy and again harrowed.

Slightly the largest yield of grain was from sowing 2½ bu. Contrary to the usual results, the yield from sowing one bu. was nearly as large. The largest yield of straw was from sowing 3 bu., but with little variation from sowing 2½, 3, or 3½ bu. The yield of straw was the largest from sowing 2½ bu.

The average of the results from six years' trials show largest yield from sowing 2½ bu., with nearly as large from sowing 3 bu., and no important difference in yield whether 2½, 3, 3½ or 4 bu. were sown. The average yield of straw was slightly largest from sowing 3 bu. per acre. The yields of both grain and straw varied greatly in the different years, but the average is satisfactory—over 50 bushels of grain and not far from 3,000 lb. straw per acre.

Experiment No. 14. Oats, Time of Sowing.

The land used for this experiment was in corn in 1892, and the stalks were removed.

March 31st, the land was disked and staked out in 12 plats, each one-twentieth of an acre in area. Plats 1 to 6, inclusive, were sown each with four pounds, and the remaining six each with five pounds of oats. The oats, Pringle's progress, were sown broadcast by hand and covered by disking. The plats were then harrowed, sown with timothy

YIELD OF OATS FROM DIFFERENT RATES OF SEEDING, 1893.

Plat No.	Seed per acre, bu.	Stubs per sq. ft.	Wt. 100 berries, grams.	Per cent kernel in berries.	Pounds per bu.	Yield per acre.	
						Straw, lb.	Grain, bu.
1	1	19	2.17	73.2	36.5	2330	62.2
2	1.5	21	1.79	76	38	2190	52.8
3	2	41	2.25	70.4	38.25	2110	54.1
4	2.5	33	2.10	74.3	34	2630	62.8
5	3	40	2.07	77	36	2580	55.6
6	3.5	47	2.13	67	37	2080	50
7	4	47	2	72.2	33.75	2395	55.8

YIELD OF OATS FROM DIFFERENT RATES OF SEEDING, 1888 to 1893.

Seed per acre, bu.	1888.	1889.	1890.	1891.	1892.	1893.	Average.
			Straw per acre, pounds.				
1	3820	4600	2820	1275	1742	2330	2764
1.5	4400	3800	1740	1970	1980	2190	2680
2	4540	4000	1800	2748	1832	2110	2838
2.5	4860	3000	2460	2638	1935	2630	2920
3	5220	4400	1960	2790	2100	2580	3192
3.5	4400	4100	2000	3060	1952	2080	2932
4	4260	3200	2020	3110	2377	2395	2894
			Grain per acre, bushels.				
1	52.5	36.3	25.3	36.7	40.5	62.2	42.2
1.5	59.4	33.1	21.6	56.9	43.5	52.8	44.5
2	61.4	42.5	17.5	74.8	43.3	54.1	48.9
2.5	63.8	43.8	29.1	72.6	44.5	62.8	52.8
3	61.9	47.2	27.5	76.6	44.3	55.6	52.2
3.5	62.5	52.1	24.7	79.7	42.4	50	51.9
4	60.6	50.6	21.9	76.3	43.2	55.8	51.4
			Pounds per bushel.				
1	.....	25.5	26	28.5	25.5	36.5	28.4
1.5	.....	25	26.5	31	27.5	38	29.6
2	.....	28	24	31.5	28	38.25	30
2.5	.....	28	29	32	28	34	30.2
3	.....	29	29	32.5	28	36	30.9
3.5	.....	29.5	28	32	28.7	37	31
4	.....	29.5	29	32	29.2	33.75	30.7

and clover, and again harrowed. The following table gives the dates of sowing and ripening, yield of both straw and grain, pounds per bushel, and per cent of kernel in berries for each plat, also the average for each sown at the same date. A mistake made in harvesting prevents giving the separate yields of plats 2 and 3.

In general, the yield of both straw and grain, pounds per bushel and per cent of kernel decrease with the lateness of sowing.

The second table, giving the average for five years, shows the largest yields to be from the earlier sowings, with quite a uniform decrease in yield as the season advances.

YIELD OF OATS FROM SOWING AT DIFFERENT TIMES, 1893.

Date of sowing.	Ripe July	Plat No.	Yield per acre.		Lb. per bu.	Per cent kernel in berries.	Plat No.	Yield per acre.		Lb. per bu.	Per cent kernel in berries.	Average.			
			Straw, lb.	Grain, bu.				Straw, lb.	Grain, bu.			Yield per acre.		Lb. per bu.	Per cent kernel in berries.
												Straw, lb.	Grain, bu.		
Mar. 31	18	1	2040	51.3	35	73	7	2235	58.9	34	75	2137	55.1	34.5	74
Apr. 8	19	2	1930	49.7	34	72	8	2225	56.7	35	73	2077	53.2	34.5	72.5
" 17	20	3					9	1680	38.8	33	66	1805	44.2	33.5	69
May 3	26	4	2155	46.4	28.5	70	10	1490	27.2	30	72	1822	36.8	29.3	71
" 3	26	5	1555	27.7	30	69	11	1410	24.7	30	64	1482	26.2	30	66.5
" 10	28	6	1280	15	27	66	12	1355	15.2	27	57	1317	15.1	27	61.5

YIELD OF OATS FROM SOWING AT DIFFERENT TIMES, 1888—1893.

Date of sowing.	1888		1889			1890			1892			1893			Average.		
	Yield per acre.		Lb. per bu.	Yield per acre.		Lb. per bu.	Yield per acre.		Lb. per bu.	Yield per acre.		Lb. per bu.	Yield per acre.		Lb. per bu.	Yield per acre.	
	Straw, lb.	Grain, bu.		Straw, lb.	Grain, bu.		Straw, lb.	Grain, bu.		Straw, lb.	Grain, bu.		Straw, lb.	Grain, bu.		Straw, lb.	Grain, bu.
Mar. 14	....	....	28.5	3600	48.1	....	....	....	....	....	....	....	....	....	....	....	....
" 22	....	....	28	4600	41.5	31.8	3140	44.1	....	....	....	....	....	....	29 9	3870	42.8
Mar. 28-31	....	....	28.5	5200	41 3	31	3390	45.1	28	1767	46	34 6	2137	55.1	30.5	3124	46.8
Apr. 4-8	5080	66.3	26.5	4000	36.3	27	2890	36.5	27.5	1520	42 4	34.5	2077	53.2	28.8	3113	47
Apr. 11-17	5020	56.5	25	4000	33.1	27 3	3020	30	26.5	1442	47.7	33 4	1805	44.2	28	3057	42.3
Apr. 18-21	5040	48.8	22	4100	25	26.8	2740	28.1	25	1332	41.7	....	....	....	24.7	3303	35.9
Apr. 25-28	5020	49,4	21	3700	9.4	26.8	2540	19.6	15	1482	42.4	....	....	....	20.9	3186	30.2
May 3-4	....	....	....	....	....	....	....	....	19	1325	23.9	29.6	1652	31.5	24.2	1489	27.7
May 10	....	....	....	....	....	....	....	....	....	....	....	27	1317	15 1	....	....	....

Experiment No. 15. Oats, Depth of Sowing.

April 6, 1893, sixty selected kernels were planted in each of twelve rows 10 ft. long. Rows 1 and 2 were covered one inch deep, and each succeeding two rows one inch deeper, rows 11 and 12 being covered six inches deep. There was an extra row on either side. The table gives the number of plants started, number of panicles harvested, weight of grain, and weight of 100 kernels for each row. In general there is a decrease from the shallowest to the deepest planting.

YIELD OF OATS FROM SOWING AT DIFFERENT DEPTHS, 1893.

Depth sowing, inches.	Row No.	No. panicles harvested.	Wt. straw, ounces.	Wt. grain, ounces.	Wt. 100 kernels, grams.
1	1	175	13.25	7.75	2.14
1	2	196	15.75	8.5	2.27
2	3	165	13.5	8	2.3
2	4	133	10	5.75	2.28
3	5	110	8.5	4.5	2.17
3	6	133	10.5	5.5	2.32
4	7	142	11	6	2.25
4	8	154	11.5	6	2.07
5	9	91	9.25	4	2.2
5	10	56	5	2.25	2.04
6	11	13	.75	.25	1.89
6	12	21	1.5	.75	

YIELD OF OATS FROM SOWING AT DIFFERENT DEPTHS, 1888 to 1893.

Depth of sowing, inches.	1888		1889		1890		1891		1892		1893		Average.	
	No. of panicles.	Relative yield.	No. of panicles.	Relative yield.	No. of panicles.	Relative yield.	No. of panicles.	Relative yield.	No. of panicles.	Relative yield.	No. of panicles.	Relative yield.	No. of panicles.	Relative yield.
1	566	90	407	81	362	100	205	69	179.5	100	185.5	100	318	90
2	495	80	424	69	312	76	338	100	161	94	149	85	313	84
3	465	100	434	76	307	65	192	49	146.5	85	121.5	62	278	73
4	469	95	439	100	269	65	188	55	171.5	77	148	74	281	78
5	481	80	....	....	181	29	136	26	177.5	51	73.5	38	210	45
6	445	55	....	....	75	12	91	18	155.5	63	17	6	157	31

The foregoing table giving results for each of six years shows the average relative yield to be in favor of covering one inch deep, with a decrease in yield for each succeeding inch, excepting four inches deep.

Experiment 128. Oats, Time and Manner of Harvesting. Effect upon Yield and Chemical Composition.

[The first paragraph and table following are from Bulletin No. 23.]

"For each of the years 1891 and 1892, trials were made to determine the effect of time and manner of harvesting oats. In the table is given for each year the average results from six plats harvested early,

six when medium ripe, six when fully ripe, and of six plats which were bound and shocked soon after cutting, six cut and allowed to dry thoroughly in the swath before being bound, and of six where the heads were cut off, leaving most of the stalk standing. There are no very striking differences shown, except in the case of the plats cut late in 1892. This result was in part due to the fact that some of these plats were not so favorably situated as some of the others in the experiment. In each year the best results were obtained where the sheaves were bound and shocked soon after cutting. The explanation is not readily given, but the facts seem to show that this ordinary practice is a good one. Striking differences in the yield in the two years are shown, and equally striking differences in the weight per bushel. The variety was not the same. In 1891, welcome oats were used; in 1892, Pringle's progress."

EFFECT OF TIME AND MANNER OF HARVESTING OATS AT DATES AND UNDER CONDITIONS GIVEN.

Date.	Stage of Ripeness.	Yield per acre.		Pounds per bu.	Wt. 100 berries.	Per cent kernel in berries.
		Straw, lb.	Grain, bu.			
1891,						
July 6.	Stems green, ½ leaves green, kernels mostly in milk	2887	64.4	34	2.31	69.8
" 11.	Kernels mostly in dough, some hard	2619	63.9	34.7	2.43	71.3
" 17.	Fully ripe	2179	59.4	34.5	2.46	71.2
.....	Bound and shocked in ordinary manner	3180	63.1	34	2.46	70.8
.....	Loose till dry, then bound and shock'd	3179	56.5	34.7	2.38	71.7
.....	Heads removed	1307	65.4	34.5	2.39	69.8
1892.						
July 16.	Stems green, ¼ leaves green, kernels mostly in dough, some in milk	1656	45.1	26.25	2.31	67.58
" 22.	Oats mostly hard, some in dough	1740	45.9	25.7	2.22	66.7
" 30.	Fully ripe	1284	33	25.4	2.25	66
.....	Bound and shocked in ordinary manner	1892	45.5	26.5	2.27	67.6
.....	Loose till dry, then bound and shock'd	1770	42.8	25.9	2.27	66
.....	Heads removed	1020	35.6	25.9	2.22	66.6

EFFECT UPON CHEMICAL COMPOSITION.

In addition to the above a chemical analysis was made of the grain of each of the plats for each year, also an analysis of the straw for each for 1892, and an analysis of the stubble from the plats that were headed. Duplicate analyses were made for each plat and the average taken. The tables give the average composition of six plats cut early, six plats cut medium ripe, six plats cut fully ripe, and six plats which were bound and shocked soon after cutting, six cut and allowed to dry in the swath before binding and shocking, and six having the heads

removed leaving most of the straw standing; also the average of three plats of stubble. For 1891, there seems to be no difference in composition worthy of mention, due either to time or manner of harvesting. In 1892, the protein and fat are slightly higher for the early curing and for those bound and shocked. As to the straw, it also shows a higher per cent of protein and fat for the earlier cutting than for either the medium or late. As to manner of harvesting, the small quantity of straw from the plats that were headed was slightly better, while the stubble from the same plats was slightly poorer in protein than was the straw from the plats harvested by other methods.

There is quite a difference in the composition of the grain for the two years. That for 1891 has considerably the higher per cent of fat and protein, and consequently a higher feeding value. This better composition of the oats of 1891 may be due to the fact that it was the more favorable season for oats, or that they were of a different variety. It suggests that it might be profitable to study more carefully the composition of different varieties as grown under different conditions.

ANALYSES OF GRAIN, STRAW, AND STUBBLE OF OATS HARVESTED AT DIFFERENT STAGES OF RIPENING, 1891–2.

Analyses of Grain, 1891.

	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Ether, extract.
July 6. Stems green, ½ leaves green, kernels mostly in milk	3.40	14.94	12.52	62.95	6.20
July 11. Kernels mostly in dough; some hard	3.41	15.01	11.95	63.73	5.90
July 17. Fully ripe	3.36	15.25	12.06	63.40	5.93
Bound and shocked in ordinary manner	3.45	15	12.54	63	6.03
Loose till dry, then bound and shocked	3.35	15.15	11.93	63.71	5.86
Heads removed	3.39	15.05	12.05	63.38	6.13

Analyses of Grain, 1892.

July 16. Stems green, ¼ leaves green, kernels mostly in dough; some in milk	3.51	13.30	12.79	65.73	4.66
July 22. Oats mostly hard, some in dough	3.75	13.22	12.58	66.37	4.08
July 30. Fully ripe	3.81	12.56	13.09	66	4.54
Bound and shocked in ordinary manner	3.73	13.24	12.60	66.38	4.05
Loose till dry, then bound and shocked	3.64	12.80	13.05	65.86	4.65
Heads removed	3.69	13.05	12.81	65.81	4.58

Analyses of Straw, 1892.

July 16. Stems green, ¼ leaves green, kernels mostly in dough, some in milk	8.93	4.05	42.14	42.80	2.07
July 22. Oats mostly hard, some in dough	8.66	3.69	44.75	40.85	2.04
July 30. Fully ripe	7.79	3.93	45.58	40.99	1.71
Bound and shocked in ordinary manner	8.93	3.77	44.46	40.79	2.05
Loose till dry, then bound and shocked	8.27	3.66	44.31	41.81	1.94
Heads removed	8.37	4.22	43.50	42.02	1.89
Analysis of stubble, 1892, av. 3 plats	8.77	3.58	45.64	39.86	2.15

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