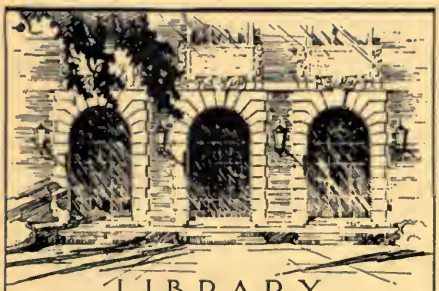

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YIELD OF SWEET CORN

In Relation to Distance and Rate of Planting

By W. A. Huelsen

UNIVERSITY OF ILLINOIS
AGRICULTURAL EXPERIMENT STATION

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CONTENTS

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Yield of Sweet Corn in Relation to Distance and Rate of Planting

W. A. Huelsen, Chief in Vegetable Crops

PRACTICALLY ALL the sweet corn raised in Illinois is planted in cross-checked rows at distances ranging from 42 x 42 inches down to 36 x 36 inches. The number of plants per hill is equally variable, ranging from 2 to 5, without any apparent regard to the planting distance.

Until about 1925, 42 x 42 inches was the most common planting distance for sweet corn, the stands averaging about 3 plants per hill, but at present 38 x 38 inches with 3 to 4 plants per hill seems to be more popular than the wider distances. This trend toward closer spacing seems to arise largely from the use of improved farm machinery rather than from any demonstrated superiority in yield or quality from the corn so planted.

By 1932 the tendency toward closer planting reached the point where a spacing of 36 x 36 inches with 5 plants per hill was often used. In some instances even, fields were planted 32 x 32 inches with 4 plants per hill. It is self-evident that overplanting is poor farm practice, and that it may be even more disastrous to good yields than underplanting. As this trend toward closer planting coincided with the drouth cycle of 1930-1936, many growers were greatly disappointed in their yields, and consequently in the last few years planting distances have tended to be more conservative.

This general confusion in rates and distances of planting sweet corn reflects the lack of definite knowledge on the subject. The experiments reported here were started in 1930 for the purpose of determining the optimum distances and rates for planting sweet corn, particularly the two varieties Country Gentleman and Narrow Grain Evergreen.

PREVIOUS WORK WITH SPACING EXPERIMENTS

A great many spacing studies have been made with various crops, but only a few are of direct interest so far as the spacing of sweet corn is concerned. McCluer[8*] made some very interesting studies, including both sweet and field corn, in Illinois half a century ago. Three sweet-

*These numbers refer to literature citations on page 104.

corn varieties were tested; namely Cory, an early type 4 feet tall, Burlington, a second early type 5 to 6 feet tall, and Roslyn Hybrid, a late type 7 to 8 feet tall. The spacing between rows was 44 inches, and the hills were 12, 18, 24, 30, and 36 inches apart in the row. For the largest variety, McCluer added plots with hills 42 inches apart. All the plantings were made with 4 kernels per hill. Unfortunately the plantings were badly infected by what seems to have been bacterial blight, and the early varieties were very severely damaged. Because of this damage, all ears and nubbins were counted and weighed, a fact which makes it difficult now to interpret the results. Cory, the earliest and smallest type, seems to have done best on a 24- to 30-inch spacing. Burlington, the next largest variety, required a 36-inch spacing. Roslyn Hybrid, the tallest variety, yielded increasingly more and larger ears as the spacing was increased from 18 to 42 inches. In general, and in accordance with expectation, McCluer's results indicated that small varieties require less space than large ones.

Morrow and Gardner[9*] in 1893 observed that field corn in central Illinois produced smaller ears and stalks and more stover when planted thickly. In five years of their trials they found no difference in yield between corn planted in checked rows and that planted in drilled rows when the same number of kernels was planted per acre.

Davenport and Fraser[1*] reported in 1895 on another rate-of-planting experiment with field corn, the most interesting point of which seemed to be that date of planting had no particular effect on the relationships among the plantings made at the various rates, except at the latest planting (June 3), when the difference between yield on plots planted at the rate of 2 kernels per hill and those at the rate of 5 kernels per hill was less than on the plots planted at other dates.

In 1908 Hume, Center, and Hegnauer[6*] reported on a rate-of-planting experiment with field corn showing that in general corn could be spaced closer in northern Illinois than in central Illinois. This work is of particular significance to the sweet-corn grower because the present practice is to plant closer in northern than in central Illinois. Also in these experiments fewer stalks per hill with the hills closer together yielded more grain than more stalks per hill in hills farther apart.

The work of Watson,[10*] Watson and Davis,[11*] Haber,[4*] and Magruder[7*] will be discussed later, so far as it bears upon the findings of the present experiments.

METHODS AND PROCEDURE

The experimental work reported here consisted of two series of tests. The first, conducted in 1930 and 1931, was preliminary; the second, running from 1932 to 1936, was the main test.

Preliminary Experiments

The 1930-1931 experiments involved 90 rates and spacings, without replications, as follows:

Checked Rows		*Drilled Rows*	
Inches between rows	*Rate*	*Inches between rows*	*Rate*
42 x 42 42 x 40 42 x 38 42 x 36 40 x 40 40 x 38 40 x 36 38 x 38 38 x 36 36 x 36	1, 2, 3, 4, and 5 plants per hill at each distance	42 40 38 36	Single plants 4, 5, 6, 7, 8, 10, 12, 14, 16, and 18 inches apart in the row

The plan of the 1930-1931 tests is shown in Fig. 1. It should be understood, however, that the four blocks of plots were not planted precisely as shown, altho the plot arrangement within each block is correctly indicated. In 1930 one series of 90 plots was planted with the Country Gentleman variety, but in 1931 two series were planted, Narrow Grain Evergreen being added. (The results of these tests are discussed on page 75.)

1932-1936 Experiments

Layout.—In view of the results of the preliminary experiments, the layout for the 1932-1936 experiments (Fig. 2) was changed, the distances and rates used being as follows:

Checked Rows		*Drilled Rows*	
Inches between rows	*Rate*	*Inches between rows*	*Rate*
42 x 42 40 x 40 38 x 38 36 x 36	2, 3, 4, and 5 plants per hill at each distance	42 40 38 36	Single plants 8, 14, and 20[a] inches apart in the row

([a]In the drilled rows, a spacing of 20 inches was used even tho 18 inches had been the widest in the preliminary experiments; data from the preliminary experiments had suggested that the widest spacing might lie outside the range of those experiments.)

Thus in the main tests there were only four checked-row spacings and four rates, a total of 16 variations. The spacings between drill rows were likewise limited to four, with only three distances between plants, a total of 12 variations. There were accordingly only 28 variations all told, but as each was replicated four times, 112 plots were needed for each variety, Country Gentleman and Narrow Grain Evergreen.

The plot detail, which was uniform thruout the work, is shown in Fig. 3. Each plot was entirely surrounded by a single border row and

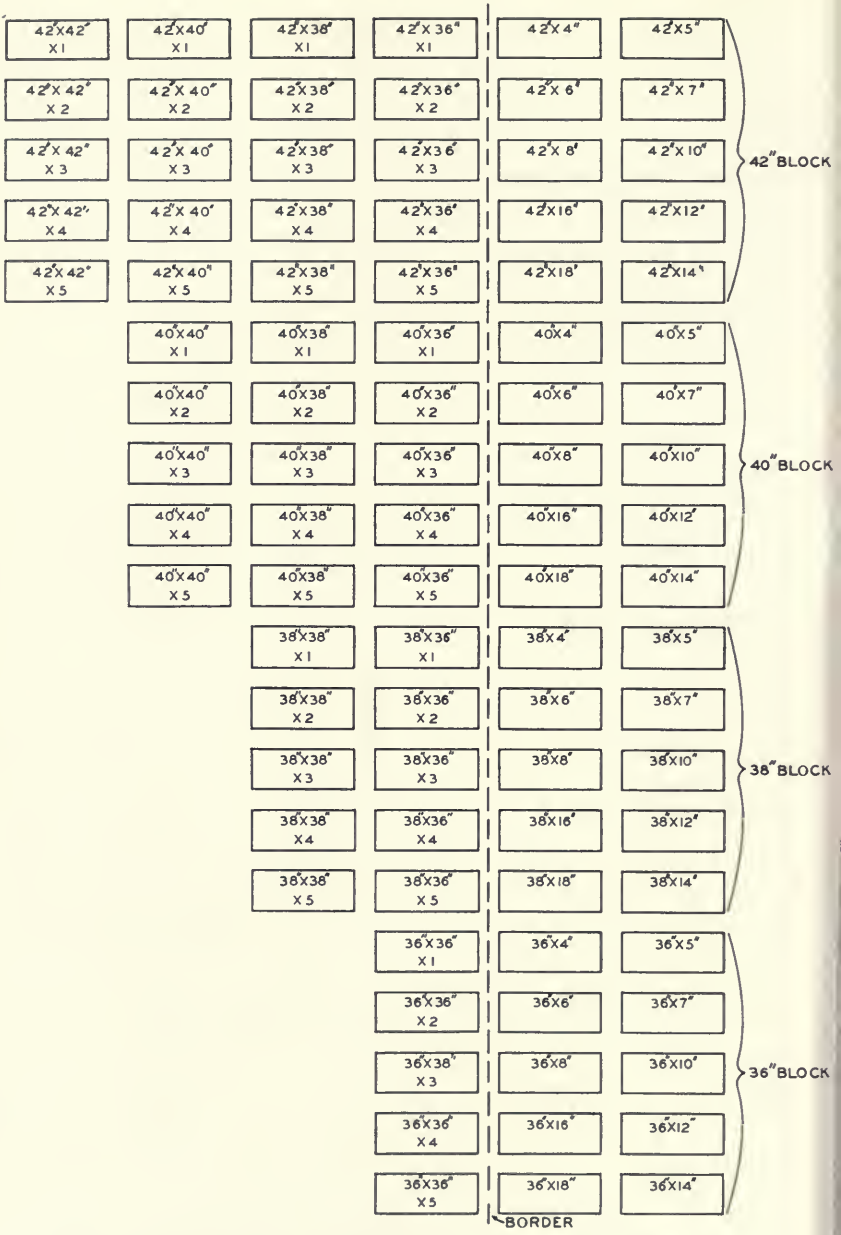


FIG. 1.—PLOT LAYOUT OF THE 1930-1931 SPACING EXPERIMENTS

In 1930 one series was planted with Country Gentleman, and in 1931 there were two such series, one for Country Gentleman and one for Narrow Grain Evergreen. The blocks were planted at random and not in the triangle shown.

the outside plots by two border rows. These borders were all cut out by hand the day before harvesting. Records were kept on forty hills. The drilled plots were not exactly the same size, but varied from 35 to 36 feet in length. They were surrounded by one border row on each side, by a 3-foot extension on the inside, and by a 5-foot extension on the outside. Thus on each drilled plot the rows extended at least 3 feet beyond the plot boundaries on each end.

The layout in Fig. 2 is on the Latin-square basis, so far as the checked plantings are concerned; but this method could not be extended to the entire block because the drilled plantings would have prevented cross cultivation. Could it have been used thruout, the Latin-square method would have simplified the computations enormously.

Soil.—The experiments were conducted at Urbana, and the plots were moved each year. The soil was of average fertility and was given no fertilizer treatments except such as were needed to maintain the fertility level.

Planting and Cultivation.—Each year the blocks were laid out with a horse-drawn marker, and the correct distances in the drilled-rows were marked with a hand marker. The plantings were made with hand planters. The checked plantings were seeded at twice the indicated rate per hill, and in the drilled plantings two seeds were dropped at each place. When the plants were 4 inches high, the checked plantings

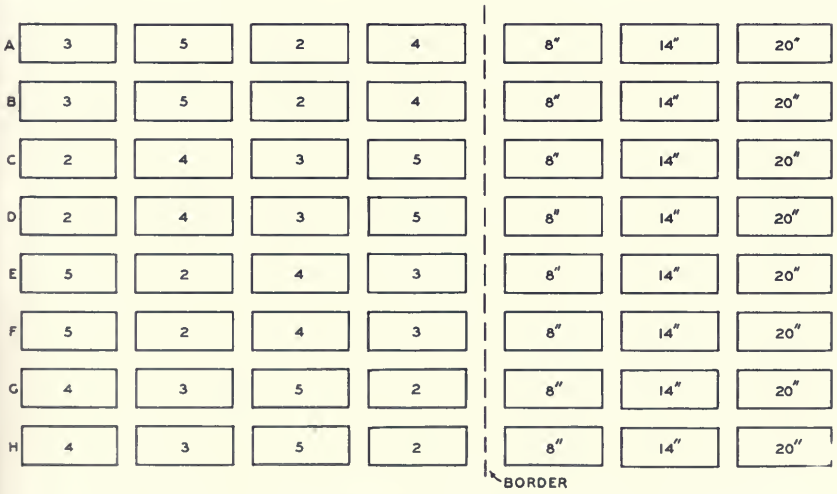


FIG. 2.—PLOT ARRANGEMENT IN ONE OF THE BLOCKS OF THE 1932-1936 SPACING EXPERIMENTS

There were four such blocks, one each for the 36-, 38-, 40-, and 42-inch rows. Tiers A, C, E, and G were planted with Country Gentleman and B, D, F, and H with Narrow Grain Evergreen.

were thinned to the correct rates per hill and the extra plants were removed from the drilled plantings. It should be noted that the drilled plantings were not "blocked" during thinning, the two seeds being dropped in the right place to begin with.

Cultivation, given when needed, seldom exceeded two plowings each way for the checked rows. Owing to the plot layout, the drilled rows were cultivated only half as many times as the checked rows. Some hoeing was therefore necessary in the drilled plots.

Harvesting.—The plots were harvested at identical stages of maturity as determined by silk counts, following the method described by Huelsen and Michaels.[5*] In 1930 only the yields of unhusked ears were recorded, but in all subsequent years the weights of husked ears also were recorded.

The yields of fodder were measured 1 to 3 days after the ears were snapped. The stalks were cut by hand as close to the ground as practicable and weighed immediately.

Varieties.—The varieties used in all the experiments were open-

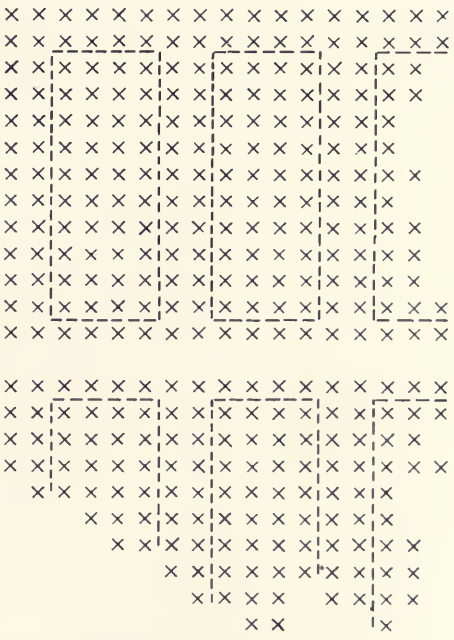


FIG. 3.—DETAILS OF STANDARD PLOTS AND BORDERS IN ALL SERIES

The yields were measured from four 10-hill rows in the checked plots. In the drill rows also four rows were harvested, each row being 36 feet long in the 8-inch series (54 plants), and 35 feet long in the 14- and 20-inch series (30 and 21 plants respectively).

pollinated strains selected by ear-row methods at the Illinois Station, and tested by individual ears for germination and freedom from disease. The same strains were used thruout the experiments.

Number of Replications.—The data in Tables 3 to 14 consist of averages of 21 replications for the checked plantings and 17 for the drilled plantings. The odd replication, 21 instead of 20 and 17 instead of 16, is due to the fact that the 1931 yields were included in the means. Only 17 replications are reported for the drilled plantings because the four replications in 1933 were severely damaged by chinch bugs and the yields for that year were consequently omitted.

The replications for fodder yields were 17 for the checked plantings and 13 for the drilled plantings. Yields for 1934 were omitted from the data on checked plantings and those for 1933 and 1934 from the data on drilled plantings because severe drouth and chinch-bug infestation caused such excessive dehydration of the stalks that they could scarcely be termed green fodder. As ear yields were relatively good in spite of the conditions, these were included—except in the drilled plantings of 1933, as explained above.

Some of the mean yields were computed from an odd number of replications, resulting from the omission of one plot or more, generally where the stand was defective because of cutworms, gophers, or other natural hazards.

The fact that yields for the unfavorable year 1933 were omitted from the drilled-row plantings and, of course, from the corresponding checked-row planting with which each drilled-row planting was paired, might lead to some question of the conclusions being based on unequal comparisons. In the checked-row plantings the four replications for 1933 were included in all the averages.

The question is, would it be better to omit the 1933 replications from the checked-row averages? The effect of omitting the 1933 yields from the means of two of the principal yield components—weights of prime husked ears and of green fodder—is summarized in Table 1. Since the yields were analyzed on the basis of pairs (that is, the 3-, 4-, and 5-per-hill rates are paired with the 2-per-hill rate for the corresponding distance; and the 40″x 40″, 38″x 38″, and 36″x 36″ planting distances are paired with the 42″x 42″ for the corresponding rates per hill), similar comparisons must be made of the percentages in Table 1.

If the yields of prime husked ears are compared according to distance between rows, rate per hill being held constant, the closer plantings would have a slight advantage if data for 1933 were omitted. These increases are, however, within the limits of the standard errors, and it is very doubtful whether any advantage gained by omitting the 1933 data would not be counterbalanced by the corresponding loss in degrees of freedom. So far as green fodder is concerned, the differ-

TABLE 1.—PERCENTAGE INCREASES IN AVERAGE YIELDS OF PRIME HUSKED EARS AND OF GREEN FODDER, 1932-1936, WHEN DATA FOR UNFAVORABLE YEAR 1933 ARE OMITTED

Planting distance	Plants per hill	Increases for Country Gentleman in—		Increases for Narrow Grain Evergreen in—	
		Prime husked ears	Green fodder	Prime husked ears	Green fodder
inches		*perct.*	*perct.*	*perct.*	*perct.*
42 x 42	2	1.53	3.58	.60	4.20
40 x 40	2	1.58	2.40	.52	3.38
38 x 38	2	.94	6.55	−1.67	6.66
36 x 36	2	3.40	6.32	2.27	6.01
42 x 42	3	−.94	4.40	0	2.78
40 x 40	3	1.81	−2.02	1.98	4.20
38 x 38	3	.91	5.91	−2.21	4.05
36 x 36	3	4.97	7.33	2.73	6.73
42 x 42	4	−1.57	3.91	−.23	2.49
40 x 40	4	1.99	2.73	2.23	2.53
38 x 38	4	4.49	6.31	2.42	6.21
36 x 36	4	5.13	7.68	4.81	7.62
42 x 42	5	1.13	5.01	1.03	1.64
40 x 40	5	3.49	4.14	.74	2.70
38 x 38	5	3.54	6.72	−.67	3.39
36 x 36	5	4.27	6.51	3.60	6.73

ences arising from including or excluding the 1933 data are negligible. Likewise, when the comparisons are made on the basis of rate, with distance between rows being held constant, the differences due to including or leaving out the 1933 data are negligible so far as green fodder is concerned and very slight so far as prime husked ears are concerned.

Statistical Methods

The experimental results could have been analyzed by any one of a number of methods. The method finally adopted seemed the least cumbersome. As mentioned briefly above, it consisted of a definite series of comparisons as follows:

1. Yields from the plots planted at the rate of 3, 4, and 5 plants per hill respectively were paired with yields from the 2-per-hill planting. There were thus four groups of pairs in the data on checked rows, one for each of the distances 42″x 42″, 40″x 40″, 38″x 38″, and 36″x 36″.

2. Yields from the plantings at the three drilled-row rates (20, 14, and 8 inches between plants) were paired with yields from the checked rows planted 2 plants per hill for each of the four distances between rows—for example, the yields from the 42″x 42″x 2 checked-row planting were paired with the yields from the drilled rows at distances of 42″x 8″, 42″x 14″, and 42″x 20″ respectively; and the same for the other distances between rows.

advisable, according to the preceding discussion, it is evident that nothing is gained by planting closer than 42″x 42″, none of the increases obtained by planting at narrower distances at the 4-per-hill rate being significant. At the 2-per-hill rate significant increases in yield were obtained at the 40″x 40″ distance, 10.67 percent, and at the 38″x 38″ distance, 13.11 percent. Likewise at the 36″x 36″ distance a significant increase of 13.13 percent was obtained at the 3-per-hill rate, but a planting as close as this is not advisable in view of the effect on yields of husked ears (Fig. 7). Apparently a planting of 38″x 38″ x 2 is the closest advisable for Narrow Grain Evergreen.

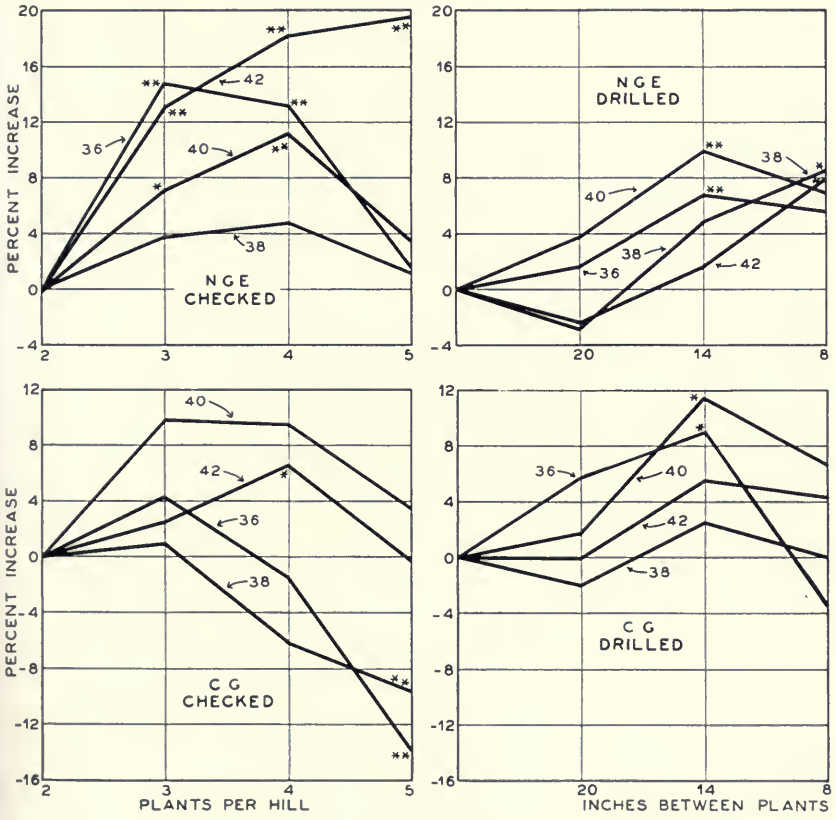


FIG. 4.—WEIGHTS OF SORTED UNHUSKED EARS, SHOWN AS PERCENT INCREASE OVER THE TWO-PER-HILL RATE FOR EACH DISTANCE BETWEEN ROWS (BASED ON TABLE 3)

(Single star (*) indicates significant increase; double star (**) shows highly significant increase)

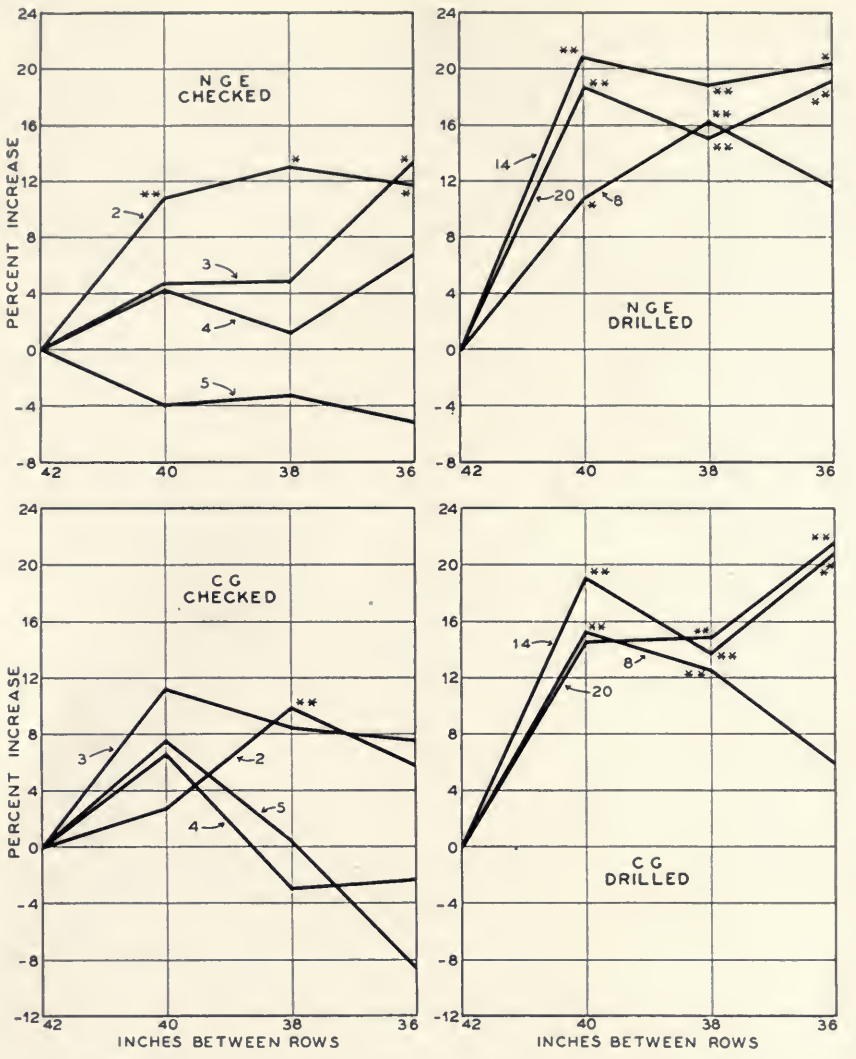


FIG. 5.—WEIGHTS OF SORTED UNHUSKED EARS, SHOWN AS PERCENT INCREASE OVER THE 42-INCH DISTANCE BETWEEN ROWS (BASED ON TABLE 4)
(Single star (*) indicates significant increase; double star (**) shows highly significant increase)

When the distances of planting Country Gentleman were reduced below 42″x 42″ no significant increases in weights of sorted unhusked ears were obtained at either the 3- or the 4-per-hill rate (Table 4 and Fig. 5). However, the yield was slightly higher at each rate of planting when the distance was reduced from 42″x 42″ to 40″x 40″. The 40″x 40″x 3 planting gave the largest increase, tho it was not significant. In view of the probable superiority of the 3-per-hill rate, the 40″x 40″ x 3 planting is most likely the heaviest planting advisable.

Weights of Prime Husked Ears

Number of Plants per Hill.—The weights of prime husked ears of Narrow Grain Evergreen were significantly increased in a number of instances as the rate of planting was increased above 2 plants per hill (Table 5 and Fig. 6). Planting at the rate of 3 per hill gave significant increases over all but one of the plantings in the 2-per-hill group. In the 40″x 40″ series, 4 plants per hill resulted in the highest increase, and in the 42″x 42″ series, 5 plants per hill returned yields very slightly higher than 4 plants per hill. The trends for weights of prime husked ears shown by the curves in Fig. 6 resemble those for weights of sorted unhusked ears (Fig. 4) very closely and the same conclusions may therefore be drawn: namely, that 4 plants per hill is the heaviest rate of planting advisable for Narrow Grain Evergreen.

The trends in weights of unhusked and husked ears of Country Gentleman (Tables 3 and 5, and Figs. 4 and 6) also are very similar, and it is therefore certain that rates of planting heavier than 3 plants per hill are not advisable for this variety.

Distance Between Rows.—The trend in weights of prime husked ears of Narrow Grain Evergreen when the distances between rows were narrowed below 42″x 42″ was exactly the same as that in the weights of sorted unhusked ears (Tables 4 and 6, and Figs. 5 and 7), but the only significant increases obtained were those where the rate of planting was 2 plants per hill. The 40″x 40″x 2 planting gave a significant increase of 7.43 percent and the 38″x 38″x 2 planting a highly significant increase of 12.13 percent. With respect to distances, the 38″x 38″x 2 planting would perhaps seem to be the optimum on the basis both of weights of unhusked ears and of husked ears; but with respect to rate of planting, as discussed above, the 40″x 40″x 4 or 42″x 42″x 4 plantings would seem to be the most favorable.

Further comparisons may be made on the basis of mean weights, as follows:

Distance	*Plants per hill*	*Unhusked ears (Table 3)* lb.	*Husked ears (Table 7)* lb.
38″ x 38″	2	7 542	4 622
40″ x 40″	4	8 137	5 031
42″ x 42″	4	7 812	4 859

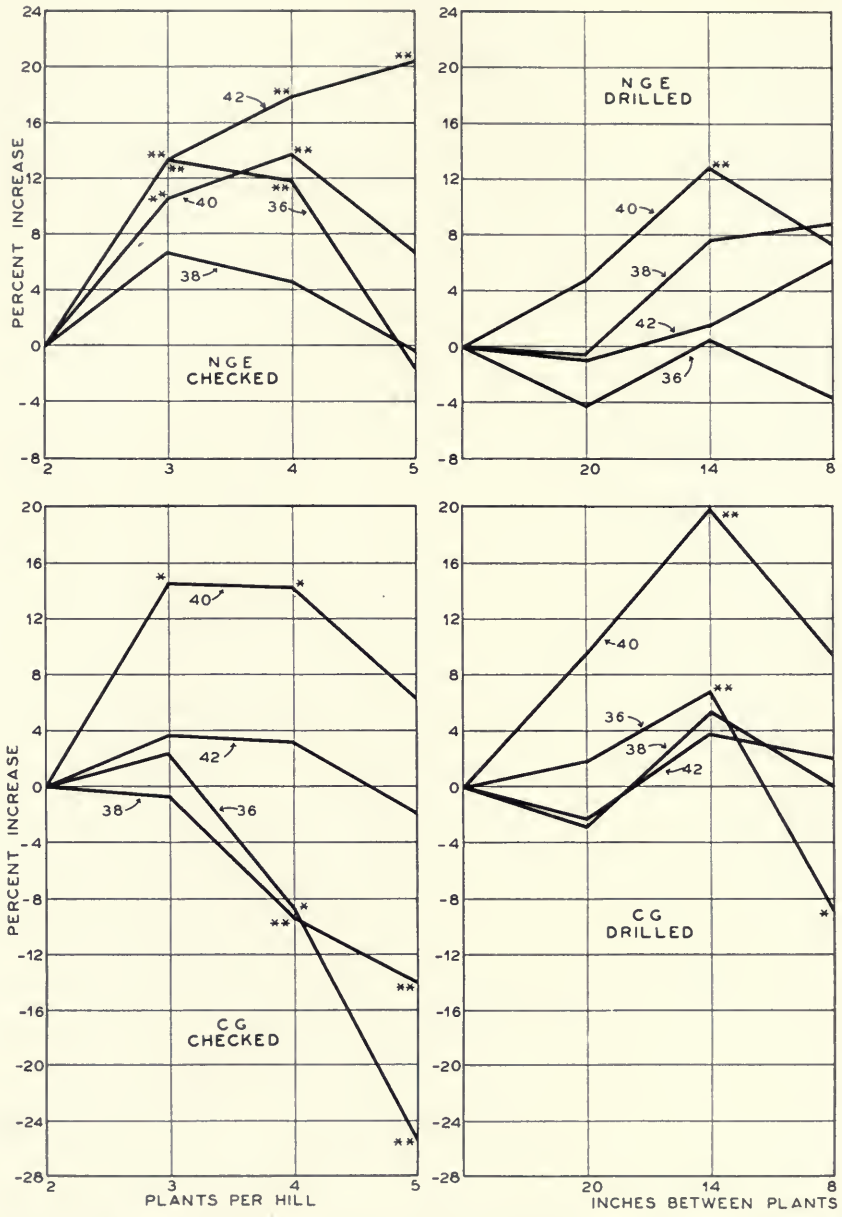


FIG. 6.—WEIGHTS OF PRIME HUSKED EARS, SHOWN AS PERCENT INCREASE OVER THE TWO-PER-HILL RATE FOR EACH DISTANCE BETWEEN ROWS
(BASED ON TABLE 5)

(Single star (*) indicates significant increase; double star (**) shows highly significant increase)

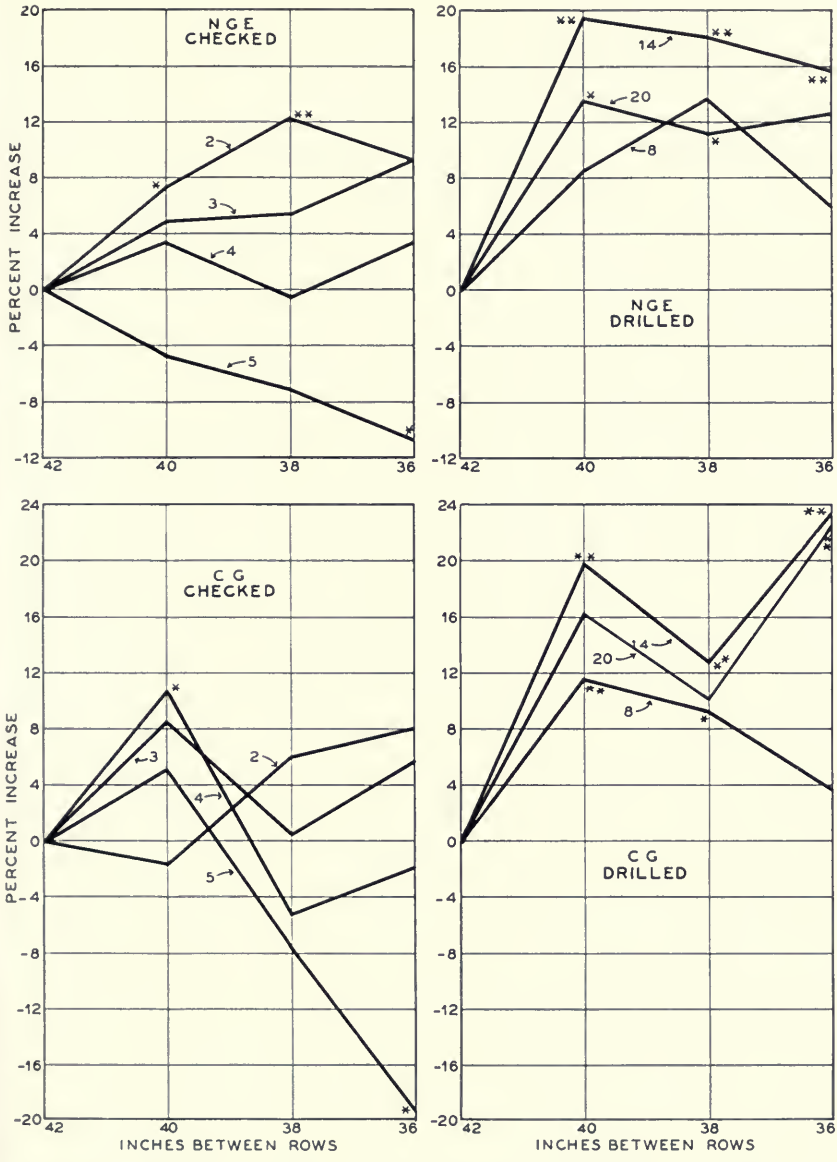


FIG. 7.—WEIGHTS OF PRIME HUSKED EARS, SHOWN AS PERCENT INCREASE OVER THE 42-INCH DISTANCE BETWEEN ROWS (BASED ON TABLE 6)

(Single star (*) indicates significant increase; double star (**) shows highly significant increase)

Thus the 40-inch and the 42-inch plantings resulted in higher mean weights both of unhusked and of husked ears than the 38-inch planting; and since in analyzing an experiment of this type the widest distances between the rows must obviously be given the preference, it may be assumed that a 40″x 40″x 4 or a 42″x 42″x 4 planting is preferable to a 38″x 38″x 2 planting.

In the Country Gentleman variety (Table 6 and Fig. 7) the superiority of the 40″x 40″ and 42″x 42″ planting distances was evident, since there were practically no significant increases over the plantings at the 42″x 42″ distance. The conclusion reached on the basis of weights of unhusked ears, that 40″x 40″x 3 is probably the optimum planting, is valid also with respect to weights of husked ears.

Number of Sorted Unhusked Ears

Number of Plants per Hill.—Increasing the number of plants per hill beyond 2 resulted in large significant increases in number of sorted unhusked ears for both Narrow Grain Evergreen and Country Gentleman (Table 7 and Fig. 8).

Eliminating the less desirable rates and distances of planting would be difficult on the basis of the data in Table 7 alone but becomes relatively simple when additional data are taken into account. Thus all the 5-per-hill plantings may be eliminated, as the total unhusked weights (Table 3 and Fig. 4) failed to keep pace with the total number of unhusked ears, indicating an undesirable decrease in weight per ear. Similarly the entire 36″x 36″ series need not be considered (Table 3). The 3-per-hill plantings all had smaller increases (Table 7) than the 4-per-hill plantings.

This leaves only the 4-per-hill rates planted 42″x 42″, 40″x 40″, and 38″x 38″. However the 42″x 42″x 4 plantings had a definitely smaller total yield than the 40″x 40″x 4 and 38″x 38″x 4. Accordingly the 38″x 38″x 4 and the 40″x 40″x 4 plantings remain as the most nearly optimum plantings where number of sorted unhusked ears per acre is the important yield factor.

As to Country Gentleman (Table 7 and Fig. 8), only the 40″x 40″ and 42″x 42″ planting distances need be considered. Plantings at the rate of 4 plants per hill gave the maximum increases over the 2-per-hill rate. The 40″x 40″x 4 planting resulted in both the largest total yield and the largest increase over the 2-per-hill rate.

Distance Between Rows.—The closer planting distances gave the largest increases over the 42″x 42″ distance in number of sorted unhusked ears of Narrow Grain Evergreen, according to Table 8 and Fig. 9. As planting distance was narrowed, the largest and most

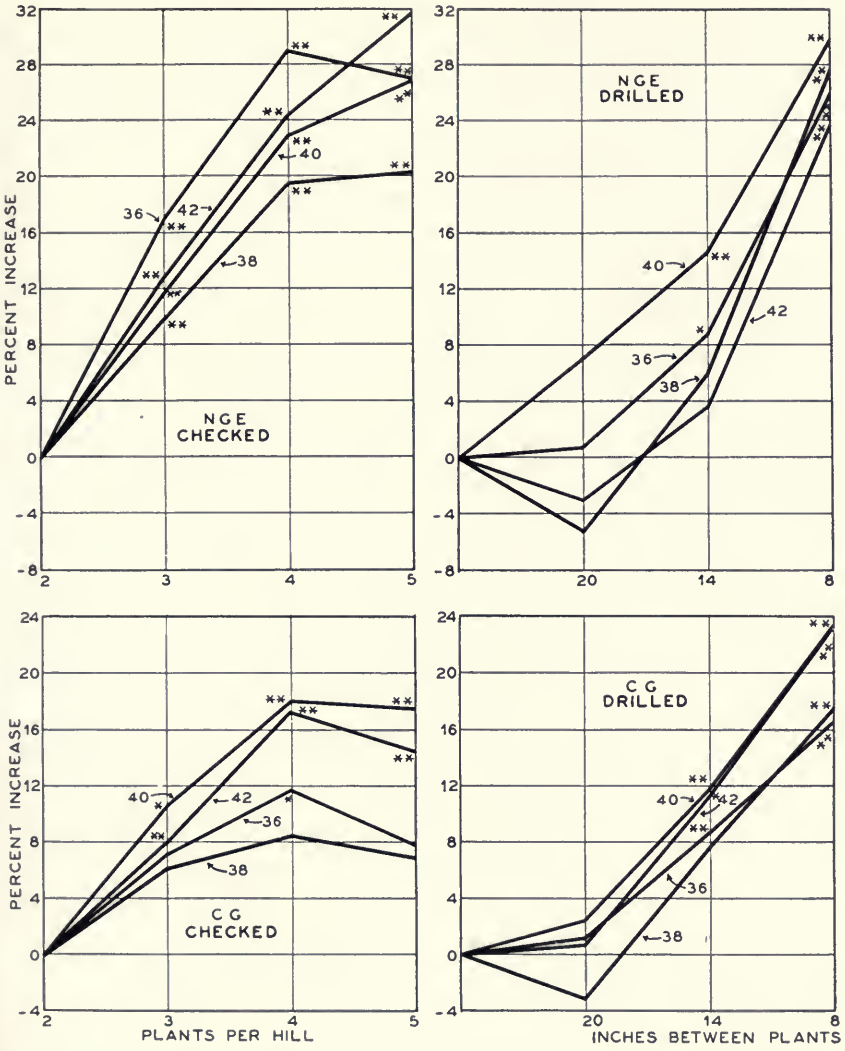


FIG. 8.—NUMBER OF SORTED UNHUSKED EARS, SHOWN AS PERCENT INCREASE OVER THE TWO-PER-HILL RATE FOR EACH DISTANCE BETWEEN ROWS
(BASED ON TABLE 7)

(Single star (*) indicates significant increase; double star (**) shows highly significant increase)

consistent increases in number of ears were obtained with the 3- and the 4-per-hill rates. However, it is doubtful from the previous discussion (Table 7) whether anything is gained by plantings heavier than 38″x 38″x 4. The 36″x 36″x 4 planting gave a larger number of ears, according to Table 8, and a significant increase over the corresponding 42″x 42″x 4 planting, but the equivalent increase in weight of unhusked ears was not significant (Table 4). The 38″x 38″x 4 planting behaves in a similar fashion to the 36″x 36″x 4. Since nothing is gained by

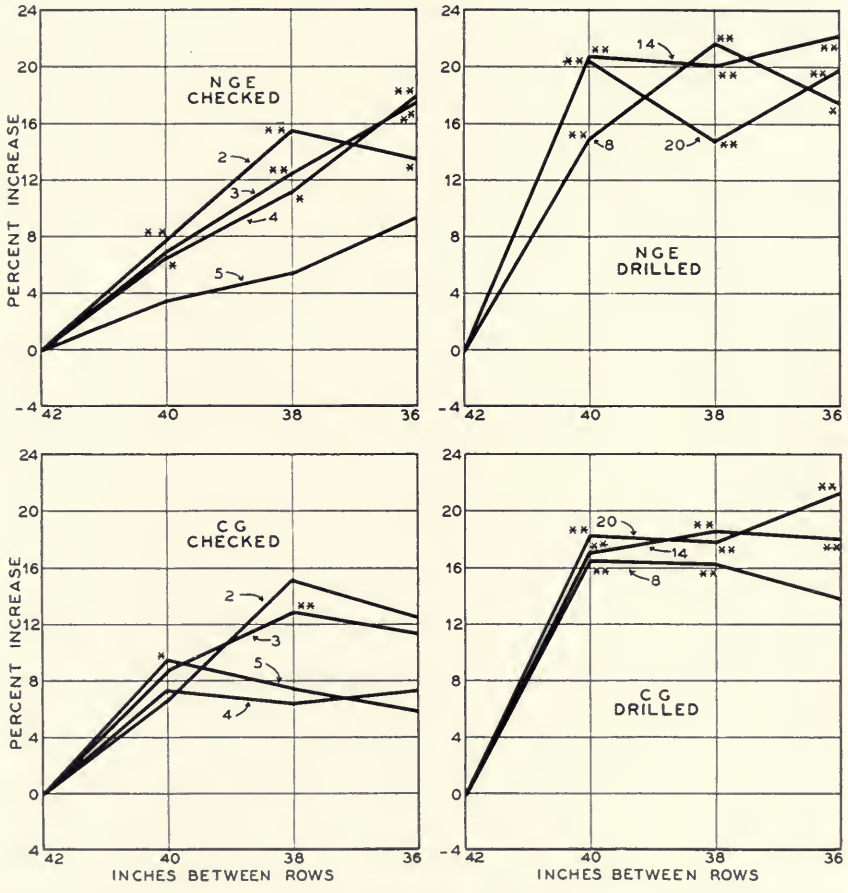


FIG. 9.—NUMBER OF SORTED UNHUSKED EARS, SHOWN AS PERCENT INCREASE OVER THE 42-INCH DISTANCE BETWEEN ROWS (BASED ON TABLE 8)
(Single star (*) indicates significant increase; double star (**) shows highly significant increase)

planting closer, the 38″x 38″x 4 is the heaviest planting advisable where number of ears is the primary consideration.

Country Gentleman showed a tendency toward an increased number of sorted unhusked ears as the distance between hills was reduced, but only two of the increases were significant (Table 8 and Fig. 9). Since both of these significant increases seem to have occurred at random, it appears that 40″x 40″x 4 is the heaviest planting which need be considered, especially as it produced the largest number of ears per acre.

Weight per Prime Husked Ear

Data showing yields in terms of number of prime husked ears have been omitted, but the ratios between the weights and the corresponding numbers of prime husked ears, which give the weight per prime husked ear, have been included. Similar ratios for sorted unhusked ears were also computed but are not reported here.

The effect of rate and distance of planting on weight per prime husked ear is shown in Tables 9 and 10. In both varieties, increasing the number of plants per hill reduced the weight per ear. This is a matter of great importance to the grower. If ears are sold on the basis of count, a planting somewhat heavier than usual is advisable, as more ears will be produced per acre. In addition the weight per ear in naturally large-eared types such as Narrow Grain Evergreen and Country Gentleman can be reduced somewhat without resulting in any noticeable difference in appearance. On the other hand, for the cannery grower, whose sweet corn is weighed in, the size of the ear is an important factor in the expense per ton for snapping—the heavier the ears the less the expense.

According to Tables 9 and 10, rates heavier than 3 plants per hill result in a considerable reduction in the size of the Narrow Grain Evergreen ear. A 40″x 40″x 3 planting seems to be the most desirable planting consistent with the previous discussion regarding weight, and a 40″x 40″x 4 planting the most desirable, so far as number of ears is concerned.

The weight per prime husked ear of Country Gentleman was also reduced when the rate was increased. The 40″x 40″x 3 planting is the most desirable planting when corn is to be sold on the basis of weight, and 40″x 40″x 4 when it is sold by number.

Percent Recovery of Prime Husked Ears

Increasing the number of plants per hill above 2 and reducing the distance between rows below 42″x 42″ had only a very slight effect on the recovery of prime husked ears of Narrow Grain Evergreen (Tables 11 and 12), but in Country Gentleman large significant reductions occurred at the closer planting distances. So far as Country

Gentleman is concerned, the 40″x 40″x 3 and 40″x 40″x 4 plantings, previously recommended, gave as good recovery as those planted at a 42-inch spacing or at a 2-per-hill rate.

Weights of Green Fodder

Number of Plants per Hill.—Weights of green fodder of both varieties tended to increase as number of plants was increased above 2 per hill (Table 13). Significant increases in Narrow Grain Evergreen occurred at the 5-per-hill rate in the 42″x 42″ and 38″x 38″ plantings and at all rates in 36″x 36″ distance of planting. Total yields varied surprisingly little. Of the plantings previously considered, the 40″x 40″x 4 planting gave a relatively high total yield. Nothing was gained by using a heavier planting.

In Country Gentleman (Table 13) increasing the rate above 2 plants per hill had a much greater effect on weights of green fodder, resulting in large significant increases. The 40″x 40″x 4 planting had the highest total yield and a large significant increase.

Distance Between Rows.—The largest increases in weights of green fodder for Narrow Grain Evergreen were associated with the 4- and the 5-per-hill rate (Table 14). The previous conclusion that 40″x 40″x 4 is the heaviest planting of Narrow Grain Evergreen that should be made is confirmed by these comparisons, this planting giving the largest increase over the 42″x 42″x 4 planting.

Similarly for Country Gentleman (Table 14) the 40″x 40″x 4 planting gave both the largest total yield and the largest increase over the 42″x 42″x 4 planting.

(Tables 3 to 14 follow.)

TABLE 3.—WEIGHT OF SORTED UNHUSKED EARS: EFFECT OF INCREASING NUMBER OF PLANTS PER HILL IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN PLANTS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per acre	Increase over 2-per-hill rate		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
42 x 42	3	7 479	872†	13.20	21
	4	7 812	1 205†	18.24	21
	5	7 887	1 280†	19.38	21
40 x 40	3	7 832	520*	7.11	21
	4	8 137	825†	11.29	21
	5	7 577	265	3.62	21
38 x 38	3	7 724	292	3.94	20
	4	7 912	370	4.91	21
	5	7 626	84	1.12	21
36 x 36	3	8 461	1 082†	14.66	21
	4	8 350	971†	13.16	21
	5	7 490	111	1.50	21
Drilled rows					
42 x 20	1	6 377	−156	−2.39	17
42 x 14	1	6 652	119	1.83	17
42 x 8	1	7 049	516*	7.90	17
40 x 20	1	7 579	272	3.73	17
40 x 14	1	8 034	727†	9.95	17
40 x 8	1	7 818	511	6.99	17
38 x 20	1	7 332	−201	−2.67	17
38 x 14	1	7 903	370	4.91	17
38 x 8	1	8 183	650*	8.62	17
36 x 20	1	7 376	126	1.74	16
36 x 14	1	7 733	483†	6.66	16
36 x 8	1	7 647	397	5.48	16
Country Gentleman					
Checked rows					
42 x 42	3	5 668	126	2.27	21
	4	5 900	358*	6.47	21
	5	5 518	−24	−.42	21
40 x 40	3	6 301	560	9.76	21
	4	6 287	546	9.52	21
	5	5 939	198	3.45	21
38 x 38	3	6 142	54	.89	21
	4	5 721	−367	−6.03	21
	5	5 501	−587†	−9.63	21
36 x 36	3	6 100	243	4.14	21
	4	5 767	−90	−1.54	21
	5	5 051	−806†	−13.76	21
Drilled rows					
42 x 20	1	5 210	−3	−.05	17
42 x 14	1	5 493	280	5.38	17
42 x 8	1	5 429	216	4.15	17
40 x 20	1	5 965	98	1.67	17
40 x 14	1	6 536	669*	11.40	17
40 x 8	1	6 254	387	6.59	17
38 x 20	1	5 978	−124	−2.03	17
38 x 14	1	6 248	146	2.38	17
38 x 8	1	6 106	4	.06	17
36 x 20	1	6 144	330	5.69	16
36 x 14	1	6 334	520*	8.95	16
36 x 8	1	5 736	−216	−3.64	17

*Significant difference, P equals .05. †Highly significant difference, P less than .05.

Note.—In this and the following tables the fractions of pounds were dropped after the percentages were calculated.

TABLE 4.—WEIGHT OF SORTED UNHUSKED EARS: EFFECT OF REDUCING DISTANCE BETWEEN HILLS IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN ROWS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per acre	Increase over 42″ spacing		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
40 x 40	2	7 312	705†	10.67	21
38 x 38	2	7 432	862*	13.11	20
36 x 36	2	7 379	772*	11.69	21
40 x 40	3	7 832	353	4.72	21
38 x 38	3	7 724	350	4.75	20
36 x 36	3	8 461	982*	13.13	21
40 x 40	4	8 137	325	4.17	21
38 x 38	4	7 912	100	1.29	21
36 x 36	4	8 350	538	6.89	21
40 x 40	5	7 577	−310	−3.94	21
38 x 38	5	7 626	−261	−3.30	21
36 x 36	5	7 490	−397	−5.03	21
Drilled rows					
40 x 20	1	7 579	1 202†	18.85	17
38 x 20	1	7 332	955†	14.98	17
36 x 20	1	7 377	1 177†	18.97	16
40 x 14	1	8 034	1 382†	20.76	17
38 x 14	1	7 903	1 251†	18.80	17
36 x 14	1	7 733	1 302*	20.25	16
40 x 8	1	7 818	769*	10.91	17
38 x 8	1	8 183	1 134†	16.09	17
36 x 8	1	7 647	794	11.59	16
Country Gentleman					
Checked rows					
40 x 40	2	5 741	199	3.60	21
38 x 38	2	6 088	546†	9.86	21
36 x 36	2	5 857	315	5.69	21
40 x 40	3	6 301	633	11.18	21
38 x 38	3	6 142	474	8.37	21
36 x 36	3	6 100	432	7.62	21
40 x 40	4	6 288	388	6.57	21
38 x 38	4	5 721	−179	−3.04	21
36 x 36	4	5 767	−133	−2.26	21
40 x 40	5	5 939	421	7.62	21
38 x 38	5	5 501	−17	−.31	21
36 x 36	5	5 051	−467	−8.47	21
Drilled rows					
40 x 20	1	5 965	755	14.49	17
38 x 20	1	5 979	769†	14.75	17
36 x 20	1	6 144	1 076†	21.25	16
40 x 14	1	6 536	1 043†	18.98	17
38 x 14	1	6 248	755†	13.74	17
36 x 14	1	6 334	1 091†	20.80	16
40 x 8	1	6 254	825†	15.19	17
38 x 8	1	6 105	677†	12.46	17
36 x 8	1	5 736	307	5.64	17

*Significant difference, *P* equals .05. †Highly significant difference, *P* less than .05.

TABLE 5.—WEIGHT OF PRIME HUSKED EARS: EFFECT OF INCREASING NUMBER OF PLANTS PER HILL IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN PLANTS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per acre	Increase over 2-per-hill rate		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
42 x 42	3	4 664	542†	13.15	21
	4	4 859	737†	17.90	21
	5	4 950	828†	20.09	21
40 x 40	3	4 894	466†	10.52	21
	4	5 031	603†	13.62	21
	5	4 712	284	6.42	21
38 x 38	3	4 843	297	6.53	20
	4	4 834	212	4.59	21
	5	4 606	−16	−.34	21
36 x 36	3	5 084	592†	13.17	21
	4	5 027	535†	11.90	21
	5	4 411	−81	−1.80	21
Drilled rows					
42 x 20	1	4 111	−38	−.93	17
42 x 14	1	4 203	54	1.28	17
42 x 8	1	4 400	251	6.03	17
40 x 20	1	4 664	213	4.79	17
40 x 14	1	5 019	568†	12.75	17
40 x 8	1	4 774	323	7.25	17
38 x 20	1	4 572	−27	−.60	17
38 x 14	1	4 958	359	7.80	17
38 x 8	1	5 001	402	8.72	17
36 x 20	1	4 481	−195	−4.17	16
36 x 14	1	4 690	14	.31	16
36 x 8	1	4 502	−174	−3.73	16
Country Gentleman					
Checked rows					
42 x 42	3	3 821	136	3.68	20
	4	3 683	119	3.33	20
	5	3 624	−76	−2.05	20
40 x 40	3	3 981	508*	14.63	21
	4	3 969	496*	14.31	21
	5	3 696	223	6.42	21
38 x 38	3	3 709	−29	−.76	21
	4	3 388	−350†	−9.36	21
	5	3 216	−522†	−13.96	21
36 x 36	3	3 901	93	2.44	21
	4	3 473	−336*	−8.82	21
	5	2 833	−975†	−25.60	21
Drilled Rows					
42 x 20	1	3 318	−74	−2.17	17
42 x 14	1	3 523	131	3 85	17
42 x 8	1	3 459	67	1.97	17
40 x 20	1	3 859	331	9.40	17
40 x 14	1	4 223	695†	19.71	17
40 x 8	1	3 857	329	9.34	17
38 x 20	1	3 662	−111	−2.94	17
38 x 14	1	3 969	196	5.22	17
38 x 8	1	3 775	2	.06	17
36 x 20	1	3 909	68	1.78	16
36 x 14	1	4 101	260†	6.77	16
36 x 8	1	3 589	−349*	−8.87	17

*Significant difference, P equals .05. †Highly significant difference, P less than .05.

TABLE 6.—WEIGHT OF PRIME HUSKED EARS: EFFECT OF REDUCING DISTANCE BETWEEN HILLS IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN ROWS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per acre	Increase over 42″ spacing		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
40 x 40	2	4 428	306*	7.43	21
38 x 38	2	4 622	500†	12.13	21
36 x 36	2	4 492	370	8.98	21
40 x 40	3	4 894	230	4.93	21
38 x 38	3	4 843	240	5.22	20
36 x 36	3	5.084	420	9.00	21
40 x 40	4	5 031	171	3.53	21
38 x 38	4	4 834	−26	−.53	21
36 x 36	4	5 027	167	3 43	21
40 x 40	5	4 712	−238	−4.81	21
38 x 38	5	4 606	−344	−6.95	21
36 x 36	5	4 411	−539*	−10.89	21
Drilled rows					
40 x 20	1	4 664	553*	13.47	17
38 x 20	1	4 572	461*	11.22	17
36 x 20	1	4 481	488	12.22	16
40 x 14	1	5 019	816†	19.41	17
38 x 14	1	4 958	755†	17.98	17
36 x 14	1	4 690	636†	15 68	16
40 x 8	1	4 773	373	8.50	17
38 x 8	1	5 001	601	13.66	17
36 x 8	1	4 502	249	5.84	16
Country Gentleman					
Checked rows					
40 x 40	2	3 473	−54	−1.54	21
38 x 38	2	3 738	211	5.98	21
36 x 36	2	3 808	281	7.99	21
40 x 40	3	4 149	328	8.59	20
38 x 38	3	3 845	24	.62	20
36 x 36	3	4 035	214	5.61	20
40 x 40	4	4 076	393*	10.68	20
38 x 38	4	3 493	−190	−5.17	20
36 x 36	4	3 613	−70	−1.90	20
40 x 40	5	3 810	186	5.15	20
38 x 38	5	3 340	−284	−7.83	20
36 x 36	5	2 918	−706†	−19.48	20
Drilled rows					
40 x 20	1	3 859	541	16.31	17
38 x 20	1	3 662	344	10.35	17
36 x 20	1	3 910	710†	22.17	16
40 x 14	1	4 223	700†	19.89	17
38 x 14	1	3 969	446†	12.69	17
36 x 14	1	4 101	768†	23.07	16
40 x 8	1	3 857	398†	11.52	17
38 x 8	1	3 775	316*	9.14	17
36 x 8	1	3 589	130	3.77	17

*Significant difference, *P* equals .05. †Highly significant difference, *P* less than .05.

TABLE 7.—NUMBER OF SORTED UNHUSKED EARS: EFFECT OF INCREASING NUMBER OF PLANTS PER HILL IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN PLANTS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Ears per acre	Increase over 2-per-hill rate		Number of replications
			Number	Percent	
Narrow Grain Evergreen					
Checked rows					
42 x 42	3	10 686	1 202†	12.67	21
	4	11 784	2 300†	24.25	21
	5	12 489	3 005†	31.68	21
40 x 40	3	11 398	1 190†	11.66	21
	4	12 548	2 340†	22.92	21
	5	12 929	2 721†	26.66	21
38 x 38	3	11 869	1 046†	9.66	20
	4	13 094	2 150†	19.64	21
	5	13 146	2 202†	20.12	21
36 x 36	3	12 567	1 815†	16.88	21
	4	13 867	3 115†	28.97	21
	5	13 636	2 884†	26.82	21
Drilled rows					
42 x 20	1	9 032	−275	−2.95	17
42 x 14	1	9 648	341	3.66	17
42 x 8	1	11 485	2 178†	23.40	17
40 x 20	1	10 878	714	7.02	17
40 x 14	1	11 646	1 482†	14.58	17
40 x 8	1	13 196	3 032†	29.83	17
38 x 20	1	10 368	−568	−5.19	17
38 x 14	1	11 588	652	5.96	17
38 x 8	1	13 964	3 028†	27.69	17
36 x 20	1	10 812	90	.84	17
36 x 14	1	11 652	930*	8.67	17
36 x 8	1	13 490	2 768†	25.82	17
Country Gentleman					
Checked rows					
42 x 42	3	9 508	708†	8.04	21
	4	10 314	1 514†	17.20	21
	5	10 061	1 261†	14.33	21
40 x 40	3	10 346	974*	10.39	21
	4	11 064	1 692†	18.05	21
	5	11 016	1 644†	17.54	21
38 x 38	3	10 737	628	6.21	21
	4	10 952	843	8.34	21
	5	10 816	707	6.99	21
36 x 36	3	10 570	688	6.96	21
	4	11 049	1 167*	11.81	21
	5	10 641	759	7.68	21
Drilled rows					
42 x 20	1	8 308	56	.68	17
42 x 14	1	9 172	920*	11.15	17
42 x 8	1	10 169	1 917†	23.23	17
40 x 20	1	9 824	227	2.36	17
40 x 14	1	10 734	1 137†	11.85	17
40 x 8	1	11 824	2 227†	23.20	17
38 x 20	1	9 779	−308	−3.05	17
38 x 14	1	10 878	791	7.84	17
38 x 8	1	11 817	1 730†	17.15	17
36 x 20	1	10 072	121	1.22	17
36 x 14	1	10 820	869†	8.73	17
36 x 8	1	11 584	1 633†	16.41	17

*Significant difference, P equals .05. †Highly significant difference, P less than .05.

TABLE 8.—NUMBER OF SORTED UNHUSKED EARS: EFFECT OF REDUCING DISTANCE BETWEEN HILLS IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN ROWS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Ears per acre	Increase over 42″ spacing		Number of replications
			Number	Percent	
Narrow Grain Evergreen					
Checked rows					
40 x 40	2	10 208	724†	7.63	21
38 x 38	2	10 944	1 460†	15.39	21
36 x 36	2	10 752	1 268*	13.37	21
40 x 40	3	11 398	712	6.66	21
38 x 38	3	11 869	1 306†	12.36	20
36 x 36	3	12 567	1 881†	17.60	21
40 x 40	4	12 548	764*	6.48	21
38 x 38	4	13 094	1 310*	11.12	21
36 x 36	4	13 867	2 083†	17.68	
40 x 40	5	12 929	440	3.52	21
38 x 38	5	13 146	657	5.26	21
36 x 36	5	13 636	1 147	9.18	21
Drilled rows					
40 x 20	1	10 878	1 846†	20.44	17
38 x 20	1	10 368	1 336†	14.79	17
36 x 20	1	10 812	1 780†	19.71	17
40 x 14	1	11 646	1 998†	20.71	17
38 x 14	1	11 588	1 940†	20.11	17
36 x 14	1	11 652	2 004†	20.77	17
40 x 8	1	13 196	1 711†	14.90	17
38 x 8	1	13 964	2 479†	21.58	17
36 x 8	1	13 490	2 005*	17.49	17
Country Gentleman					
Checked rows					
40 x 40	2	9 372	572	6.50	21
38 x 38	2	10 109	1 309	14.88	21
36 x 36	2	9 882	1 082	12.30	21
40 x 40	3	10 346	838	8.81	21
38 x 38	3	10 737	1 229†	12.92	21
36 x 36	3	10 570	1 062	11.17	21
40 x 40	4	11 064	750	7.27	21
38 x 38	4	10 952	638	6.18	21
36 x 36	4	11 049	735	7.13	21
40 x 40	5	11 016	955*	9.49	21
38 x 38	5	10 816	755	7.50	21
36 x 36	5	10 641	580	5.76	21
Drilled rows					
40 x 20	1	9 824	1 516†	18.25	17
38 x 20	1	9 779	1 471†	17.70	17
36 x 20	1	10 072	1 764†	21.23	17
40 x 14	1	10 734	1 562†	17.03	17
38 x 14	1	10 878	1 706†	18.60	17
36 x 14	1	10 820	1 648†	17.97	17
40 x 8	1	11 824	1 655†	16.27	17
38 x 8	1	11 817	1 648†	16.21	17
36 x 8	1	11 584	1 415	13.91	17

*Significant difference, *P* equals .05. †Highly significant difference, *P* less than .05.

TABLE 9.—WEIGHT PER PRIME HUSKED EAR: EFFECT OF INCREASING NUMBER OF PLANTS PER HILL IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN PLANTS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per ear	Increase over 2-per-hill rate		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
42 x 42	3	.49	−.01	−2.00	21
	4	.46	−.04	−8.00	21
	5	.45	−.05	−10.00	21
40 x 40	3	.49	−.01	−2.00	21
	4	.46	−.04	−8.00	21
	5	.43	−.07	−14.00	21
38 x 38	3	.47	−.01	−2.08	21
	4	.44	−.04	−8.33	21
	5	.41	−.07	−14.58	21
36 x 36	3	.47	−.02	−4.08	21
	4	.43	−.06	−12.24	21
	5	.40	−.09	−18.37	21
Drilled rows					
42 x 20	1	.51	0	0	17
42 x 14	1	.49	−.02	−3.92	17
42 x 8	1	.44	−.07	−13.72	17
40 x 20	1	.51	0	0	17
40 x 14	1	.50	−.01	−1.96	17
40 x 8	1	.43	−.08	−15.69	17
38 x 20	1	.50	.01	2.04	17
38 x 14	1	.50	.01	2.04	17
38 x 8	1	.42	−.07	−14.29	17
36 x 20	1	.50	−.01	−1.96	16
36 x 14	1	.49	−.02	−3.92	16
36 x 8	1	.42	−.09	−17.65	16
Country Gentleman					
Checked rows					
42 x 42	3	.42	−.02	−4.54	20
	4	.40	−.04	−9.09	20
	5	.38	−.06	−13.64	20
40 x 40	3	.42	0	0	21
	4	.40	−.02	−4.76	21
	5	.39	−.03	−7.14	21
38 x 38	3	.41	−.02	−4.65	21
	4	.38	−.05	−11.63	21
	5	.36	−.07	−16.28	21
36 x 36	3	.42	−.01	−2.33	21
	4	.38	−.05	−11.63	21
	5	.33	−.10	−23.26	21
Drilled rows					
42 x 20	1	.45	−.01	−2.17	17
42 x 14	1	.43	−.03	−6.52	17
42 x 8	1	.38	−.08	−17.39	17
40 x 20	1	.45	.02	−4.65	17
40 x 14	1	.45	.02	−4.65	17
40 x 8	1	.38	−.05	−11.63	17
38 x 20	1	.45	.01	2.27	17
38 x 14	1	.44	0	0	17
38 x 8	1	.38	−.06	−13.64	17
36 x 20	1	.46	.01	2.22	16
36 x 14	1	.44	−.01	2.22	16
36 x 8	1	.37	−.08	−17.78	16

TABLE 10.—WEIGHT PER PRIME HUSKED EAR: EFFECT OF REDUCING DISTANCE BETWEEN HILLS IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN ROWS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per ear	Increase over 42″ spacing		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
40 x 40	2	.50	0	0	21
38 x 38	2	.48	−.02	−4.00	21
36 x 36	2	.49	−.01	−2.00	21
40 x 40	3	.49	0	0	21
38 x 38	3	.47	−.02	−4.08	21
36 x 36	3	.47	−.02	−4.08	21
40 x 40	4	.46	0	0	21
38 x 38	4	.44	−.02	−4.35	21
36 x 36	4	.43	−.03	−6.52	21
40 x 40	5	.43	−.02	−4.44	21
38 x 38	5	.41	−.04	−8.88	21
36 x 36	5	.40	−.05	−11.11	21
Drilled rows					
40 x 20	1	.51	0	0	17
38 x 20	1	.50	−.01	−1.96	17
36 x 20	1	.50	−.01	−1.96	16
40 x 14	1	.50	.01	2.04	17
38 x 14	1	.50	.01	2.04	17
36 x 14	1	.49	0	0	16
40 x 8	1	.43	−.01	−2.27	17
38 x 8	1	.42	−.02	−4.54	17
36 x 8	1	.42	−.02	−4.54	16
Country Gentleman					
Checked rows					
40 x 40	2	.42	−.02	−4.54	21
38 x 38	2	.43	−.01	−2.27	21
36 x 36	2	.43	−.01	−2.27	21
40 x 40	3	.42	0	0	21[a]
38 x 38	3	.41	−.01	−2.38	21
36 x 36	3	.42	0	0	
40 x 40	4	.40	−.03	−6.98	21[a]
38 x 38	4	.38	−.05	−11.63	21[a]
36 x 36	4	.38	−.05	−11.63	21[a]
40 x 40	5	.39	−.04	−9.30	21[a]
38 x 38	5	.36	−.07	−16.28	21[a]
36 x 36	5	.33	−.10	−23.26	21[a]
Drilled rows					
40 x 20	1	.45	0	0	17
38 x 20	1	.45	0	0	17
36 x 20	1	.46	.01	2.22	16[b]
40 x 14	1	.45	.02	4.65	17
38 x 14	1	.44	.01	2.33	17
36 x 14	1	.44	.01	2.33	16[b]
40 x 8	1	.38	0	0	17
38 x 8	1	.38	0	0	17
36 x 8	1	.37	−.01	−2.63	16[b]

[a]Twenty replications for the 42″ distance. [b]Seventeen replications for the 42″ distance.

TABLE 11.—RECOVERY OF PRIME HUSKED EARS: EFFECT OF INCREASING NUMBER OF PLANTS PER HILL IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN PLANTS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per 100 pounds of sorted unhusked ears	Increase over 2-per-hill rate		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
42 x 42	3	59.47	.21	.35	21
	4	59.53	.27	.46	21
	5	59.70	.44	.74	21
40 x 40	3	60.73	1.86	3.16	21
	4	59.86	.99	1.68	21
	5	60.06	1.19	2.02	21
38 x 38	3	61.12	1.41	2.36	20
	4	60.00	.14	.23	21
	5	58.99	−.87	−1.45	21
36 x 36	3	58.55	−1.05	−1.76	21
	4	58.89	−.71	−1.19	21
	5	57.76	−1.84	−3.09	21
Drilled rows					
42 x 20	1	61 83	2.20	3.69	17
42 x 14	1	59.82	.19	.32	17
42 x 8	1	58.79	−.84	−1.41	17
40 x 20	1	59.89	1.06	1.80	17
40 x 14	1	60.50	1.67	2.84	17
40 x 8	1	57.89	−.94	−1.60	17
38 x 20	1	60.17	.66	1.11	17
38 x 14	1	59.75	.24	.40	17
38 x 8	1	58.92	−.59	−.99	17
36 x 20	1	58.85	−1.28	−2.13	16
36 x 14	1	58.48	−1.65	−2.74	16
36 x 8	1	56.53	−3.60†	−5.99	16
Country Gentleman					
Checked rows					
42 x 42	3	61.14	1.79	3.02	20
	4	58.49	−.83	−1.40	19
	5	60.82	−.91	−1.47	19
40 x 40	3	58.40	1.85	3.27	21
	4	58.90	2.35	4.16	21
	5	57.23	.68	1.20	21
38 x 38	3	56.61	−1.75	−3.00	21
	4	56.15	−2.21	−3.79	21
	5	55.84	−2.52	−4.32	21
36 x 36	3	59.33	−4.23†	−6.66	21
	4	57.59	−5.97†	−9.39	21
	5	55.23	−8.33†	−13.11	21
Drilled rows					
42 x 20	1	60.96	1.53	2.57	16
42 x 14	1	61.44	2.01	3.38	16
42 x 8	1	59.04	−.39	−.66	16
40 x 20	1	60.39	5.13†	9.28	17
40 x 14	1	61.24	5.98*	10.82	17
40 x 8	1	56.30	1.04	1.88	17
38 x 20	1	57.05	−1.15	−1.98	17
38 x 14	1	58.18	−.02	−.03	17
38 x 8	1	57.30	−.90	−1.55	17
36 x 20	1	59.21	−5.12	−7.96	16
36 x 14	1	61.13	−3.20	−4.97	16
36 x 8	1	59.98	−4.52	−7.01	17

*Significant difference, P equals .05. †Highly significant difference, P less than .05.

TABLE 12.—RECOVERY OF PRIME HUSKED EARS: EFFECT OF REDUCING DISTANCE BETWEEN HILLS IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN ROWS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per 100 pounds of sorted unhusked ears	Increase over 42″ spacing		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
40 x 40	2	58.87	−.39	−.66	21
38 x 38	2	59.86	.60	1.01	21
36 x 36	2	59.59	.33	.56	21
40 x 40	3	60.73	1.25	2.10	21
38 x 38	3	61.12	1.74	2.93	20
36 x 36	3	58.55	−.93	−1.56	21
40 x 40	4	59.86	.33	.55	21
38 x 38	4	60.00	.47	.79	21
36 x 36	4	58.89	−.64	−1.08	21
40 x 40	5	60.07	.36	.60	21
38 x 38	5	58.99	−.72	−1.21	21
36 x 36	5	57.76	−1.95	−3.27	21
Drilled rows					
40 x 20	1	59.89	−1.94	−3.14	17
38 x 20	1	60.17	−1.66	−2.68	17
36 x 20	1	58.84	−2.78	−4.51	16
40 x 14	1	60.51	.69	1.15	17
38 x 14	1	59.76	−.06	−.10	17
36 x 14	1	58.48	−1.06	−1.78	16
40 x 8	1	57.89	−.90	−1.53	17
38 x 8	1	58.92	.13	.22	17
36 x 8	1	56.53	−1.79	−3.07	16
Country Gentleman					
Checked rows					
40 x 40	2	56.85	−2.50	−4.21	20
38 x 38	2	59.66	.31	.52	20
36 x 36	2	62.56	3.21	5.41	20
40 x 40	3	59.59	−1.55	−2.54	20
38 x 38	3	57.46	−3.68†	−6.02	20
36 x 36	3	60.66	−.48	−.78	20
40 x 40	4	59.35	2.20	3.85	20
38 x 38	4	56.48	−.67†	−1.17	20
36 x 36	4	58.30	1.15	2.01	20
40 x 40	5	57.87	−1.82	−3.05	20
38 x 38	5	56.92	−2.77†	−4.64	20
36 x 36	5	56.70	−2.99†	−5.01	20
Drilled rows					
40 x 20	1	60.39	1.08	1.82	17
38 x 20	1	57.04	−2.27	−3.83	17
36 x 20	1	59.21	.54	.92	16
40 x 14	1	61.25	1.12	1.86	17
38 x 14	1	58.17	−1.96	−3.26	17
36 x 14	1	61.13	1.56	2.62	16
40 x 8	1	56.30	−1.98	−3.40	17
38 x 8	1	57.29	−.99	−1.70	17
36 x 8	1	59.98	1.70	2.92	17

†Highly significant difference, P less than .05.

TABLE 13.—WEIGHT OF GREEN FODDER: EFFECT OF INCREASING NUMBER OF PLANTS PER HILL IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN PLANTS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per acre	Increase over 2-per-hill rate		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
42 x 42	3	13 868	144	1.05	17
	4	13 883	159	1.16	17
	5	14 910	1 186†	8.64	17
40 x 40	3	14 852	−227	−1.51	17
	4	15 726	647	4.29	17
	5	15 714	635	4.21	17
38 x 38	3	14 419	−6	−.04	16
	4	15 373	682	4.64	17
	5	16 492	1 801†	12.26	17
36 x 36	3	15 475	1 453*	10.36	17
	4	15 677	1 655†	11.81	17
	5	16 591	2 569†	18.33	17
Drilled rows					
42 x 20	1	14 032	−269	−1.88	13
42 x 14	1	14 061	−240	−1.68	13
42 x 8	1	15 723	1 422†	9.95	13
40 x 20	1	16 489	900	5.77	13
40 x 14	1	16 993	1 404	9.01	13
40 x 8	1	17 808	2 219†	14.24	13
38 x 20	1	17 361	1 975†	12.84	13
38 x 14	1	17 365	1 979†	12.86	13
38 x 8	1	18 329	2 943†	19.13	13
36 x 20	1	15 614	882	5.99	12
36 x 14	1	15 439	707	4.80	12
36 x 8	1	15 924	1 192	8.09	12
Country Gentleman					
Checked rows					
42 x 42	3	11 695	−95	−.81	17
	4	12 310	520	4.41	17
	5	12 665	875	7.42	17
40 x 40	3	13 658	763	5.92	17
	4	14 414	1 519†	11.78	17
	5	14 336	1 441†	11.18	17
38 x 38	3	13 284	940	7.61	17
	4	13 219	875†	7.08	17
	5	13 981	1 637†	13.26	17
36 x 36	3	12 339	747*	6.44	17
	4	12 698	1 106†	9.54	17
	5	13 861	2 269†	19.58	17
Drilled rows					
42 x 20	1	12 409	197	1.61	13
42 x 14	1	12 291	79	.65	13
42 x 8	1	13 999	1 787†	14.64	13
40 x 20	1	15 405	2 200†	16.66	13
40 x 14	1	15 076	1 871*	14.17	13
40 x 8	1	15 434	2 229†	16.88	13
38 x 20	1	14 421	1 268	9.64	13
38 x 14	1	15 670	2 517†	19.14	13
38 x 8	1	16 471	3 318†	25.22	13
36 x 20	1	13 462	1 360†	11.24	12
36 x 14	1	13 867	1 766†	14.59	12
36 x 8	1	15 210	2 885†	23.41	13

*Significant difference, P equals .05. †Highly significant difference, P less than .05.

TABLE 14.—WEIGHT OF GREEN FODDER: EFFECT OF REDUCING DISTANCE BETWEEN HILLS IN CHECKED ROWS AND REDUCING DISTANCE BETWEEN ROWS IN DRILLED ROWS

Planting distance (inches)	Plants per hill	Pounds per acre	Increase over 42″ spacing		Number of replications
			Pounds	Percent	
Narrow Grain Evergreen					
Checked rows					
40 x 40	2	15 079	1 355†	9.87	17
38 x 38	2	14 691	967	7.05	17
36 x 36	2	14 022	298	2.17	17
40 x 40	3	14 852	984	7.10	17
38 x 38	3	14 419	539	3.88	16
36 x 36	3	15 474	1 606	11.58	17
40 x 40	4	15 726	1 843†	13.28	17
38 x 38	4	15 373	1 490†	10.73	17
36 x 36	4	15 677	1 794*	12.92	17
40 x 40	5	15 715	805*	5.40	17
38 x 38	5	16 492	1 582†	10.61	17
36 x 36	5	16 591	1 681*	11.27	17
Drilled rows					
40 x 20	1	16 489	2 457†	17.51	13
38 x 20	1	17 361	3 329†	23.72	13
36 x 20	1	15 615	1 628	16.39	12
40 x 14	1	16 994	2 933†	20.86	13
38 x 14	1	17 365	3 304†	23.50	13
36 x 14	1	15 439	1 591*	11.49	12
40 x 8	1	17 808	2 085†	13.26	13
38 x 8	1	18 329	2 606†	16.57	13
36 x 8	1	15 924	335	2.15	12
Country Gentleman					
Checked rows					
40 x 40	2	12 894	1 104	9.36	17
38 x 38	2	12 344	554	4.70	17
36 x 36	2	11 591	−199	−1.69	17
40 x 40	3	13 658	1 963†	16.78	17
38 x 38	3	13 284	1 589*	13.59	17
36 x 36	3	12 338	643	5.50	17
40 x 40	4	14 415	2 104†	17.09	17
38 x 38	4	13 218	908	7.37	17
36 x 36	4	12 698	387	3.14	17
40 x 40	5	14 336	1 671†	13.19	17
38 x 38	5	13 981	1 316*	10.39	17
36 x 36	5	13 862	1 197*	9.45	17
Drilled rows					
40 x 20	1	15 405	2 997†	24.15	13
38 x 20	1	14 420	2 012†	16.22	13
36 x 20	1	13 462	1 086*	8.78	12
40 x 14	1	15 077	2 785†	22.65	13
38 x 14	1	15 670	3 378†	27.48	13
36 x 14	1	13 868	1 776†	14.69	12
40 x 8	1	15 434	1 435*	10.25	13
38 x 8	1	16 471	2 472†	17.66	13
36 x 8	1	15 210	1 211†	8.65	13

*Significant difference, *P* equals .05. †Highly significant difference, *P* less than .05.

EXPERIMENTAL RESULTS, DRILLED PLANTINGS

The discussion of the results from the drilled-row plantings is given separately in order to avoid confusion. Growing sweet corn in drilled rows is usually limited to the early market types raised by truck growers, practically no canning corn being grown by this method in Illinois. From the standpoint of culture of the crop, however, there is no real reason why canning corn should not be so grown, as recent improvements in cultivating tools should enable the grower to keep drilled rows relatively free from weeds without hand hoeing. Large acreages of silage corn are grown in drilled rows without the weed problem proving to be unduly serious.

The question of the comparative value of drilled-row and checked-row plantings has never been satisfactorily answered so far as sweet corn is concerned. Planting in drilled rows gives a much evener distribution of plants over a given area, and therefore, theoretically at least, there is much less competition between the plants than in checked rows, where several plants are crowded together in a hill.

Weights of Sorted Unhusked Ears

Distance Between Plants in Row.—The drilled plantings of Narrow Grain Evergreen (Table 3 and Fig. 4) tended to yield greater weights of sorted unhusked ears than the respective checked rows having 2 plants per hill, some of the differences being significant. Two plantings seemed to give outstanding results, 40″x 14″ and 38″x 8″; but as the total yields of the two were almost the same, the thinner planting, 40″x 14″, is to be recommended. The total yield of the 40″x 14″ planting (8,034 pounds) was nearly the same as that of the best of the recommended checked-row plantings.

Of the Country Gentleman drilled-row plantings only two yielded significantly heavier weights of sorted unhusked ears than the corresponding checked rows having 2 plants per hill. Of these two drilled plantings the 40″x 14″ was considerably superior. The mean total yield of this planting, 6,536 pounds of sorted unhusked ears per acre, was as high as that of the best checked-row plot.

Distance Between Rows.—Nearly all the drilled plantings at distances narrower than 42 inches showed significant yield increases over those at the 42-inch distance, an indication that closer planting is essential for the heaviest yields of sorted unhusked ears from drilled rows (Table 4 and Fig. 5). For the Narrow Grain Evergreen variety the 40-inch distance seemed to be most nearly the optimum, the 40″x 14″ planting predominating. The trend in Country Gentleman was similar, but there was little choice between the 36″x 20″, 40″x 14″, and 36″x 14″ plantings. Since, however, the widest rows are the easiest to cultivate,

40″x 14″ is the preferable drilled planting for Country Gentleman. Average yields from the drilled plots were not substantially different from those of the checked plots.

Weights of Prime Husked Ears

Distance Between Plants in Row.—In weight of prime husked ears the 40″x 14″ drilled-row planting gave the largest significant increase over the 2-per-hill checked-row planting at the corresponding distance (Table 5 and Fig. 6). This was true of both Narrow Grain Evergreen and Country Gentleman. The better drilled plantings returned about the same mean total yields of prime husked ears as the corresponding checked-row plots.

Distance Between Rows.—Significant increases in weights of prime husked ears of Narrow Grain Evergreen appeared in the 40″x 14″, 40″x 20″, 36″x 14″, 38″x 20″, and 38″x 14″ plantings (Table 6, Fig. 7). The 40″x 14″ planting gave the largest significant increase and also the largest mean yield of prime husked ears. Similarly three plantings of Country Gentleman—36″x 20″, 40″x 14″, and 36″x 14″—gave almost equally large significant increases in weights of prime husked ears over those of the corresponding 42-inch rows. Since, however, the 40″x 14″ planting gave the highest mean yield it is probably preferable to either of the others.

Number of Sorted Unhusked Ears

Distance Between Plants.—Increases in number of sorted unhusked ears produced on the drilled plots over those produced on the corresponding checked-row plots having 2 plants per hill were very large for both varieties, many of the differences being significant (Table 7 and Fig. 8). The 8-inch spacing in the row gave the highest yields, and from the standpoint of number of unhusked ears, 8 inches is the best distance between plants in the row.

In the Narrow Grain Evergreen variety there is little to choose between the 40″x 8″, 38″x 8″, and 36″x 8″ plantings. Since the 40″x 8″ planting is the easiest to cultivate, it should be given preference. The 42″x 8″ and 40″x 8″ plantings are outstanding in the Country Gentleman variety (Table 7), but since the 40″x 8″ produces the larger mean yields, it is the one to be preferred.

Distance Between Rows.—In both varieties the highest total number of sorted unhusked ears was obtained from rows closer than 42 inches (Table 8 and Fig. 9). However, reducing the distance between rows below 40 inches did not have a great deal of effect either on mean total yields or percentages of increase. The 8-inch plantings produced the highest mean yields of both varieties; and within that series the 38″x 8″ plot produced the maximum yield of Narrow Grain

Evergreen (tho there was little to choose between the 40-, 38-, and 36-inch plantings) and the 40″x 8″ plot produced the maximum yield of Country Gentleman.

In general, the number of sorted unhusked ears produced on the drilled plantings was comparable to that produced on the checked-row plantings.

Weight per Prime Husked Ear

Weight per prime husked ear produced on the drilled plots was reduced as the distance between plants in the row was reduced (Table 9), as was true also on the checked-row plantings. It should be noted that the ears in the plantings drilled 20 inches apart in the row were just as heavy as those from the corresponding 2-per-hill checked plantings. The closest planting consistent with maximum weight per prime husked ear is 14 inches between plants.

Reductions in weight per prime husked ear as the distance between rows was reduced were very slight (Table 10) for both varieties. The distance at which the plants were spaced in the row evidently had a much more important effect on weight per ear than the distance between the rows.

Percent Recovery of Prime Husked Ears

The effect of decreasing the distance between plants in the drilled rows was negligible so far as the recovery of prime husked ears of Narrow Grain Evergreen was concerned (Table 11); but for Country Gentleman the trends were rather diverse, the 40″x 20″ and 40″x 14″ plantings giving significant increases over the 40″x 40″x 2 checked-row planting. Apparently Country Gentleman should be planted in 42- or 40-inch rows with the plants spaced no closer than 14 inches in the row.

Decreasing the distance between rows had a negligible effect upon the recovery of prime husked ears of both varieties (Table 12).

Weights of Green Fodder

Distance Between Plants in Row.—Yields of fodder in drilled rows were about the same as in checked rows. Fodder weights of Narrow Grain Evergreen in the drilled rows (Table 13) increased as the distance between plants in the row was reduced, the 8-inch spacing yielding the most. The 38-inch series produced heavier weights of fodder than any of the three others, and within this series the 38″x 8″ planting was especially high.

Closer spacing between plants of the Country Gentleman variety (Table 13) tended to increase fodder yields, but there was not very much increase unless the rows were 36 or 38 inches apart. The largest mean yield of fodder was produced by the 38″x 8″ planting.

Distance Between Rows.—Decreasing the distance between rows had a somewhat unexpected effect upon yields of green fodder from the drilled rows (Table 14), the 38-inch distance proving to be for both varieties the narrowest planting consistent with maximum weights, except for the 40″x 20″ spacing for Country Gentleman. Moreover, it should be noted that in general the superiority of the 38-inch over the 40-inch plantings was very slight, and that when the plants in the row were spaced 20 inches apart, the 40-inch rows of Country Gentleman were better than the 38-inch rows.

SOME OTHER EFFECTS OF RATE AND DISTANCE OF PLANTING

In addition to the effects of rate and distance of planting sweet corn on the various yield components discussed in the foregoing sections, there were certain effects on the growth habits of the plants not directly measured by the yields. Those on which records were kept were the height of the plants, the number of suckers produced, and the time at which the plants reached maturity.

Height of Plants

Heights of the plants on plots planted at different rates and distances were carefully measured in three of the years. The yearly averages are listed in Table 15. In 1933 and 1936, when soil moisture was a limiting factor, reducing the distance between hills in the checked-row plantings below 40 inches tended to reduce the height of the plant. Such reductions were not generally observable in 1935, when the amount of soil moisture was much more nearly normal.

The effect of increasing the number of plants in the hill was somewhat different from that of reducing the distance between hills. Increasing the number of plants per hill had either a very slight effect on height of plant or tended to increase it—certainly no tendency to reduce the height.

Data on height of plants in the drilled-row plantings were kept only two years, but those are sufficient to show that when soil moisture is normal, as in 1935, reducing the distance between rows tended to increase the height of the plants. When moisture was abnormally low, as in 1936, the reverse tended to be true. Similar effects were observed when the distance between plants in the row was reduced.

Number of Suckers

The number of suckers per plant varied considerably from year to year, but there was a general tendency in the checked-row plantings for the suckers to increase as distance between hills was increased

(Table 16). This tendency, however, was relatively slight as compared with the great reduction which occurred as the number of plants per hill was increased.

In drilled-row plantings the relationship was quite similar. De-

TABLE 15.—AVERAGE HEIGHT[a] OF PLANTS: WHEN GROWN IN CHECKED ROWS AND IN DRILLED ROWS AT VARIOUS PLANTING RATES AND DISTANCES

Distance between rows (inches)	Height when number of plants per hill was—				Height when distance between plants in row was—		
	2	3	4	5	20 inches	14 inches	8 inches
	Country Gentleman, 1933						
	in.	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*
42	77.9	79.1	81.3	79.2	....	....	....
40	79.6	80.2	82.1	81.4	....	....	....
38	73.9	75.2	72.1	75.4	....	....	....
36	72.3	72.6	73.7	73.4	....	....	....
	Narrow Grain Evergreen, 1933						
42	83.1	85.5	86.0	87.7	....	....	....
40	85.2	87.1	89.9	89.4	....	....	....
38	80.6	83.0	82.0	85.0	....	....	....
36	79.7	82.0	79.2	79.7	....	....	....
	Country Gentleman, 1935						
42	89.8	93.4	94.9	92.8	87.3	90.8	93.0
40	90.3	94.1	96.7	98.7	92.0	94.7	96.7
38	88.6	94.0	93.6	92.5	86.9	91.6	92.4
36	91.2	94.7	97.6	96.8	89.5	92.7	95.9
	Narrow Grain Evergreen, 1935						
42	98.6	103.9	106.4	107.6	96.4	100.3	101.4
40	101.4	106.7	108.8	110.0	104.0	106.0	109.2
38	98.3	101.8	102.2	105.3	100.9	103.7	99.3
36	102.5	105.5	106.8	108.9	101.5	104.7	107.3
	Country Gentleman, 1936						
42	75.6	74.8	76.5	75.0	72.5	72.6	70.8
40	72.8	76.0	75.5	75.2	70.5	73.7	71.0
38	69.6	71.6	71.4	74.2	68.0	68.8	66.0
36	72.3	73.1	70.8	69.3	68.4	67.0	67.6
	Narrow Grain Evergreen, 1936						
42	80.6	81.2	80.7	80.2	79.6	78.2	75.4
40	77.9	83.4	81.2	80.0	78.6	81.0	77.3
38	74.9	78.0	78.9	78.4	74.2	74.9	74.0
36	79.4	76.3	76.7	75.8	76.2	72.8	72.7

[a]In the checked-row plantings, 10 hills in the center of each plot were measured just before harvest from the ground to the tip of the tallest tassel. Each of the 4 replications was measured separately and the average heights are therefore the means of 40 hills. In the drilled-row plantings, 10 plants instead of hills were measured as described above, the average heights therefore being means of 40 plants.

TABLE 16.—AVERAGE NUMBER OF SUCKERS PRODUCED[a]: PLANTS GROWN IN CHECKED ROWS AND IN DRILLED ROWS AT VARIOUS PLANTING RATES AND DISTANCES

Distance between rows (inches)	Suckers when number of plants per hill was—				Suckers when distance between plants in row was—		
	2	3	4	5	20 inches	14 inches	8 inches
Country Gentleman, 1931							
42	2.10	1.17	.76	.42	....	1.36	.79
40	1.30	.78	.40	.16	....	1.75	.37
38	1.31	.75	.45	.07	....	1.58	.41
36	1.61	.96	.61	.32	....	1.58	.83
Narrow Grain Evergreen, 1931							
42	1.62	.68	.47	.06	....	1.72	1.03
40	1.54	.92	.41	.25	....	1.35	.88
38	1.46	.82	.46	.18	....	1.83	1.15
36	1.52	.79	.50	.14	....	.68	1.31
Country Gentleman, 1932							
42	2.04	1.13	.57	.39	3.09	2.24	1.14
40	1.97	1.29	.86	.34	3.44	2.52	1.44
38	2.34	1.52	1.07	.67	3.38	2.73	1.58
36	1.62	.87	.27	.18	2.92	2.05	1.07
Narrow Grain Evergreen, 1932							
42	2.11	1.26	.60	.44	2.89	2.12	.98
40	1.95	1.23	.85	.38	2.89	2.18	1.35
38	2.19	1.44	.97	.69	3.14	2.46	1.39
36	1.75	1.40	.58	.28	2.30	1.56	.94
Country Gentleman, 1935							
42	3.28	2.42	.98	.34	1.90	1.48	.74
40	3.28	2.20	1.46	.92	2.46	1.87	.75
38	2.20	.96	.40	.16	2.04	1.55	.61
36	2.48	.88	.28	.04	1.73	1.23	.40
Narrow Grain Evergreen, 1935							
42	4.00	2.06	1.18	.56	1.91	1.42	.57
40	4.12	1.84	1.18	.60	2.33	2.20	.39
38	2.88	1.22	.46	.18	2.44	1.57	.46
36	3.14	1.32	.80	.20	1.97	1.37	.41
Country Gentleman, 1936							
42	3.29	2.29	1.90	.99	1.86	1.12	.40
40	3.45	2.96	2.00	1.20	1.91	1.40	.24
38	3.12	2.54	1.58	.81	1.98	1.32	.45
36	2.26	1.29	.28	.10	1.90	1.25	.23
Narrow Grain Evergreen, 1936							
42	2.95	2.15	1.26	.45	1.52	.70	.14
40	2.59	1.84	.99	.36	1.68	.98	.17
38	2.39	1.26	.65	.41	1.72	.15	.78
36	1.64	.86	.49	.22	1.72	.82	.15

[a]The average number of suckers per plant was obtained by counting and averaging the suckers on the two center rows of each plot. Only suckers more than 12 inches long just before harvest were counted. The means in the table are averages of 4 replications.

creasing the distance between rows had relatively little effect on number of suckers, but reducing the distance between plants in the row reduced the number of suckers very markedly.

Time of Reaching Maturity

Reducing the distance between hills in the checked-row plantings tended to delay maturity slightly (Table 17), altho in some years, 1935 for instance, there was scarcely any delay. On the other hand, increasing the number of plants in the hill delayed maturity very appreciably.

The tendencies were similar in the drilled-row plantings. Reducing the distances between rows had no consistent effect on time of maturity, but reducing the spacing in the row tended to delay maturity.

GENERAL DISCUSSION OF RESULTS

None of the experimental work on spacing of sweet corn previously reported was sufficiently extensive to determine the effect of varying both number of plants in the hill and distance between hills on the several yield components in sweet corn. With few exceptions, drill plantings were almost entirely ignored. In the subsequent discussion the complex relationships which exist will be explained so far as the data permit.

The most recent work reported was that by Watson[10*] and Watson and Davis,[11*] in Puerto Rico, wherein it was shown that close spacing increased the yields of both ears and forage in what would be considered drilled-row planting, as the plants were thinned to one per place. But tho close spacing increased the number of ears, it reduced the weight per ear, and it also reduced the stalk diameter. The authors concluded that the optimum area per plant is 3 square feet.

Haber,[4*] from an extensive experiment at the Iowa Station with Country Gentleman and Stowell's Evergreen sweet corn, where the number of stalks per hill varied from 2 to 7, all planted 42″x 42″, made the following observations on the effect of increasing the number of stalks per hill: (1) weight per ear declines; (2) number of ears per stalk declines; (3) yields increase up to the rate of 4 stalks per hill; and (4) weight of fodder increases. Haber also ran a single experiment using Stowell's Evergreen planted in drilled rows 42 inches apart with single plants 12 inches apart in the row. He concluded that the checked-row method was far superior to the drilled row. Eisele,[2*] working with field corn at the same station, found that higher rates per hill increased the total number of ears produced per unit of area, but that the ratio of nubbins also increased markedly.

Magruder,[7*] in experiments at Wooster and Marietta, Ohio, with Early Adams, a small variety of an early flint type sold as sweet corn,

TABLE 17.—DAYS REQUIRED FOR MATURITY: PLANTS GROWN IN CHECKED ROWS AND IN DRILLED ROWS AT VARIOUS PLANTING RATES AND DISTANCES

(Figures indicate number of days between planting and date when 75 percent of the total silks had appeared[a])

Distance between rows (inches)	When number of plants per hill was—				When distance between plants in row was—		
	2	3	4	5	20 inches	14 inches	8 inches
Country Gentleman, 1932							
42	62	63	64	66	64	64	67
40	62	63	64	66	63	63	65
38	63	64	65	66	63	63	66
36	63	64	66	68	63	64	67
Narrow Grain Evergreen, 1932							
42	62	63	64	65	63	64	67
40	63	64	64	66	64	65	67
38	63	63	65	64	63	64	66
36	64	64	66	68	64	64	67
Country Gentleman, 1933							
42	61	63	64	66	..	..	..
40	62	64	65	68	..	..	..
38	63	63	66	67	..	..	..
36	64	65	66	67	..	..	..
Narrow Grain Evergreen, 1933							
42	63	64	65	66	..	..	..
40	64	66	66	68	..	..	..
38	64	63	65	67	..	..	..
36	64	65	66	68	..	..	..
Country Gentleman, 1935							
42	61	62	63	64	62	63	65
40	61	62	62	64	63	61	60
38	61	62	64	65	61	62	65
36	60	61	63	67	63	60	59
Narrow Grain Evergreen, 1935							
42	60	61	63	63	64	62	61
40	61	62	63	63	62	61	61
38	60	62	64	67	64	61	61
6	60	61	63	66	62	60	60
Country Gentleman, 1936							
42	71	71	72	73	72	72	74
40	71	71	72	72	72	72	73
38	72	72	74	74	72	72	74
36	72	73	74	75	72	72	74
Narrow Grain Evergreen, 1936							
42	71	72	73	74	71	72	73
40	71	72	72	74	71	71	73
38	72	72	74	74	72	72	74
36	72	73	74	76	72	73	75

[a]The number of days given in each case is the average of 4 replications. The two center rows of each plot were counted. This is equivalent to half the total plot.

and with Stowell's Evergreen, was unable to reach any definite conclusions. He stated that proper distance of planting depends upon such factors as size of plant, soil fertility, supply of moisture, and purpose for which the crop is grown. No experimental evidence was presented to show the relationship between these factors.

The author in 1930 and 1931 carried on a series of preliminary tests at Urbana (page 37) which formed the basis from which to estimate the probable optima in rates and distances, and the layout for the main test during the following five years. For Country Gentleman the highest yields of unhusked ears in 1930 were obtained, with only one exception, from plantings at the rate of 2 kernels per hill at each distance of planting. The most favorable distance seemed to be 42″x 38″. Yields from most of the drilled-row plantings were extremely low, indicating that drilled rows may not be so well adapted to dry seasons as checked rows. In 1931 the optimum rate of planting Country Gentleman was 3 kernels per hill at all distances except one; and the yields from the drilled plantings were again much below those of the more productive checked plots. Differences in moisture during the two seasons probably accounted for the fact that 2 kernels per hill gave best yields in 1930 but 3 per hill gave best results in 1931. The behavior of Narrow Grain Evergreen, included in 1931, was considerably different from that of Country Gentleman, for Narrow Grain Evergreen did not seem to be very selective, the optimum rates at each distance being 3, 4, or 5 plants per hill but never 1 or 2. In general, the highest yields of Narrow Grain Evergreen were obtained from the 42-inch spacings and 3, 4, or 5 plants per hill. In drilled rows Narrow Grain Evergreen did better than Country Gentleman. The optimum drilled plantings were nearly all confined to the rows 42 inches apart, 42″x 8″ giving the best yield of husked ears.

Space Occupied by Each Plant as a Criterion

The trends shown in the analysis of experimental results in the foregoing sections are rather diverse and sometimes contradictory. It is this apparent confusion, however, which indicates that the relationships existing in these experiments are quite complex and furthermore that the yield of one component may not be used as an index to the yield of another component under the same conditions.

Before proceeding to discuss this matter further, the data need to be examined on the basis of differences due to a single factor, space occupied per plant.

Where corn plants stand alone, as in drilled rows, there is no question concerning the actual area occupied by each, but in hill plantings the actual area for each must be assumed. For instance, the area occupied by one hill 42″x 42″ is 1,764 square inches. In a 1-per-hill

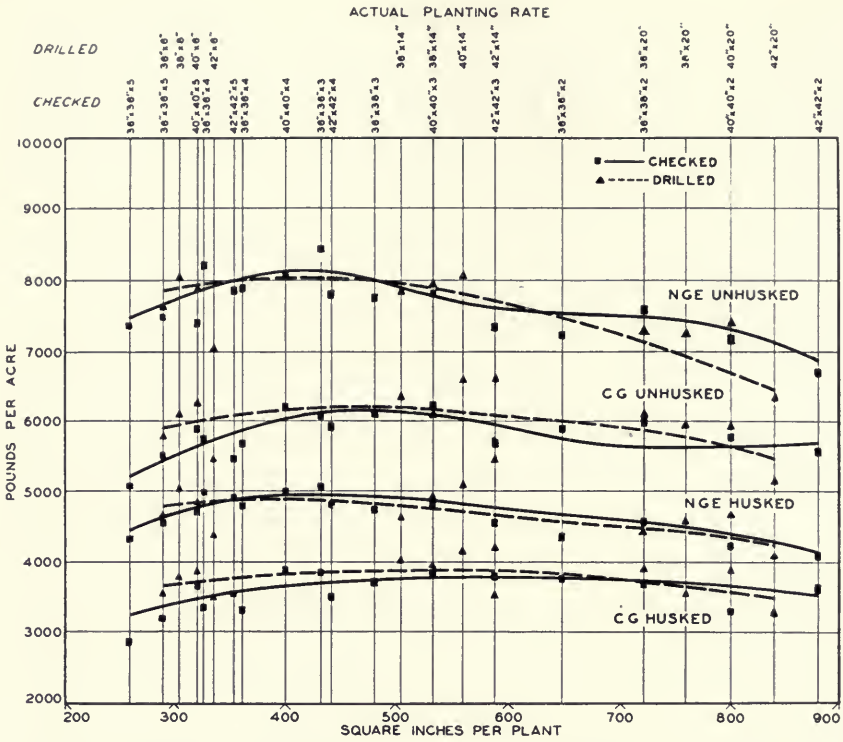


FIG. 10.—POUNDS OF SORTED UNHUSKED AND PRIME HUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT (1932-1936 AVERAGES)

planting this would also be the area occupied by the plant. But the question is whether in the plots having 2, 3, 4, and 5 plants per hill the area occupied may be assumed to be respectively $\frac{1764}{2}, \frac{1764}{3}, \frac{1764}{4}$, and $\frac{1764}{5}$ square inches.

There is a question also whether checked-row plantings, in which the plants are grouped in hills, may not give better mutual protection than drilled plantings, where the plants stand singly.

The frequency distributions and the freehand curves which have been plotted indicate that the assumption as to space occupied per plant in checked plantings is justified, as the curves for total weights of ears (Figs. 10, 21, 22, and 23) tended to follow a normal distribution. Moreover since the yields of the drilled plantings did not differ consistently from the yields of the checked plantings, it is clear that there was no better mutual protection in one type of planting than in the other.

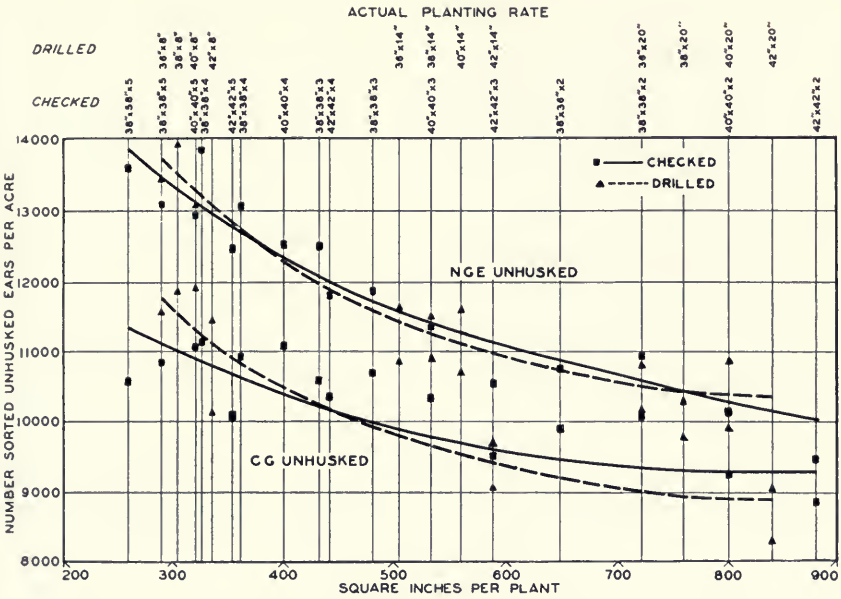


FIG. 11.—NUMBER OF SORTED UNHUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT (1932-1936 AVERAGES)

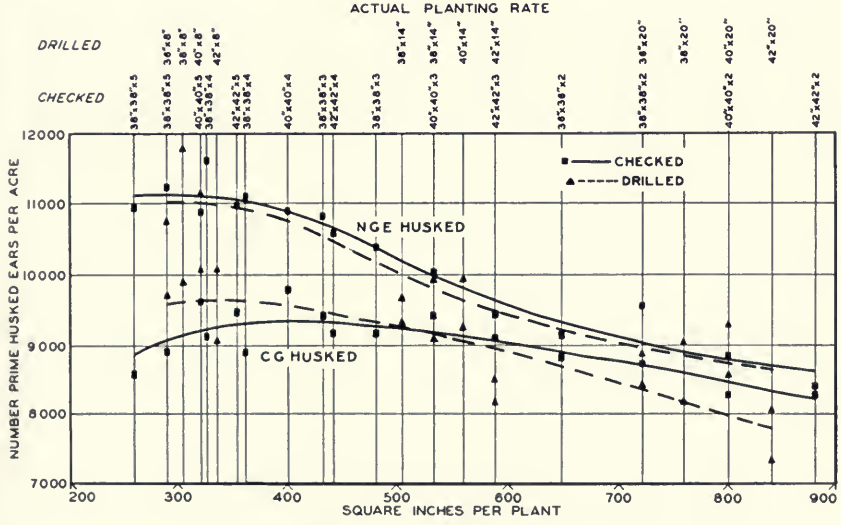


FIG. 12.—NUMBER OF PRIME HUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT (1932-1936 AVERAGES)

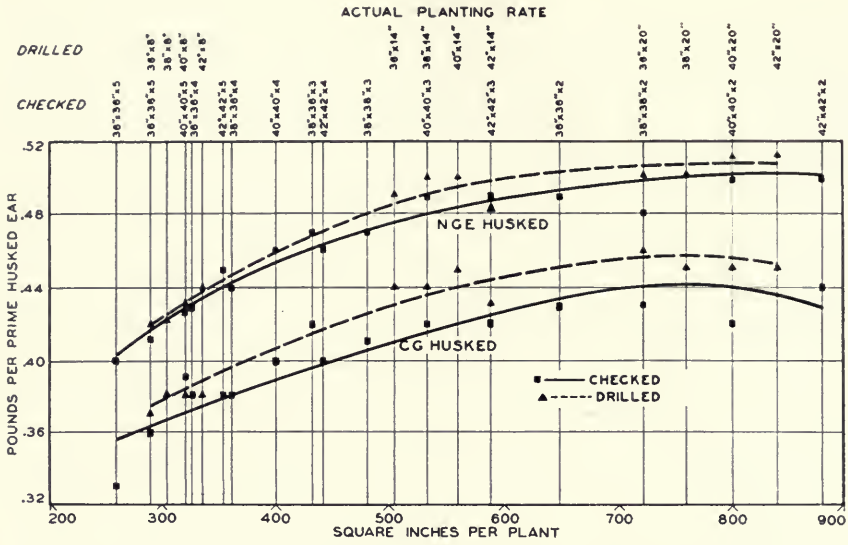


FIG. 13.—WEIGHT PER PRIME HUSKED EAR AS AFFECTED BY SPACE OCCUPIED PER PLANT (1932-1936 AVERAGES)

The data from the preliminary experiments of 1930 and 1931 lend themselves particularly well to an analysis based on space occupied per plant because there were 10 different checked-row spacings with rates varying from 1 to 5 plants per hill, a total of 50 variations. In the drilled-row plantings there were 4 different widths between rows and 10 spacings in the row, a total of 40 variations.

The data from the preliminary experiments are plotted in Figs. 21 to 32 and those from the 1932-1936 experiments in Figs. 10 to 20. The yields have not been corrected in any way, and freehand curves are interpolated in order to indicate the trends more clearly. In some instances where the trends are sufficiently clear or where no trends exist, the freehand curves have been omitted.

The unhusked and husked weights (Figs. 10 and 21 to 26) tend to follow a normal or a skewed frequency distribution. The principal differences are with respect to the varietal tolerances. The modes of the freehand curves show that Country Gentleman required more space per plant than Narrow Grain Evergreen. Unhusked and husked weights within each variety do not necessarily follow the same trends.

In the experiments of Watson[10*] and Haber[4*] there was a close relationship between space occupied per plant and number of unhusked ears. In the present experiments also the number of sorted unhusked ears declined as the space per plant was increased, both in the checked and in the drilled plots (Fig. 11). The respective freehand curves are

almost parallel, as are also the plotted curves, where the irregularities are practically the same. The fact that these irregularities are virtually parallel suggests that while space per plant exerted a general effect on number of unhusked ears, some other factor had a partially independent effect. In the checked-row plantings this factor seems to have been number of plants per hill and in the drilled-row plantings, distance between rows.

The number of prime husked ears (Fig. 12) also declined as space per plant was increased, Narrow Grain Evergreen being affected much more strongly in this respect than Country Gentleman. The plotted curves, however, do not show the parallelism which occurred with respect to number of unhusked ears.

The marked differences between the curves for weights and for numbers of prime husked ears (Figs. 10 and 12) indicate that weight per ear increased as space per plant increased (Fig. 13).

In the experiments of Watson[10*] and Haber[4*] the weights of green

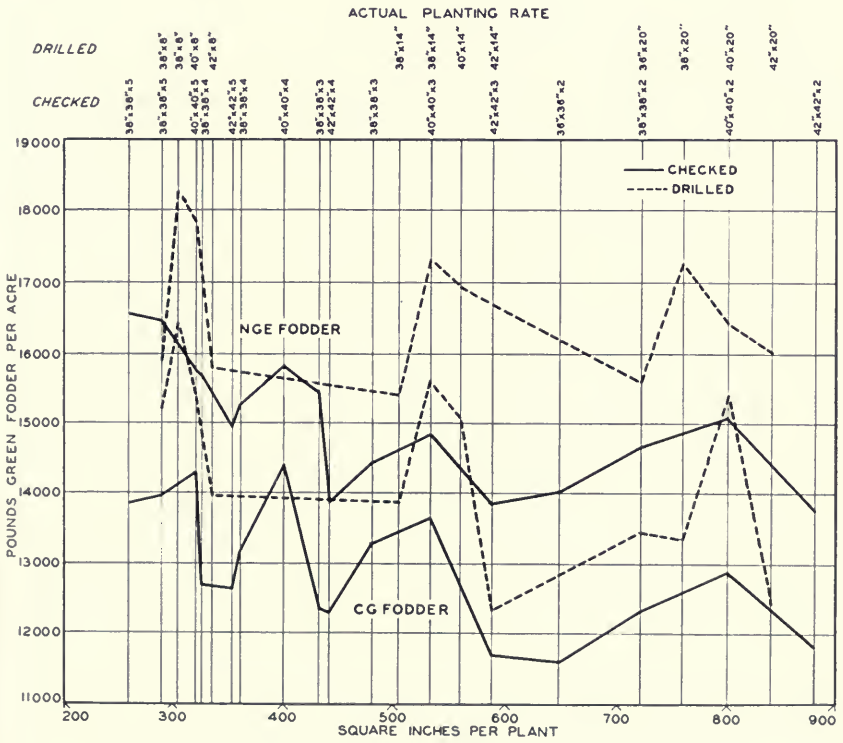


FIG. 14.—YIELD OF GREEN FODDER AS AFFECTED BY SPACE OCCUPIED PER PLANT (1932-1936 AVERAGES)

fodder produced, which is a direct measure of plant growth, increased as the spacings of the plants became narrower. According to the freehand curves in Figs. 14, 29, and 30, this would seem to have been true in these experiments also, but at the same time the extraordinarily wide fluctuations in the plotted curves indicate that some other factor, which could hardly have been soil variation alone, was exerting a strong influence. In the checked-row plantings, (Fig. 14), this factor was the 40-inch distance between the rows, a distance which seems to be especially favorable to high yields of green fodder. The curve for Narrow Grain Evergreen has three distinct modes, each of which coincides with a 40″x 40″ planting. Similarly, that for Country Gentleman has four modes, each of which also coincides with the 40″x 40″ planting. The curves for the drilled-row plantings also are trimodal, the modes coinciding with the 38-inch rows except in the case of the 40″x 20″ planting of Country Gentleman, which was more favorable than the 38″x 20″ planting.

The wide fluctuations in the fodder yields of the preliminary experiments (Figs. 29 and 30) can probably be explained on somewhat the same basis, altho the data are insufficient for many conclusions to be drawn, being the results of a single year (1931) without replications. However, there is evidence that altho space occupied per plant

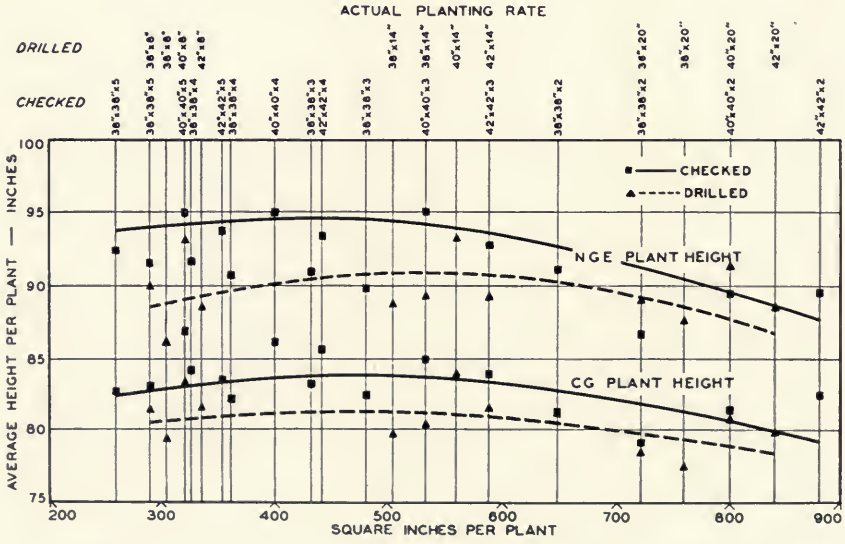


FIG. 15.—AVERAGE PLANT HEIGHT AS AFFECTED BY SPACE OCCUPIED PER PLANT (AVERAGES OF 1933, 1935, AND 1936 FOR CHECKED ROWS AND OF 1935 AND 1936 FOR DRILLED ROWS)

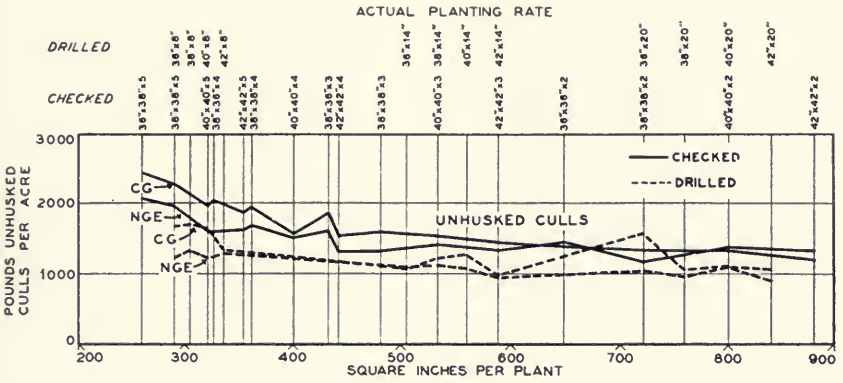


FIG. 16.—POUNDS OF UNHUSKED CULLS AS AFFECTED BY SPACE OCCUPIED PER PLANT (1932-1936 AVERAGES)

is the primary factor determining total fodder yields, other factors may in individual instances greatly modify the general trend.

Another measure of plant growth besides yield of fodder is the average height per plant, plotted in Fig. 15. When the points showing the actual results are connected, the resulting curves also tend to be multi-modal, and the modes are associated with the 40-inch planting distance.

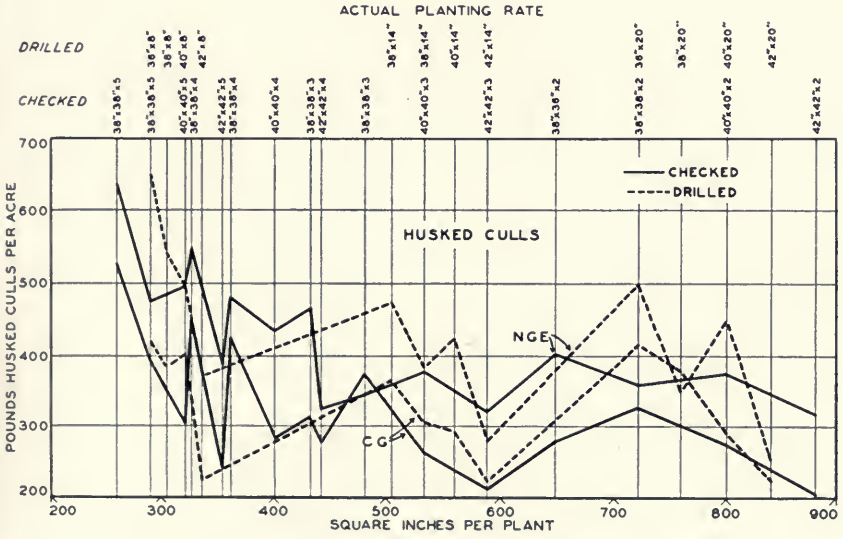


FIG. 17.—POUNDS OF HUSKED CULLS AS AFFECTED BY SPACE OCCUPIED PER PLANT (1932-1936 AVERAGES)

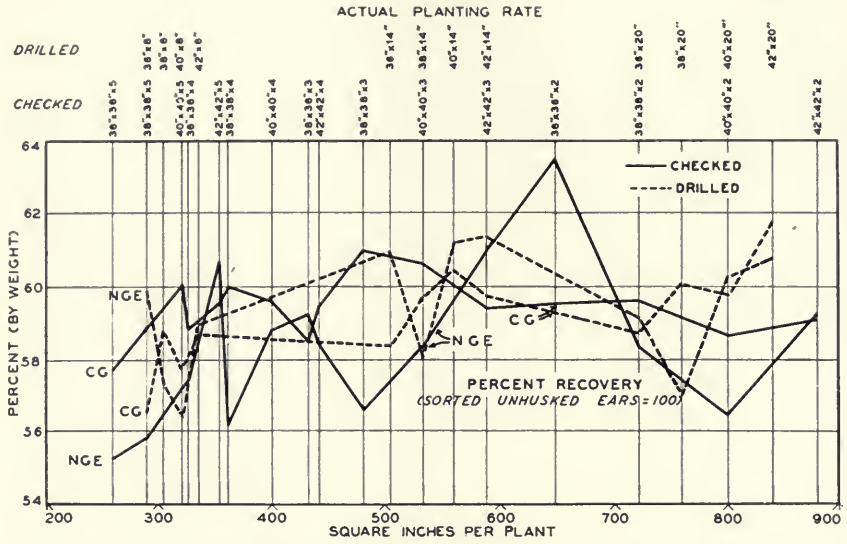


FIG. 18.—PERCENT RECOVERY OF PRIME HUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT (1932-1936 AVERAGES)

According to these data on green-fodder weights and average height per plant, plant growth is partly dissociated from space occupied per plant. Space occupied per plant, in other words, is not the only factor which determines growth.

A comparison of Figs. 10, 14, 22, and 23 with 29 and Figs. 25 and 26 with 30 shows that the relation between fodder weights and weights of unhusked and husked ears is not particularly close. However, it is also evident that while the freehand curves in Figs. 10, 22, 23, 25, and 26 suggest a relationship between space per plant and yield of unhusked and of husked ears, nevertheless the irregularities of the plotted curves, which are quite similar for the corresponding weights and treatments of the respective varieties, indicate the existence of optimum distances and rates, as did also the data on green fodder.

The percentages of prime husked ears calculated from the formula—

$$\frac{\text{total weight prime husked ears}}{\text{total weight sorted unhusked ears}} \times 100$$

—are plotted in Figs. 18, 31, and 32. These percentages are important as a measure of waste in the form of husks. The curves are exceedingly irregular, but there seems to have been a slight tendency for recovery to decrease when the plantings were either extremely close or far apart, with the exception of the drilled plantings of 1931 (Fig. 32). Mean weight per prime husked ear does not seem to have been closely associated with percentage of recovery (Figs. 18, 27, and 28).

Mean number of suckers per plant was associated closely with

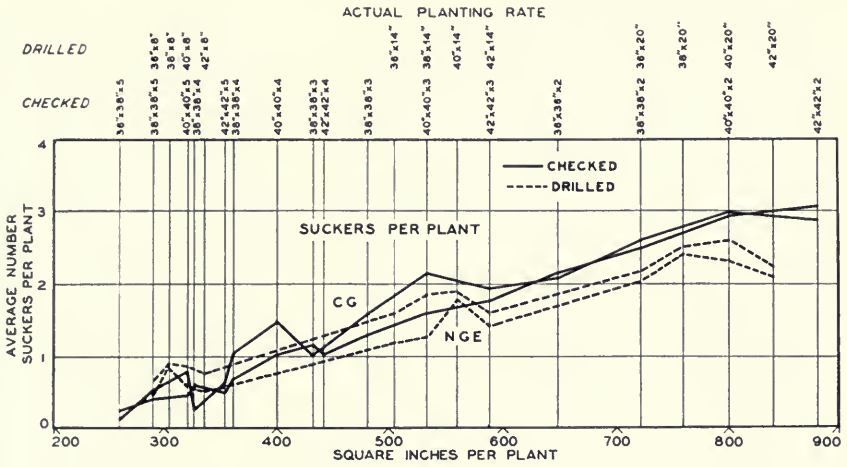


FIG. 19.—NUMBER OF SUCKERS PER PLANT AS AFFECTED BY SPACE OCCUPIED PER PLANT (1932, 1935, AND 1936 AVERAGES)

space occupied per plant (Fig. 19). Number of suckers per plant bore no close relation to total weight of green fodder, according to Fig. 14.

Relations between space occupied per plant and number of days to the midsilking period, a measure of maturity discussed by Huelsen and Michaels,[5*] are shown in Fig. 20. There is a very noticeable tendency for later maturity to be associated with the closer plantings.

The responses of the various yield components to the amount of space occupied by the sweet-corn plants are thus seen to have been exceedingly variable. Increasing or decreasing the area per plant may cause corresponding increases or reductions in certain yield components, but the effect on other yield components may be quite different. There is also evidence that certain yield components are associated with certain optimum distances between rows, number of plants per hill, or spacing in the row in drilled plantings, irrespective, within limits, of the area occupied by the plant. Furthermore the two varieties used in these experiments sometimes responded similarly and sometimes differently, leading to the conclusion that reaction to spacing is a matter of varietal character and that generalization is not permissible.

Optimum Planting Rates and Distances

The discussion based on Tables 3 to 8 and the curves in Figs. 4 to 9 has brought out the fact that the conditions which lead to the optimum production of one yield component are not necessarily the same as those which lead to optimum production of another yield component. This was especially noticeable with respect to number and weight of unhusked and of husked ears.

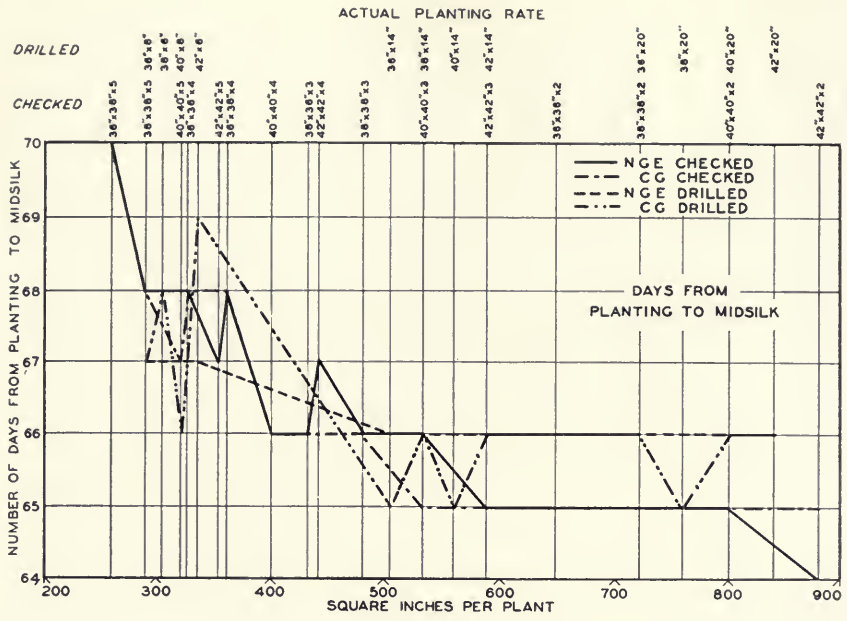


FIG. 20.—NUMBER OF DAYS FROM PLANTING TO MIDSILK AS AFFECTED BY SPACE OCCUPIED PER PLANT (AVERAGES OF 1932, 1933, 1935, AND 1936 FOR CHECKED ROWS AND OF 1932, 1935, AND 1936 FOR DRILLED ROWS)

Checked-Row Plantings.—The conclusions based upon the checked-row plots are summarized in Table 18.

The consistent performance of Country Gentleman at the 40″x 40″ spacing is very striking, this spacing unquestionably being the optimum planting distance no matter what yield component is considered the most important. The optimum rate of plants per hill, however, varies between 3 and 4. From the standpoint of weights of unhusked and of husked ears the 3-per-hill rate is superior to the 4, but if number of ears is the important factor, the 4-per-hill rate is preferable. These observations are confirmed by the conclusions regarding weight per prime husked ear and percentage of recovery of prime husked ears.

The performance of the Narrow Grain Evergreen variety was not nearly so consistent as that of Country Gentleman, indicating that Narrow Grain Evergreen is not so selective as Country Gentleman in its requirements, and that it may be planted closer than Country Gentleman without adversely affecting yields.

So far as weights both of unhusked ears and of husked ears are concerned, plantings of Narrow Grain Evergreen at distances of 40″x 40″ and 42″x 42″ give about equal results, and the rate may be as heavy as 4 plants per hill. A 38″x 38″x 2 planting also would be

TABLE 18.—CHECKED-ROW PLANTINGS: OPTIMUM RATES AND DISTANCES FOR COUNTRY GENTLEMAN AND NARROW GRAIN EVERGREEN SWEET CORN

Yield component	On basis of increasing rate per hill	On basis of decreasing distance between rows
Country Gentleman		
Weight of unhusked ears	40″ x 40″ x 3 (42″ x 42″ x 4)	40″ x 40″ x 3
Weight of prime husked ears	40″ x 40″ x 3	40″ x 40″ x 3
Number of sorted unhusked ears	40″ x 40″ x 4	40″ x 40″ x 4
Weight per prime husked ear	40″ x 40″ x 3[a] 40″ x 40″ x 4[b]	40″ x 40″ x 3[a] 40″ x 40″ x 4[b]
Percent recovery of prime husked ears	40″ x 40″ x 4[c]	40″ x 40″ x 4[c]
Weight of green fodder	40″ x 40″ x 4	40″ x 40″ x 4
Narrow Grain Evergreen		
Weight of unhusked ears	40″ x 40″ x 4, 42″ x 42″ x 4	40″ x 40″ or 42″ x 42″ at 3 or 4 rate
Weight of prime husked ears	40″ x 40″ x 4, 42″ x 42″ x 4 (38″ x 38″ x 2)	40″ x 40″ x 4, 42″ x 42″ x 4 (38″ x 38″ x 2)
Number of sorted unhusked ears	38″ x 38″ x 4, 40″ x 40″ x 4	38″ x 38″ x 4[c]
Weight per prime husked ear	Not more than 3 per hill 40″ x 40″ x 4[b]	Effect slight except when rate is over 4 per hill 40″ x 40″ x 4[b]
Percent recovery of prime husked ears	No appreciable effect	Any distance except 36″ x 36″
Weight of green fodder	40″ x 40″ x 4	40″ x 40″ x 4

Note.—Rates shown in parentheses indicate second choices.
[a]Heaviest planting advisable if total weight per acre is the important factor.
[b]Heaviest planting advisable if number of ears per acre is the important factor.
[c]Heavier planting gives somewhat higher yields, but this is the heaviest advisable.

satisfactory as regards weights of prime husked ears, but because decreasing the distances between rows adds to the cost of cultivation, while increasing the number of plants per hill adds no such costs, the 38″x 38″ spacing would not be so practical as the others.

On the basis of number of ears per acre the situation with regard to Narrow Grain Evergreen is somewhat confusing, owing to inconsistent performance. The 38″x 38″x 4 planting seems to be the optimum for number of sorted unhusked ears.

Neither the 40″x 40″x 4 nor the 42″x 42″x 4 planting proved optimum for weight per prime husked ear in the case of Narrow Grain Evergreen. From the standpoint of maximum weight per prime husked ear, where sweet corn is sold on the basis of tonnage per acre, the rate should not be more than 3 plants per hill. On the basis of count,—that is, where sales are based on number of ears per acre,—4 plants per hill is indicated, and the closest planting advisable is 40″x 40″. Considering both total weights and weight per ear, 42″x 42″x 4 and 40″x 40″x 4 are probably the best plantings, but involve some sacrifice in weight per ear. From the standpoint of number of ears, a planting

TABLE 19.—DRILLED-ROW PLANTINGS: OPTIMUM DISTANCES BETWEEN ROWS AND BETWEEN PLANTS IN THE ROW FOR COUNTRY GENTLEMAN AND NARROW GRAIN EVERGREEN SWEET CORN

Yield component	On basis of distance between plants	On basis of distance between rows
Country Gentleman		
Weight of unhusked ears	40″ x 14″	40″ x 14″
Weight of prime husked ears	40″ x 14″	40″ x 14″
Number of sorted unhusked ears	40″ x 8″	40″ x 8″
Weight per prime husked ear	14″ minimum	Very slight effect
Percent recovery of prime husked ears	No particular effect	No particular effect
Weight of green fodder	38″ x 8″ highest	38″ rows closest[a]
Narrow Grain Evergreen		
Weight of unhusked ears	40″ x 14″	40″ x 14″
Weight of prime husked ears	40″ x 14″	40″ x 14″
Number of sorted unhusked ears	40″ x 8″	38″ x 8″
Weight per prime husked ear	14″ minimum	Very slight effect
Percent recovery of prime husked ears	No particular effect	No significant difference
Weight of green fodder	38″ x 8″ highest	38″ rows closest[a]

Note.—In comparing distances between plants in the row the 2-per-hill checked-row planting for the corresponding distance between rows was used as the base. In comparing distances between rows, the comparison was entirely within the drilled series, the widest rows, 42 inches, being used as the base.

[a]Heavier planting gives somewhat higher yields, but this is the heaviest advisable.

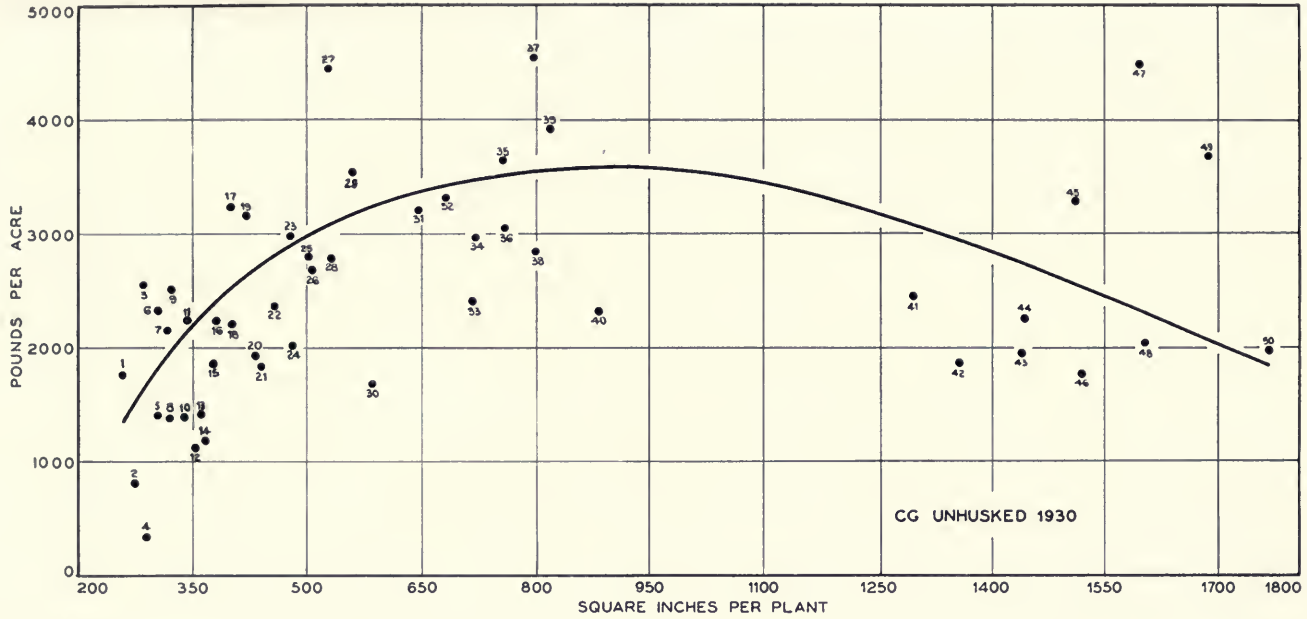
of 38″x 38″x 4 would be justified, but would also involve some sacrifice in weight per prime husked ear.

The percentage of recovery of prime husked ears did not differ appreciably for any of the foregoing plantings.

A 40″x 40″x 4 planting is very favorable also for the production of fodder, a component that needs to be very carefully considered because under the usual low prices for cannery sweet corn there is no profit for the grower unless a high production of fodder is obtained and fed to livestock.

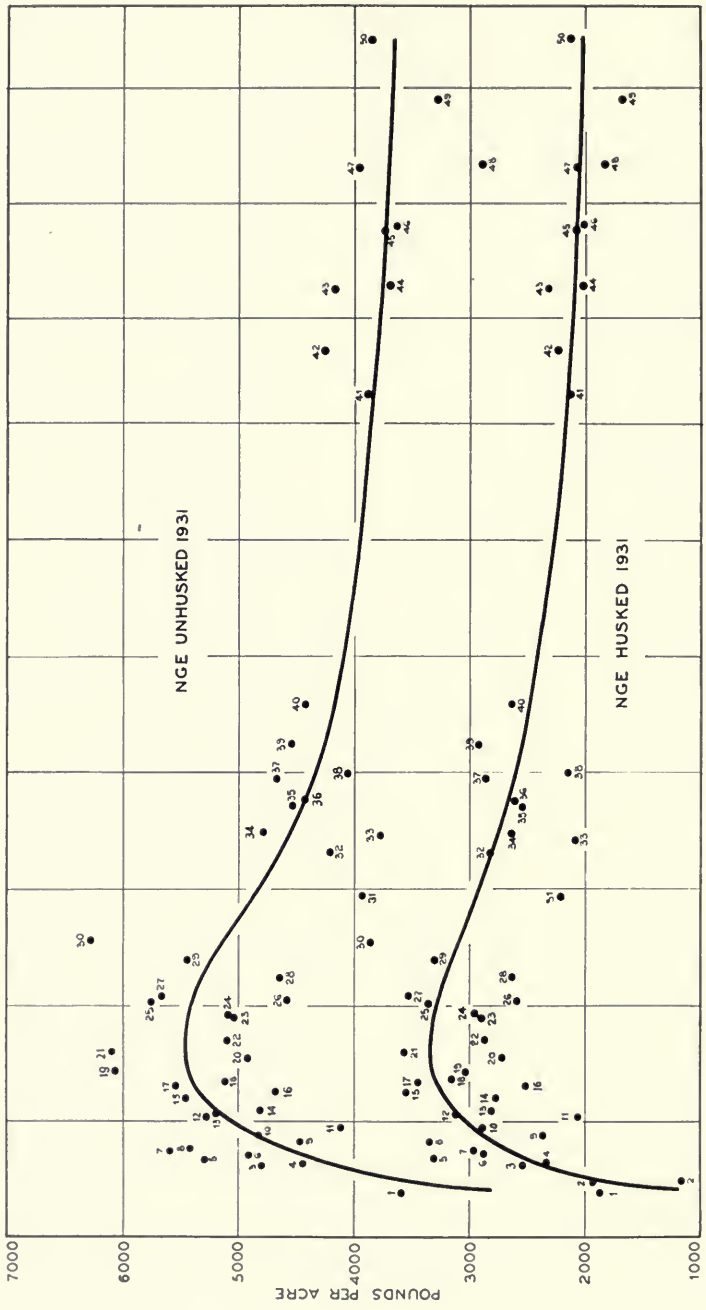
Drilled-Row Plantings.—There is no evidence from the 1932-1936 experiments that drilled-row plantings are in any way inferior to checked-row plantings so far as yields of ears are concerned, altho in the preliminary tests of 1930 and 1931 the checked-row plantings seemed to be superior. On the other hand there seems to be no basis for the belief that more fodder is produced per acre when sweet corn is planted in drilled rows.

The data for the drilled plantings are summarized in Table 19. Yields of Country Gentleman were very consistent, the 40″x 14″ planting proving to be optimum on the basis of weights of unhusked



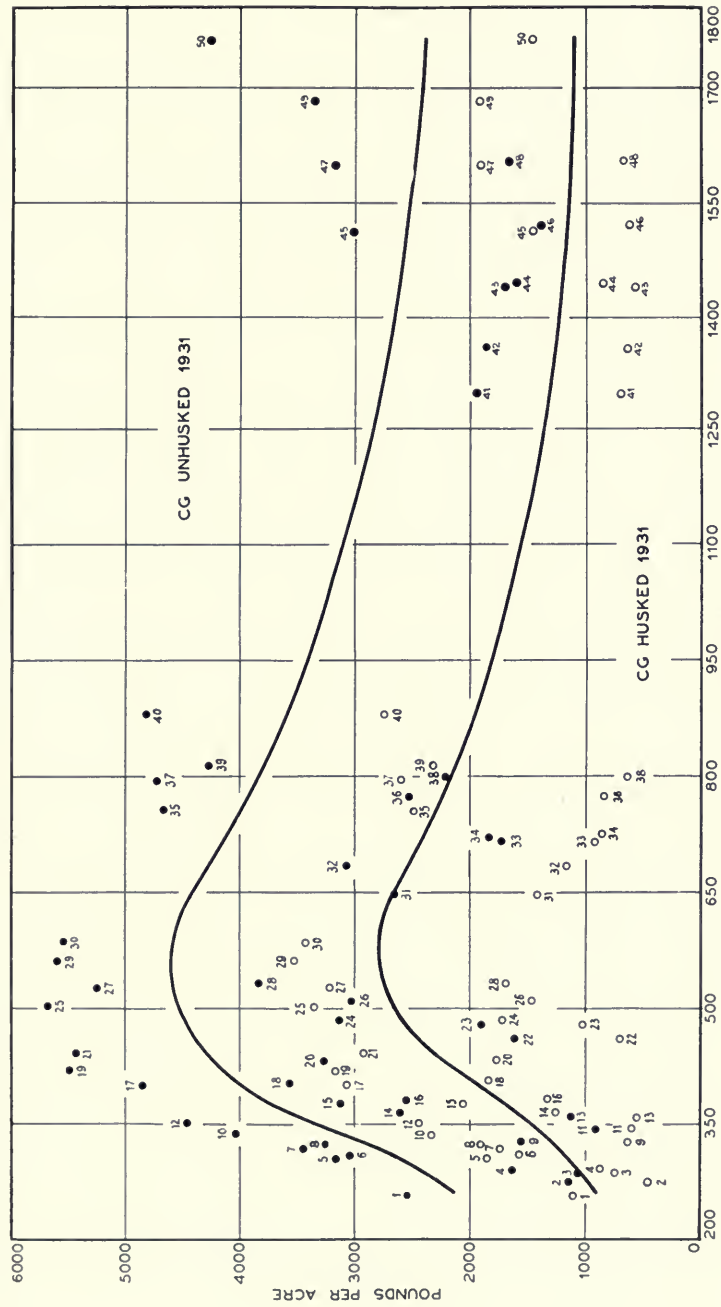
1—36″ x 36″ x 5
2—38″ x 36″ x 5
3—40″ x 36″ x 5
4—38″ x 38″ x 5
5—42″ x 36″ x 5
6—40″ x 38″ x 5
7—42″ x 38″ x 5
8—40″ x 40″ x 5
9—36″ x 36″ x 4
10—42″ x 40″ x 5
11—38″ x 36″ x 4
12—42″ x 42″ x 5
13—40″ x 36″ x 4
14—38″ x 38″ x 4
15—42″ x 36″ x 4
16—40″ x 38″ x 4
17—42″ x 38″ x 4
18—40″ x 40″ x 4
19—42″ x 40″ x 4
20—36″ x 36″ x 3
21—42″ x 42″ x 4
22—38″ x 36″ x 3
23—40″ x 36″ x 3
24—38″ x 38″ x 3
25—42″ x 36″ x 3
26—40″ x 38″ x 3
27—42″ x 38″ x 3
28—40″ x 40″ x 3
29—42″ x 40″ x 3
30—42″ x 42″ x 3
31—36″ x 36″ x 2
32—38″ x 36″ x 2
33—40″ x 36″ x 2
34—38″ x 38″ x 2
35—42″ x 36″ x 2
36—40″ x 38″ x 2
37—42″ x 38″ x 2
38—40″ x 40″ x 2
39—42″ x 40″ x 2
40—42″ x 42″ x 2
41—36″ x 36″ x 1
42—38″ x 36″ x 1
43—40″ x 36″ x 1
44—38″ x 38″ x 1
45—42″ x 36″ x 1
46—40″ x 38″ x 1
47—42″ x 38″ x 1
48—40″ x 40″ x 1
49—42″ x 40″ x 1
50—42″ x 42″ x 1

FIG. 21—POUNDS OF SORTED UNHUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT IN CHECKED ROWS: COUNTRY GENTLEMAN 1930



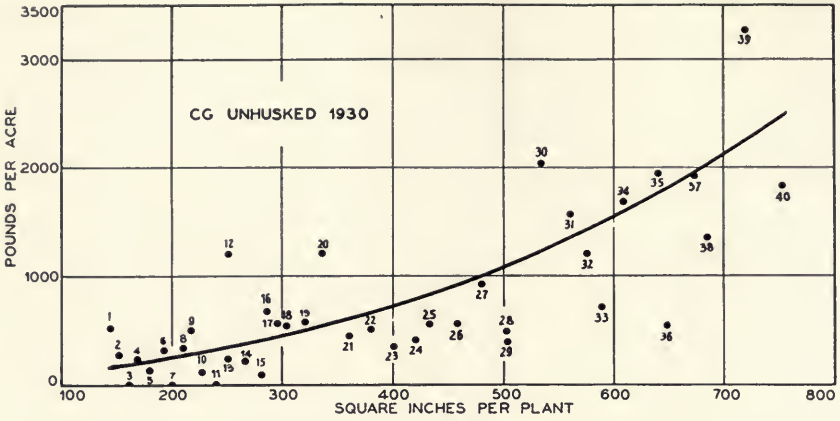
(Numbers represent planting rates; for key see Table 21, page 87.)

FIG. 22.—POUNDS OF SORTED UNHUSKED AND PRIME HUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT IN CHECKED ROWS: NARROW GRAIN EVERGREEN 1931



(Numbers represent planting rates; for key see Table 21, page 87.)

FIG. 23.—POUNDS OF SORTED UNHUSKED AND PRIME HUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT IN CHECKED ROWS: COUNTRY GENTLEMAN 1931



1—36″ x 4″	9—36″ x 6″	17—42″ x 7″	25—36″ x 12″	33—42″ x 14″
2—38″ x 4″	10—38″ x 6″	18—38″ x 8″	26—38″ x 12″	34—38″ x 16″
3—40″ x 4″	11—40″ x 6″	19—40″ x 8″	27—40″ x 12″	35—40″ x 16″
4—42″ x 4″	12—42″ x 6″	20—42″ x 8″	28—42″ x 12″	36—36″ x 18″
5—36″ x 5″	13—36″ x 7″	21—36″ x 10″	29—36″ x 14″	37—42″ x 16″
6—38″ x 5″	14—38″ x 7″	22—38″ x 10″	30—38″ x 14″	38—38″ x 18″
7—40″ x 5″	15—40″ x 7″	23—40″ x 10″	31—40″ x 14″	39—40″ x 18″
8—42″ x 5″	16—36″ x 8″	24—42″ x 10″	32—36″ x 16″	40—42″ x 18″

FIG. 24.—POUNDS OF SORTED UNHUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT IN DRILLED ROWS: COUNTRY GENTLEMAN 1930

and of husked ears, and 40″x 8″ on the basis of number of unhusked ears. Weight per prime husked ear was lower from the 40″x 8″ planting, and there were more culls. However the percentage of recovery was not reduced when plantings closer than 40″x 14″ were made. From the standpoint of green fodder, 38″x 8″ gave the maximum yields, but ear yields in this planting were seriously reduced.

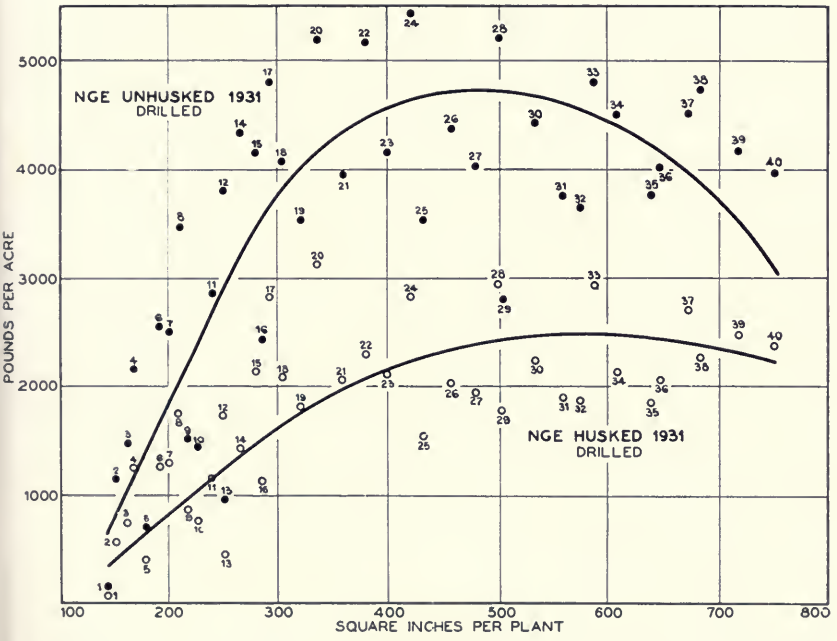
For Narrow Grain Evergreen a 40″x 14″ planting was also the optimum for maximum weights of unhusked and of husked ears. For number of ears, 38″x 8″ or 40″x 8″ was best, tho the weight per ear was somewhat lower in these plantings and weight of culls higher.

The percentage of recovery of prime husked ears was not noticeably affected by any of these plantings. The maximum yield of green fodder was obtained from the 38″x 8″ planting.

Comparative Effects of Increasing Rates and Decreasing Distances of Planting

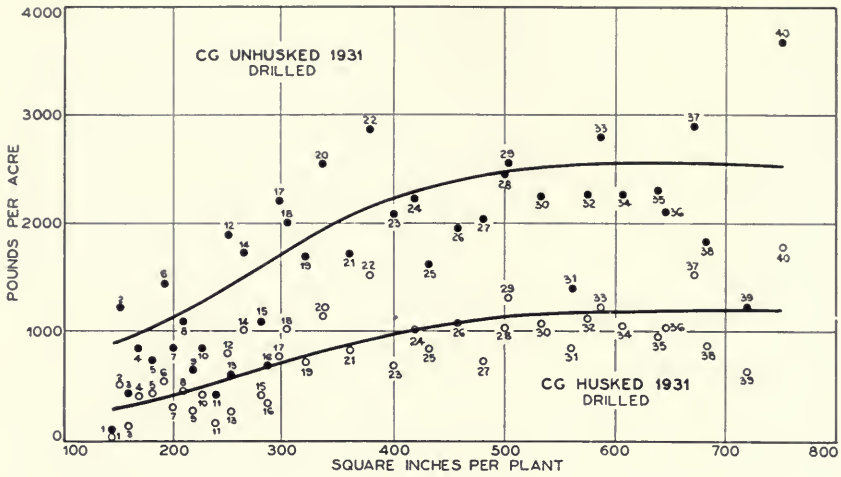
At several points in the previous discussion mention was made of the fact that increasing the number of plants in the hill had a somewhat different effect on certain of the yield components than planting the rows closer together. Owing to the diversity of the data, differential effects are difficult to determine, and therefore in order to

evaluate them the total yields of the 1931-1936 experiments have been averaged. Thus in order to determine the effect of rate per hill, all the mean yields of each rate were averaged irrespective of the distance between the hills and rows. This means that for each rate the 42″x 42″, 40″x 40″, 38″x 38″, and 36″x 36″ plantings were averaged, making a total of 84 replications. Similarly, in order to determine the means for each distance between rows and hills, all the plantings irrespective of rate were averaged, again giving 84 replications. The same general procedure was followed in averaging the results for the drilled-row plantings. Of course the same means were used for averaging rates and distances, the differences being only in the distribution. Thus the increases listed within each of the two tables, Nos. 20 and 21, are strictly comparable.



1—36″ x 4″	9—36″ x 6″	17—42″ x 7″	25—36″ x 12″	33—42″ x 14″
2—38″ x 4″	10—38″ x 6″	18—38″ x 8″	26—38″ x 12″	34—38″ x 16″
3—40″ x 4″	11—40″ x 6″	19—40″ x 8″	27—40″ x 12″	35—40″ x 16″
4—42″ x 4″	12—42″ x 6″	20—42″ x 8″	28—42″ x 12″	36—36″ x 18″
5—36″ x 5″	13—36″ x 7″	21—36″ x 10″	29—36″ x 14″	37—42″ x 16″
6—38″ x 5″	14—38″ x 7″	22—38″ x 10″	30—38″ x 14″	38—38″ x 18″
7—40″ x 5″	15—40″ x 7″	23—40″ x 10″	31—40″ x 14″	39—40″ x 18″
8—42″ x 5″	16—36″ x 8″	24—42″ x 10″	32—36″ x 16″	40—42″ x 18″

FIG. 25.—POUNDS OF SORTED UNHUSKED AND PRIME HUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT IN DRILLED ROWS: NARROW GRAIN EVERGREEN 1931



1—36″ x 4″	9—36″ x 6″	17—42″ x 7″	25—36″ x 12″	33—42″ x 14″
2—38″ x 4″	10—38″ x 6″	18—38″ x 8″	26—38″ x 12″	34—38″ x 16″
3—40″ x 4″	11—40″ x 6″	19—40″ x 8″	27—40″ x 12″	35—40″ x 16″
4—42″ x 4″	12—42″ x 6″	20—42″ x 8″	28—42″ x 12″	36—36″ x 18″
5—36″ x 5″	13—36″ x 7″	21—36″ x 10″	29—36″ x 14″	37—42″ x 16″
6—38″ x 5″	14—38″ x 7″	22—38″ x 10″	30—38″ x 14″	38—38″ x 18″
7—40″ x 5″	15—40″ x 7″	23—40″ x 10″	31—40″ x 14″	39—40″ x 18″
8—42″ x 5″	16—36″ x 8″	24—42″ x 10″	32—36″ x 16″	40—42″ x 18″

FIG. 26.—POUNDS OF SORTED UNHUSKED AND PRIME HUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT IN DRILLED ROWS: COUNTRY GENTLEMAN 1931

Checked-Row Plantings.—So far as weights of unhusked and of husked ears of Narrow Grain Evergreen are concerned, decreasing the distance between rows had a relatively slight effect in increasing yields as compared with increasing the rate per hill (Table 20). The same relationship occurred with reference to number of sorted unhusked ears and number of prime husked ears. Weight per prime husked ear was reduced more rapidly by increasing the planting rate than by reducing the distance between rows. The percentage of recovery of prime husked ears was not affected either by number of plants per hill or by distance between rows. The weights of both unhusked culls and husked culls increased in the heavier plantings. Green fodder, however, responded a little more quickly to reduced distances between hills than to an increased rate of planting.

As to Country Gentleman, increasing the rate per hill had virtually the same effect on weights of unhusked and of husked ears as decreasing the distance between hills, a tendency in contrast to that of Narrow Grain Evergreen. The number of sorted unhusked ears increased for Country Gentleman as the rate per hill increased and as

3. Yields from the 42″x 42″ checked-row planting were paired with the yields from each of the three others (40″x 40″, 38″x 38″, and 36″x 36″) at the same rate per hill, thus giving four groups of pairs, one for each of the rates 2, 3, 4, and 5 plants per hill.

4. Yields from the plantings in drilled rows 42 inches apart were paired with yields from the drilled rows 40, 38, and 36 inches apart in three groups, according to the distances of the plants apart in the rows—20, 14, and 8 inches.

Other pairings could be made, of course, but it is believed that the four kinds just described are sufficient.

The significance of the mean difference between the replications of each pair was determined according to the method described on page 114 of Fisher.[3*] The values of t were determined from Fisher's Table IV. Where the value of P is 5 percent, the difference is significant. Below the 5-percent point the difference is considered highly significant.

TABLE 2.—MONTHLY RAINFALL AND MEAN MONTHLY TEMPERATURES AT URBANA, ILLINOIS, 1929-1936

Month	1929	1930	1931	1932	1933	1934	1935	1936	Average 1888–1938
					Rainfall				
	in.	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*	*in.*
January	3.56	4.81	.47	2.60	1.96	1.42	2.17	1.28	2.16
February	.53	1.77	1.26	1.69	1.40	.76	1.27	2.81	1.83
March	2.92	1.87	2.62	1.83	5.38	3.60	2.69	1.55	3.09
April	6.40	4.07	4.43	1.31	3.35	1.03	2.87	3.00	3.42
May	7.80	1.53	3.97	1.28	5.84	.53	6.93	3.94	3.91
June	2.71	2.23	4.33	3.57	1.19	5.33	3.64	.47	3.68
July	6.46	.47	4.26	2.41	.61	2.09	4.12	1.35	3.14
August	4.77	2.02	2.90	2.63	4.40	4.87	2.36	3.54	3.29
September	.94	2.98	5.41	3.63	5.14	6.19	3.94	5.83	3.32
October	3.72	1.62	2.27	3.84	3.41	.87	1.65	3.49	2.44
November	1.36	1.49	2.54	2.37	.67	5.44	4.25	4.16	2.62
December	2.96	.22	2.00	3.33	1.12	2.22	1.32	3.67	2.10
Mean	44.13	25.08	36.46	30.49	34.47	35.15	37.21	35.09	35.06
					Mean temperature				
	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*	°*F.*
January	21.4	20.8	32.4	35.8	37.7	32.8	29.0	19.9	26.7
February	23.4	39.3	37.2	37.7	28.8	24.6	33.0	19.0	28.3
March	46.4	38.6	35.8	33.0	39.9	35.2	46.6	43.0	39.2
April	54.1	54.6	52.5	52.5	51.6	51.9	48.8	47.6	50.7
May	58.6	63.4	58.9	63.2	63.4	67.4	56.3	65.4	61.3
June	68.6	70.7	73.9	72.9	77.8	78.5	67.7	71.9	70.8
July	75.0	78.2	78.2	76.7	78.2	80.7	77.7	83.0	75.3
August	70.6	76.0	74.7	74.2	73.0	73.9	74.5	79.0	73.1
September	64.9	68.9	72.0	65.6	72.2	64.5	66.2	70.0	66.1
October	53.0	52.8	59.0	54.2	53.2	57.9	55.2	54.7	53.7
November	36.6	42.2	50.2	35.6	40.4	45.9	40.3	38.5	40.6
December	28.7	31.0	39.2	29.4	34.2	27.7	24.9	34.0	30.2
Mean	50.1	53.0	55.3	52.6	54.2	53.4	51.7	52.2	51.3

CLIMATOLOGICAL DATA

Some of the most severe drouths and highest temperatures ever recorded in the Middle West occurred during the period covered by these experiments in 1933, 1934, and 1936. The rainfall and temperature means listed in Table 2 do not fully indicate the severity of the conditions, tho the mean temperatures were above normal, especially during June, July, and August, in all years of the tests except 1935.

The experiments, including the preliminary tests, covered the entire drouth cycle of 1930-1936. The experimental results were therefore probably modified by the facts that moisture was definitely a limiting factor in 1930, 1933, 1934, and 1936 and that high temperatures were common every year except 1935. However, conditions such as these may be expected at any time in the Middle West; and if the results were modified by the weather, the modifications were in the right direction. That is to say, planting distances and rates for sweet corn in Illinois should be determined by the expectation of heat and drouth rather than of ample rainfall and moderate weather, for there are but few seasons during which there are no dry periods. If such dry periods coincide with a critical period in the development of sweet corn (at time of tasseling and silking, for instance), yields may be greatly reduced.

EXPERIMENTAL RESULTS, CHECKED PLANTINGS

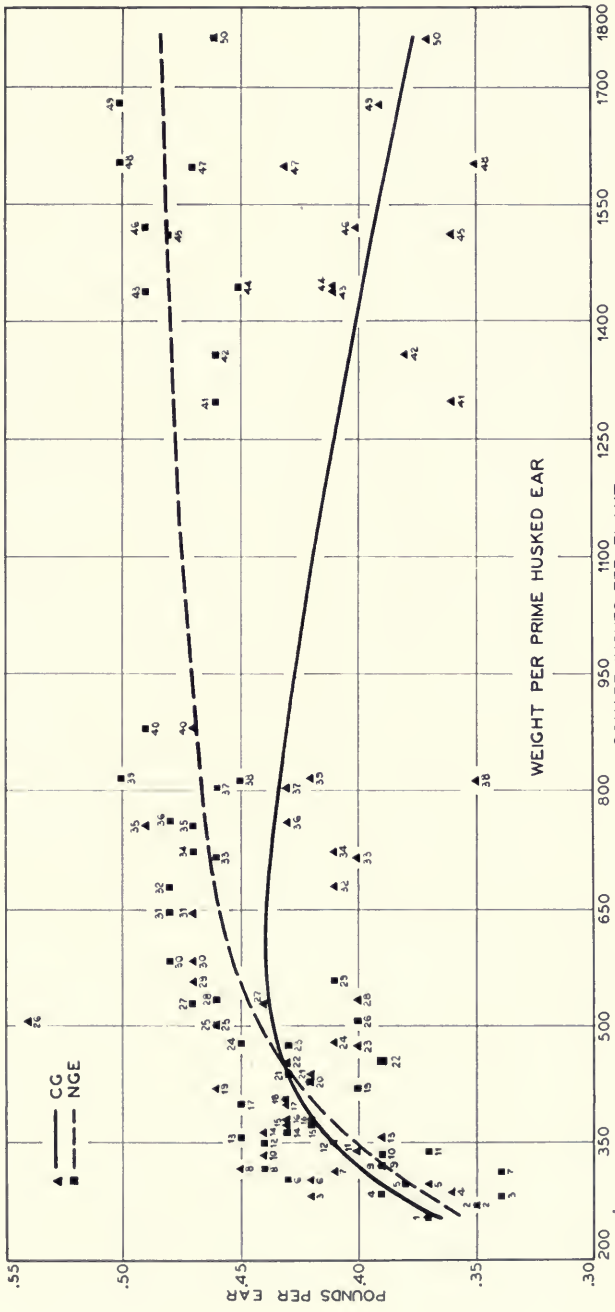
Weights of Sorted Unhusked Ears

Number of Plants per Hill.—Increasing the rate of planting above 2 plants per hill gave significant increases in weights of sorted unhusked ears of Narrow Grain Evergreen at all planting distances except the 38″x 38″ (Table 3[1] and Fig. 4). These increases were confined to the 3- and 4-per-hill rates of planting except in the 42″x 42″ series, where there was a slight increase for the 5-per-hill rate over the 4-per-hill rate. Four plants per hill is therefore definitely the heaviest rate advisable for planting Narrow Grain Evergreen.

In the plantings of Country Gentleman, on the other hand, increasing the rate above 2 plants per hill led to only one significant increase over the 2-per-hill rate (Table 3 and Fig. 4). The one significant increase was obtained at the 42″x 42″ distance at 4 plants per hill, but because this increase is inconsistent with the remainder of the plantings it is probable that 3 plants per hill is the maximum rate for Country Gentleman.

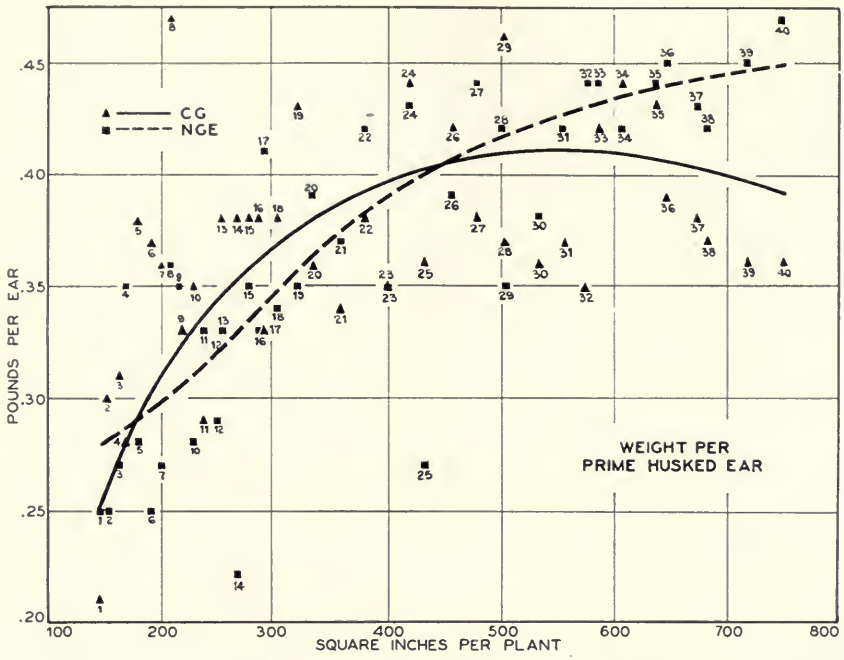
Distance Between Rows.—The effect of distance of planting upon yields of Narrow Grain Evergreen is influenced by the rate per hill (Table 4 and Fig. 5). Since 4 plants per hill is the maximum rate

[1]Tables 3 thru 14 will be found on pages 55 to 66.



(Numbers represent planting rates; for key see Table 21, page 87.)

FIG. 27.—WEIGHT PER PRIME HUSKED EAR AS AFFECTED BY SPACE OCCUPIED PER PLANT IN CHECKED ROWS: 1931



1—36″ x 4″	9—36″ x 6″	17—42″ x 7″	25—36″ x 12″	33—42″ x 14″
2—38″ x 4″	10—38″ x 6″	18—38″ x 8″	26—38″ x 12″	34—38″ x 16″
3—40″ x 4″	11—40″ x 6″	19—40″ x 8″	27—40″ x 12″	35—40″ x 16″
4—42″ x 4″	12—42″ x 6″	20—42″ x 8″	28—42″ x 12″	36—36″ x 18″
5—36″ x 5″	13—36″ x 7″	21—36″ x 10″	29—36″ x 14″	37—42″ x 16″
6—38″ x 5″	14—38″ x 7″	22—38″ x 10″	30—38″ x 14″	38—38″ x 18″
7—40″ x 5″	15—40″ x 7″	23—40″ x 10″	31—40″ x 14″	39—40″ x 18″
8—42″ x 5″	16—36″ x 8″	24—42″ x 10″	32—36″ x 16″	40—42″ x 18″

FIG. 28.—WEIGHT PER PRIME HUSKED EAR AS AFFECTED BY SPACE OCCUPIED PER PLANT IN DRILLED ROWS: 1931

the distances between rows decreased. The number of prime husked ears, however, failed to increase when there were more than 3 plants per hill, and there was an actual decrease in number for distances of less than 40″x 40″. Weight per prime husked ear in Country Gentleman declined more rapidly when rate per hill was increased than when the hills were planted closer together. In this respect the reactions of Country Gentleman and Narrow Grain Evergreen were the same.

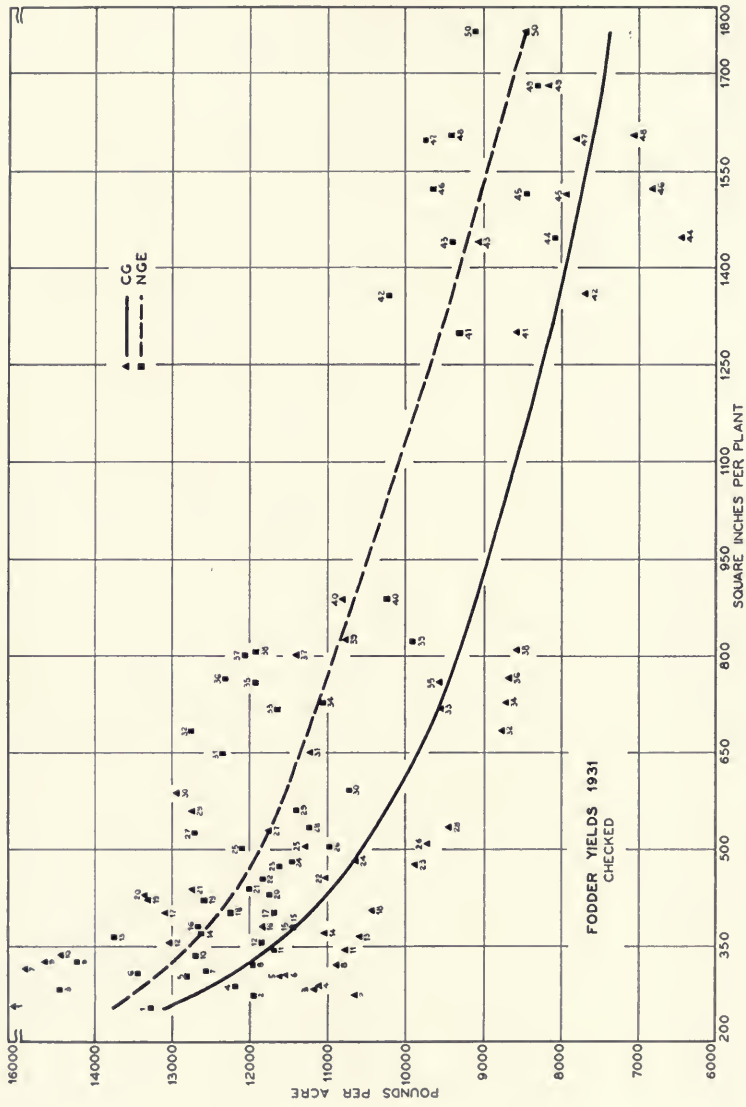
Weights of unhusked culls in the case of Country Gentleman were affected more by increased rate per hill than by reduced distances between rows. Weights of husked culls, on the other hand, were affected more by reduced distances than by increased rates.

The percentage of recovery of prime husked ears in the Country

TABLE 20.—TOTAL YIELDS IN CHECKED-ROW PLANTINGS: EFFECT OF INCREASING PLANTS PER HILL COMPARED WITH EFFECT OF REDUCING DISTANCES BETWEEN HILLS

Yield component[a]	Yield when number of plants per hill was—				Yield when distance between rows was—			
	2	3	4	5	42 inches	40 inches	38 inches	36 inches
Narrow Grain Evergreen								
Sorted unhusked ears, pounds	7 182	7 874	8 053	7 645	7 446	7 714	7 674	7 920
Prime husked ears, pounds	4 416	4 871	4 938	4 670	4 649	4 766	4 707	4 478
Sorted unhusked ears, number	10 347	11 630	12 823	13 050	11 111	11 771	12 233	12 706
Prime husked ears, number	8 966	10 156	11 031	11 020	9 811	10 158	10 556	10 649
Weight per prime husked ear, pound	.49	.48	.45	.42	.48	.47	.45	.44
Unhusked culls, pounds	1 336	1 456	1 550	1 824	1 411	1 485	1 550	1 708
Husked culls, pounds	365	378	450	497	339	423	414	514
Percent recovery of prime husked ears	59.40	59.97	59.57	59.13	59.49	59.88	59.96	58.70
Green fodder, pounds	14 379	14 653	15 165	15 927	14 096	15 343	15 177	15 441
Country Gentleman								
Sorted unhusked ears, pounds	5 807	6 053	5 919	5 502	5 657	6 067	5 863	5 694
Prime husked ears, pounds	3 636	3 962	3 716	3 423	3 703	3 780	3 513	3 504
Sorted unhusked ears, number	9 541	10 290	10 845	10 634	9 671	10 450	10 654	10 536
Prime husked ears, number	8 438	9 469	9 265	9 368	9 024	9 277	8 936	8 941
Weight per prime husked ear, pound	.43	.42	.40	.38	.41	.41	.40	.39
Unhusked culls, pounds	1 330	1 604	1 786	2 140	1 514	1 588	1 814	1 944
Husked culls, pounds	271	293	360	368	234	282	381	394
Percent recovery of prime husked ears	59.60	59.71	57.82	57.80	59.95	57.77	56.74	58.93
Green fodder, pounds	12 155	12 744	13 160	13 711	12 115	13 576	13 207	12 622

[a]Means of 80 to 84 replications except for green fodder, for which there were 48 to 51 replications.

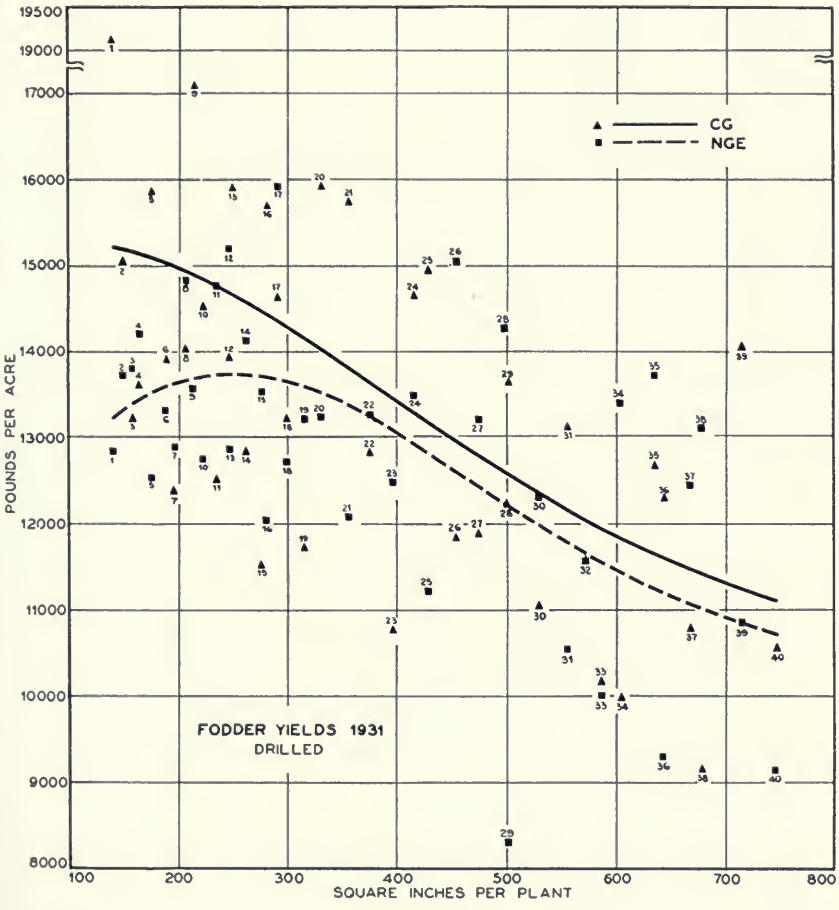


(Numbers represent planting rates; for key see Table 21, page 87.)

FIG. 29.—POUNDS OF GREEN FODDER AS AFFECTED BY SPACE OCCUPIED PER PLANT IN CHECKED ROWS: 1931

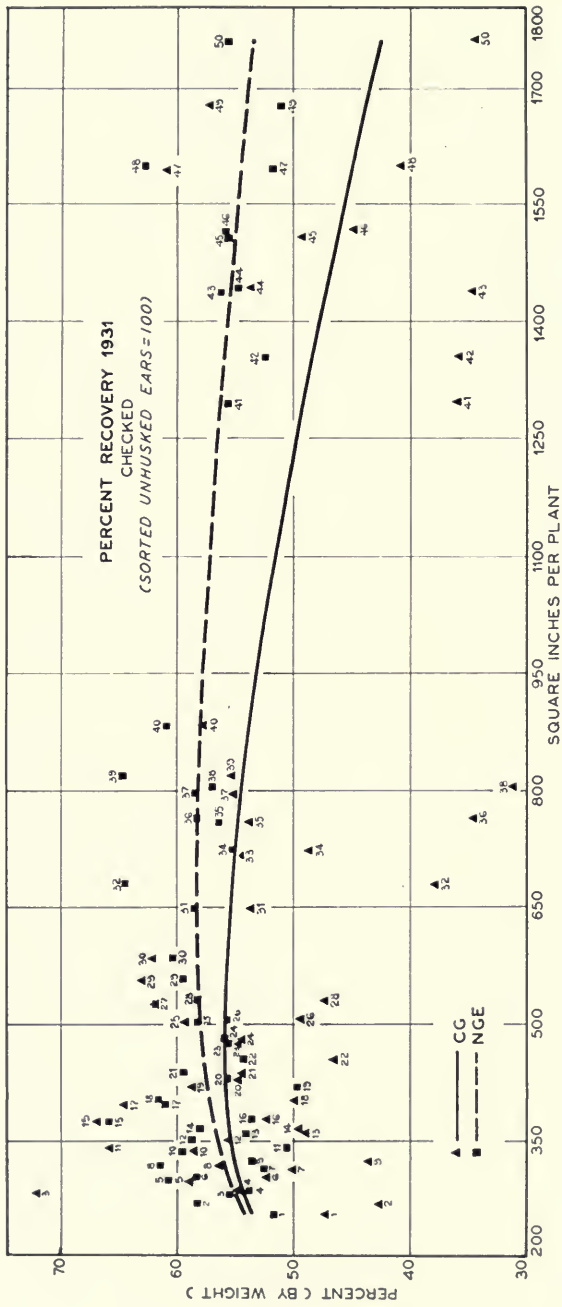
Gentleman plots was reduced by closer planting; whereas with Narrow Grain Evergreen recovery was not affected by closer planting.

In production of green fodder both Country Gentleman and Narrow Grain Evergreen responded slightly more to closer planting of rows than to increasing the number of plants in the hill.



1—36″ x 4″	9—36″ x 6″	17—42″ x 7″	25—36″ x 12″	33—42″ x 14″
2—38″ x 4″	10—38″ x 6″	18—38″ x 8″	26—38″ x 12″	34—38″ x 16″
3—40″ x 4″	11—40″ x 6″	19—40″ x 8″	27—40″ x 12″	35—40″ x 16″
4—42″ x 4″	12—42″ x 6″	20—42″ x 8″	28—42″ x 12″	36—36″ x 18″
5—36″ x 5″	13—36″ x 7″	21—36″ x 10″	29—36″ x 14″	37—42″ x 16″
6—38″ x 5″	14—38″ x 7″	22—38″ x 10″	30—38″ x 14″	38—38″ x 18″
7—40″ x 5″	15—40″ x 7″	23—40″ x 10″	31—40″ x 14″	39—40″ x 18″
8—42″ x 5″	16—36″ x 8″	24—42″ x 10″	32—36″ x 16″	40—42″ x 18″

FIG. 30.—POUNDS OF GREEN FODDER AS AFFECTED BY SPACE OCCUPIED PER PLANT IN DRILLED ROWS: 1931



(Numbers represent planting rates; for key see Table 21, page 87.)

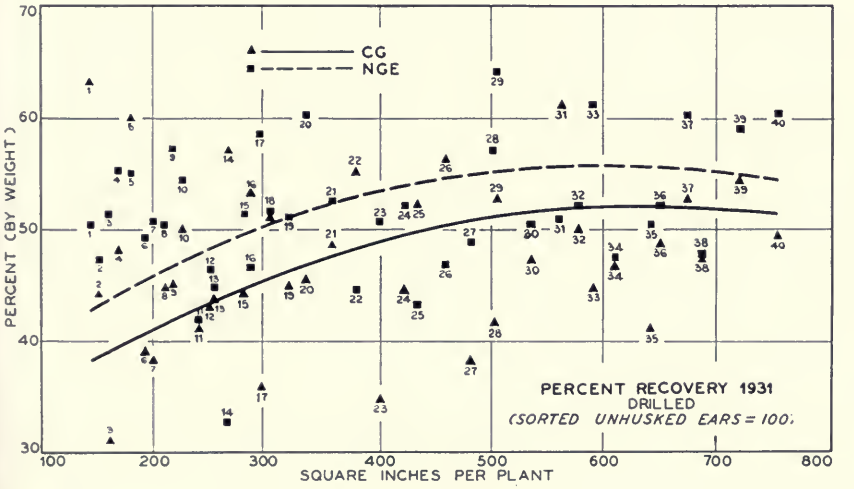
FIG. 31.—PERCENT RECOVERY OF PRIME HUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT IN CHECKED ROWS: 1931

Drilled-Row Plantings.—In the drilled rows the weights of both unhusked and husked ears responded more quickly and more favorably to closer distances between the rows than to closer spacing in the row, the two varieties reacting the same in this respect (Table 21).

On the other hand the number of unhusked ears and of prime husked ears of both varieties responded very rapidly to closer spacing in the row but more slowly to closer distances between rows.

Likewise, as might be expected from the response of number of ears to spacing in the row and distances between rows, the weight per prime husked ear of both varieties decreased very rapidly with closer spacing of plants in the row but was not affected by closer rows. The recovery of prime husked ears was adversely affected by heavier plantings, the closer distances between rows seeming to have no more adverse effect than closer spacing in the row.

The weights of unhusked culls of both varieties increased much more rapidly with closer spacing in the row than with reduced distances between rows. On the other hand, the weights of husked culls increased more rapidly as distances between rows were reduced than as the spacing in the row was reduced.



1—36″ x 4″	9—36″ x 6″	17—42″ x 7″	25—36″ x 12″	33—42″ x 14″
2—38″ x 4″	10—38″ x 6″	18—38″ x 8″	26—38″ x 12″	34—38″ x 16″
3—40″ x 4″	11—40″ x 6″	19—40″ x 8″	27—40″ x 12″	35—40″ x 16″
4—42″ x 4″	12—42″ x 6″	20—42″ x 8″	28—42″ x 12″	36—36″ x 18″
5—36″ x 5″	13—36″ x 7″	21—36″ x 10″	29—36″ x 14″	37—42″ x 16″
6—38″ x 5″	14—38″ x 7″	22—38″ x 10″	30—38″ x 14″	38—38″ x 18″
7—40″ x 5″	15—40″ x 7″	23—40″ x 10″	31—40″ x 14″	39—40″ x 18″
8—42″ x 5″	16—36″ x 8″	24—42″ x 10″	32—36″ x 16″	40—42″ x 18″

FIG. 32.—PERCENT RECOVERY OF PRIME HUSKED EARS AS AFFECTED BY SPACE OCCUPIED PER PLANT IN DRILLED ROWS: 1931

TABLE 21.—TOTAL YIELDS IN DRILLED PLANTINGS: EFFECT OF DECREASING DISTANCES BETWEEN PLANTS IN THE ROW COMPARED WITH EFFECT OF DECREASING DISTANCES BETWEEN ROWS

Yield component[a]	Yield when distance between plants in the row was—			Yield when distance between rows was—			
	20 inches	14 inches	8 inches	42 inches	40 inches	38 inches	36 inches
Narrow Grain Evergreen							
Sorted unhusked ears, pounds	7 429	7 890	7 883	6 693	7 810	7 773	7 585
Prime husked ears, pounds	4 572	4 889	4 759	4 238	4 819	4 844	4 558
Sorted unhusked ears, number	10 686	11 629	13 551	10 055	11 907	11 973	11 985
Prime husked ears, number	9 067	9 890	11 191	8 854	10 100	10 256	9 791
Weight per prime husked ear, pound	.50	.50	.42	.48	.48	.47	.47
Unhusked culls, pounds	1 039	1 093	1 289	1 074	1 160	1 136	1 125
Husked culls, pounds	435	428	563	302	458	426	540
Percent recovery of prime husked ears	59.63	59.58	57.78	60.15	59.43	59.61	57.95
Green fodder, pounds	16 488	16 599	17 354	14 605	17 097	17 685	15 659
Country Gentleman							
Sorted unhusked ears, pounds	6 029	6 373	6 032	5 377	6 252	6 111	6 071
Prime husked ears, pounds	3 810	4 098	3 740	3 463	3 980	3 802	3 866
Sorted unhusked ears, number	9 892	10 811	11 742	9 216	10 794	10 825	10 825
Prime husked ears, number	8 388	9 260	9 877	8 187	9 312	9 063	9 149
Weight per prime husked ear, pound	.45	.44	.38	.42	.43	.42	.42
Unhusked culls, pounds	1 126	1 234	1 618	1 062	1 340	1 370	1 305
Husked culls, pounds	356	323	405	239	331	359	402
Percent recovery of prime husked ears	58.88	60.18	57.86	60.48	59.31	57.51	60.11
Green fodder, pounds	14 429	14 872	15 705	12 900	15 305	15 521	14 180

[a]Means of 48 to 51 replications, except for green fodder, for which there were 36 to 39 replications.

Yields of green fodder showed a greater increase as a result of closer spacing of rows than of closer spacing of plants in the row, the two varieties responding similarly.

Summary of Varietal Responses.—The data in Tables 20 and 21 bring out definitely that changes in distances between rows or between plants or hills in the row have a differential effect upon the several yield components and, furthermore, that varietal response may be quite different. In order to show these different responses, the data are summarized below by the type of response given.

Checked-Row Plantings

	Components affected	
Dominant factor	*Narrow Grain Evergreen*	*Country Gentleman*
Increasing rate per hill	Weight unhusked ears	.....
	Weight husked ears	.....
	Number unhusked ears	.....
	Number prime husked ears	Number prime husked ears
	Weight per husked ear	Weight per husked ear
	.....	Weight unhusked culls
Decreasing distance between hills	Weight green fodder	Weight green fodder
	.....	Weight husked culls
No dominant factor	.....	Weight unhusked ears
	.....	Weight husked ears
	.....	Number unhusked ears
	Recovery prime husked ears	Recovery prime husked ears
	Weight unhusked culls	.....
	Weight husked culls	.....

Drilled-Row Plantings

	Components affected	
Dominant factor	*Narrow Grain Evergreen*	*Country Gentleman*
Closer spacing in the row	Number unhusked ears	Number unhusked ears
	Number prime husked ears	Number prime husked ears
	Weight per husked ear	Weight per husked ear
	Recovery prime husked ears	Recovery prime husked ears
	Weight unhusked culls	Weight unhusked culls
Decreasing distance between rows	Weight unhusked ears	Weight unhusked ears
	Weight husked ears	Weight husked ears
	Weight green fodder	Weight green fodder
	Weight husked culls	Weight husked culls

The two varieties reacted practically the same in drilled-row plantings, but quite differently in checked-row plantings. It is obvious that in checked plantings, increasing the rate per hill had a stronger influence on Narrow Grain Evergreen than planting the rows closer together. Country Gentleman, on the other hand, tended to be affected more indiscriminately and was much more sensitive to extremes than was Narrow Grain Evergreen.

SUMMARY AND CONCLUSIONS

Preliminary experiments in 1930 and 1931 with fifty different checked-row and forty different drilled-row plantings of Country Gentleman and Narrow Grain Evergreen sweet corn indicated that changing the distance between rows, the number of plants to the hill, and the spacing between plants in the rows had a highly complex and varying effect on yields. Further experiments with sixteen different checked-row and twelve different drilled-row plantings replicated four times and extending over the five years 1932-1936 made it possible to analyze the differential effects of changing rates and distances of planting on several of the yield components of the same two varieties. The data were analyzed both in detail and on the basis of differences due to a single factor, namely, space occupied per plant.

Effect of Space per Plant.—Analysis on the basis of space occupied per plant showed that in general the yields were reduced as plantings became unusually heavy or unusually light, but that responses were not the same among the several yield components nor for the two varieties. In addition the responses to amount of space per plant in the drilled rows differed from those in the checked rows. The nature of the yield variations were such as to suggest that while space occupied per plant may have strongly influenced yields, other factors exercised a partially independent effect. These factors consisted of unusually favorable distances between rows, favorable number of plants per hill, favorable spacing in the row, or favorable combinations of distance and rate in the checked-row plantings or distance and spacing in the row in the drilled-row plantings.

The dominant effect of unusually favorable combinations of planting was especially noticeable in weights of green fodder and heights of plants, showing that plant growth is partly dissociated from space occupied per plant. The weights of usable unhusked and prime husked ears tended to respond in the same manner as the two growth factors, but the relationship was not very close.

Some of the other yield components, especially number of unhusked ears, weight per prime husked ear, number of suckers per plant, and maturity as determined by silk counts, seemed to be more dependent on space occupied per plant.

Comparative Effect of Increasing Rate in the Row or Distance Between Rows.—In general, planting distances and rates which are favorable for the maximum production of one yield component are not necessarily favorable for the maximum production of any of the others; therefore the yield of one component under a certain set of conditions cannot be used as the basis for determining the yield of another. Furthermore since varieties have an individual response to changing distances and rates of planting, the behavior of one variety

cannot be used to predict the behavior of another even under the same set of conditions.

Increasing the rate per hill in checked rows or the distance between plants in drilled rows may have a quite different effect from that of planting the rows closer together. With Narrow Grain Evergreen, increasing the rate per hill in checked rows had a far more marked effect on yields than reducing the distances between hills. Country Gentleman, on the other hand, was affected to as great an extent by rate per hill as by distance between rows. From the practical standpoint, changing the distance between rows in a Narrow Grain Evergreen planting in an effort to influence the yield was relatively ineffective compared with changing the rate per hill. But Country Gentleman was much more sensitive to changes in either rate or distance, and it will therefore pay the grower of Country Gentleman to set his planter for the optimum distance between rows and to obtain plates giving the proper drop.

In drilled-row plantings Narrow Grain Evergreen and Country Gentleman reacted practically the same, the correct distance between rows being a more important factor than the correct distance between plants in the row. This means that within reasonable limits there can be a considerable variation in the drop by the planter without yields being appreciably affected, but that care should be taken to set the planter so that the rows will be the optimum distance apart.

In dry seasons, when soil moisture is a limiting factor, decreasing the distances between hills reduced the heights of the plants, but increasing the number of plants in the hill had only a slight effect on plant height. In drilled-row plantings closer distances between rows and closer spacing in the row reduced the plant heights during dry seasons but led to greater heights in normal seasons.

Changing the distance between rows had a relatively slight effect on number of suckers compared with the great reduction when the rate per hill was increased. In drilled-row plantings the effects were similar; reducing spacing in the row had a much more marked effect on number of suckers than reducing the distance between the rows.

Maturity was delayed much more markedly by increasing the rate per hill or by closer spacing in the row than it was by reducing the distance between rows.

RECOMMENDATIONS

From the results of the present study certain plantings can be recommended for regions whose soils and climate are in general comparable to those at Urbana, Illinois, where these studies were made.

In the checked-row plantings Narrow Grain Evergreen can be planted more heavily than the smaller Country Gentleman variety,

but in drilled rows the requirements of the two varieties are the same. There is no evidence that plantings in drilled rows produce yields consistently different from those in checked rows.

Truck growers who wish to produce the largest number of fair-sized ears per acre should plant at the following rates and distances:

Country Gentleman: in checked rows, 40″x 40″ with 4 plants per hill; or in drilled rows 40 inches apart with plants 8 inches apart in the row.

Narrow Grain Evergreen: in checked rows, 38″x 38″ with 4 plants per hill; or in drilled rows 40 inches apart with plants 8 inches apart in the row.

Cannery growers who are interested in producing the maximum weights of heaviest ears should plant at the following rates and distances:

Country Gentleman: in checked rows, 40″x 40″ with 3 plants per hill; or in drilled rows 40 inches apart with plants 14 inches apart in the row.

Narrow Grain Evergreen: in checked rows, 40″x 40″ with 4 plants per hill; or in drilled rows 40 inches apart with plants 14 inches apart in the row.

LITERATURE CITED

1. DAVENPORT, E., and FRASER, W. J. Corn experiments, 1895. Ill. Agr. Exp. Sta. Bul. 42. 1896.
2. EISELE, H. F. Influence of environmental factors on the growth of the corn plants under field conditions. Iowa Agr. Exp. Sta. Res. Bul. 229. 1938.
3. FISHER, R. A. Statistical methods for research workers. 4th ed. Oliver and Boyd, London. 1932.
4. HABER, E. S. Check rowed or drilled corn? Effect of number of plants per hill on yields of sweet corn. Canner 71, No. 3, pp. 13, 14, and 16. 1930.
5. HUELSEN, W. A., and MICHAELS, W. H. The yield complex of sweet corn. Ill. Agr. Exp. Sta. Bul. 432. 1937.
6. HUME, A. N., CENTER, O. D., and HEGNAUER, L. Distance between hills for corn in the Illinois corn belt. Ill. Agr. Exp. Sta. Bul. 126. 1908.
7. MAGRUDER, ROY. Distance of planting sweet corn to increase yields. Ohio Agr. Exp. Sta. Bimo. Bul. 13, 68-72. 1928.
8. MCCLUER, G. W. Sweet corn, thickness of planting, 1891. *In* Ill. Agr. Exp. Sta. Bul. 21, pp. 101-102. 1892.
9. MORROW, G. E., and GARDNER, F. D. Experiments with corn. *In* Ill. Agr. Exp. Sta. Bul. 31, pp. 333-360. 1894.
10. WATSON, A. N. Report of activities of the Puerto Rico Experiment Station of the Office of Experiment Stations, U. S. Department of Agriculture, for the month of August, 1936. Mimeo rpt. Mayaguez, P. R. Jan. 15, 1937.
11. ———— and DAVIS, R. L. Statistical analysis of a spacing experiment with sweet corn. Amer. Soc. Agron. Jour. 30, 10-17. 1938.

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