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BULLETIN No. 126

DISTANCE BETWEEN HILLS FOR CORN IN
THE ILLINOIS CORN BELT

By ALBERT N. HUME, O. D. CENTER
AND LEONARD HEGNAUER



URBANA, ILLINOIS, JULY, 1908

SUMMARY OF BULLETIN NO. 126

1. In the northern part of the corn belt of Illinois, the largest yields have been secured from ordinary land by planting corn in hills 36 inches apart both ways with three kernels per hill. Page 366

2. In central Illinois, on ordinary brown silt loam prairie land that ordinarily produces more than fifty bushels of corn per acre, corn planted in hills 39.6 inches each way with three kernels per hill has produced the largest yields. Page 367

3. In the same part of the corn belt on land that ordinarily produces less than fifty bushels of corn per acre, corn planted in hills 36 inches each way with two kernels per hill has produced the largest yields. Page 367

DISTANCE BETWEEN HILLS FOR CORN IN THE ILLINOIS CORN BELT

By ALBERT N. HUME, ASSOCIATE IN CROP PRODUCTION,
O. D. CENTER, FIRST ASSISTANT IN CROP PRODUCTION,
AND LEONARD HEGNAUER, ASSISTANT IN CROPS

By far the greater part of the corn area of Illinois is annually planted in check rows. It is not the purpose of the present bulletin to prove the advantage of this method of planting corn, since it is assumed that it is the method that will remain in vogue on account of the comparative ease with which corn in check rows can be cultivated and kept clear of weeds. It is the purpose of this bulletin to report the progress of an investigation to determine the distance apart at which hills of corn must be checked to return the highest and most profitable yields and as a corollary to this to determine whether the planting of two kernels per hill at closer distances may give any better distribution of stalks than the planting of three kernels per hill at greater distances.

PLAN OF EXPERIMENT

A good many experiments have been conducted at the several experiment stations in the United States for the purpose of determining the proper thickness for planting corn. Obviously this problem is one of importance throughout the entire corn belt, but its solution is to a great extent a local problem and results from one locality might not be directly applicable to another with a different soil or climate. Moreover it is found by inspecting reports from the several experiment stations, including the Ontario Experiment Station at Guelph, Canada, that much of the experimental work done in this connection has taken into account differences in the number of stalks in each hill or row rather than varying the distance apart of the hills or rows.

Some such experiments were carried out by the Illinois Experiment Station and are summarized in Bulletin 31. This previous work which contributes indirectly to the present study will be referred to later. The present experiments are arranged in a way to vary the thickness of planting corn by increasing or decreasing the distances between rows, in both directions. This accords with the theory that in order to make the most perfect growth each corn plant should have its allotted amount of soil space with as little in-

terference from neighboring corn plants as possible. Accordingly the experiments were arranged so that hills of corn could be checked on different plots at distances ranging from 33 inches to 44 inches between the hills. In addition to the plots that were in exact accord with these measurements there were intermediate ones that furnished substantial duplicates. In order that the plan may be more clear the following diagram is given.

This in reality shows the outline of the distance experiment field at Sibley, Illinois, in 1904, but it illustrates the general plan of the distance experiments on all the fields in all years.

PLAN OF DISTANCE BETWEEN HILLS EXPERIMENT, SIBLEY FIELD, 1904
(Figures in small squares indicate distance of hills apart in inches)

| 3 Kernels per hill. | | | | 2 Kernels per hill. | 3 Kernels per hill. |
|---------------------|------|------|------|---------------------|---------------------|
| 44 | 44 | 44 | 44 | DIVISION B. | DIVISION C. |
| x | x | x | x | | |
| 44 | 39.6 | 36 | 33 | | |
| 44 | 39.6 | 39.6 | 39.6 | | |
| x | x | x | x | | |
| 39.6 | 39.6 | 36 | 33 | | |
| 44 | 39.6 | 36 | 36 | | |
| x | x | x | x | | |
| 36 | 36 | 36 | 33 | | |
| 44 | 39.6 | 36 | 33 | | |
| x | x | x | x | | |
| 33 | 33 | 33 | 33 | | |
| DIVISION D. | | | | DIVISION E. | DIVISION F. |
| DIVISION G. | | | | DIVISION H. | DIVISION I. |

In the diagram above, each large division contains 64 square rods and each small one 4 square rods.

The field experiments upon which this bulletin is based have been in progress since 1903, and have been carried out on seven different fields. The land in each of these fields is representative of the largest areas of the section of the state in which it is situated. In northern Illinois in 1903 the experiment was conducted on a field located northeast of Myrtle, in Ogle county. This same field was used in 1904. In 1905, the field, which was used for this and similar experiments, was located near Sycamore, DeKalb county. For the work of 1906, and subsequently, a more permanent field was secured, which is located about one mile south of DeKalb, DeKalb county.

In the southern part of the corn belt of Illinois this experiment has been continued every year since 1903 on fields at Sibley, in Ford county, and at Urbana, in Champaign county. During two of the years, 1904 and 1905, experiments were also made on two different fields located near Mattoon, in Coles county.

Obviously, results obtained from the northern part of a large state like Illinois will not necessarily apply to another section of the state. It is assumed, however, that results from fields at Myrtle, Sycamore, and DeKalb may be averaged, all being representative of the northern section of Illinois, and results from fields at Sibley, Urbana, and Mattoon, in the southern section may be averaged in like manner, as applying to that part of the Illinois corn belt.

Practically all the fields away from Urbana from which these results were taken have been planted with machinery. Planting at Urbana has always been done by hand, in the thought that a little more accurate planting may be done by that means. The check wires used at outside fields were so made that the first nine hills were checked 44 inches apart, the next ten hills 39.6 inches apart, the next eleven hills 36 inches apart, and the next twelve hills 33 inches apart, each of these series being two rods long. The series were repeated as many times as practicable according to the size of the field. Also where the planters were used the distance between the planter shoes was changed so that it would correspond to the lengths of links of the check wire.

From the above plan it can be seen that the distance experiment on the Sibley field was repeated six times in 1904 for the three-kernel plots and three times for the two-kernel plots. It must be evident that with work of this kind many duplicate plots are necessary in order that averages may be true. Differences of soil and season cannot be equalized without the use of many plots during several seasons.

Corn checked in hills 44 inches apart each way with two kernels per hill should grow theoretically 6480 stalks per acre; 39.6 inches apart, 8000 stalks per acre; 36 inches apart, 9680 stalks per acre; and 33 inches apart, 11,520 stalks per acre. Corn checked in rectangles at distances intermediate between these given will grow intermediate numbers of stalks per acre. Supposing that hills be checked with three kernels instead of two, the 44-inch rows should have theoretically 9720 stalks per acre; the 39.6-inch rows, 12,000 stalks per acre; the 36-inch rows, 14,520 stalks per acre; and the 33-inch rows, 17,280 stalks per acre. In like manner, as in the case of the 2-kernel plots, the corn checked in rectangles at intermediate distances will have intermediate numbers of stalks per acre.

It should be clearly understood that even under the most ideal field conditions for experimental work some stalks of corn are likely to be missing and an imperfect stand result. The stands of corn on plots reported in this bulletin were in some instances much better than others, but stands on all plots reported in the same series were comparable with each other. If the stand was very defective or if for any other reason the yield of any plot was known to be abnormal, the yield of the plot was not considered in making up averages. The averages are made up of the actual yields, harvested from the plots, and may therefore be taken as representative of field conditions in the part of the corn belt they represent.

For the purpose of this bulletin all plots were put into fourteen groups. The kinds of plots in the several groups are explained in the following table:

The numbers in the first column refer simply to the 14 kinds of plots, each succeeding one allowing for an increased number of stalks per acre over that of the preceding. Column 2 refers to the distance of the hills apart in the various groups of plots. It will be noted that in each of the groups 3, 4, and 5, there is a slight variation in distance apart of hills among the plots considered in making up the average, but this variation is so slight that the plots are practical duplicates. Column 3 gives the number of stalks per acre that would theoretically result from planting at the several distances. Column 4 refers to the number of plots in each division which necessarily fall into the several groups. In case there is only one plot in a division of a given distance its yield per acre is the one put down for such plots in the tables. In other cases where there are two plots in one group, the average yield of these plots is the one put down in Tables 6, 7, 8, and 9. The yields of corn for 1904 reported in this bulletin are in terms of air-dry shelled

TABLE I.—DISTANCE BETWEEN HILLS IN THE SEVERAL PLOTS, NUMBER OF STALKS PER ACRE AND NUMBER OF PLOTS USED IN MAKING AVERAGES

| Two kernels per hill. | | | |
|-------------------------|----------------------------------|----------------------------|--|
| Number of group. | Distance between hills (inches). | Number of stalks per acre. | Number of plots used in making each average. |
| 1 | 44 x 44 | 6480 | 1 |
| 2 | 44 x 39.6 | 7200 | 2 |
| 3 | 39.6 x 39.6 | 8000 | 1 |
| | 36 x 44 | 7920 | 2 |
| 4 | 33 x 44 | 8640 | 2 |
| | 36 x 39.6 | 8800 | 2 |
| 5 | 36 x 36 | 9680 | 1 |
| | 33 x 39.6 | 9600 | 2 |
| 6 | 33 x 36 | 10560 | 2 |
| 7 | 33 x 33 | 11520 | 1 |
| Three kernels per hill. | | | |
| 8 | 44 x 44 | 9720 | 1 |
| 9 | 44 x 39.6 | 10800 | 2 |
| 10 | 39.6 x 39.6 | 12000 | 1 |
| | 36 x 44 | 11880 | 2 |
| 11 | 33 x 44 | 12960 | 2 |
| | 36 x 39.6 | 13200 | 2 |
| 12 | 36 x 36 | 14520 | 1 |
| | 33 x 39.6 | 14400 | 2 |
| 13 | 33 x 36 | 15840 | 2 |
| 14 | 33 x 33 | 17280 | 1 |

corn per acre; for 1905, all of the yields of fields away from Urbana are given in terms of air-dry ear corn per acre, the field weights only being used at Urbana that year; in 1906, field weights alone were used on all fields; all yields of 1907 are given in bushels of ear corn per acre, the basis for calculation being 75 pounds per bushel.

RESULTS FROM NORTHERN ILLINOIS

Table 2, below, summarizes all yields from distance experiments secured from fields located in northern Illinois in Ogle and DeKalb counties.

By consulting the headings of the separate divisions of Table 2, it will be seen that the plots were situated at different places, three separate years. In the columns headed "Av.," will appear to some extent the degree of regularity with which the average yields increase or decrease according to thickness of planting. Generally, both in the case of the two-kernel plots and also the three-kernel plots, these average yields increase toward the thicker plantings.

They do so with enough consistency so that yields from all plots of the three fields may fairly be averaged to get a general average representing the three fields and the three seasons. The general averages are given in the last column of Table 2. In this column the average yields of all two-kernel plots are seen to increase from the thinnest planting up to the second thickest. In similar manner the average yields of all three-kernel plots increase regularly. The highest average yield of all is from the plantings 33 inches by 33 inches, with three kernels planted per hill.

Obviously, this distance of planting which gave the highest average yield in northern Illinois is closer than will be considered practical for general farming, at least with the size of horses and implements at present in general use. With this practical consideration in mind, the following statement is warranted.

TABLE 2.—SUMMARY OF AVERAGE YIELDS FROM ALL FIELDS IN NORTHERN ILLINOIS; MYRTLE, SYCAMORE AND DEKALB

Figures indicate actual yields, bushels per acre.

| Two kernels per hill. | | | | | | |
|----------------------------------|----------------------------|-----------------|-------------------|-----------------|-----------------|----------------------------------|
| Distance between hills (inches). | Number of stalks per acre. | Myrtle 1904 Av. | Sycamore 1905 Av. | DeKalb 1906 Av. | DeKalb 1907 Av. | Gen. Av. 1904, 1905, 1906, 1907. |
| 44x44 | 6480 | 38.5 | 37.1 | 51.6 | 49.0 | 44.1 |
| 44x39.6 | 7200 | 43.6 | 42.3 | 52.6 | 49.8 | 47.1 |
| 39.6x39.6 | 8000 | 44.4 | 44.1 | 55.1 | 51.1 | 48.7 |
| 36x44 | | | | | | |
| 33x44 | 8800 | 47.3 | 43.2 | 60.9 | 52.1 | 50.9 |
| 36x39.6 | | | | | | |
| 36x36 | 9680 | 45.8 | 47.1 | 71.6 | 52.1 | 54.2 |
| 33x39.6 | | | | | | |
| 33x36 | 10560 | 46.3 | 45.8 | 67.4 | 57.5 | 54.3 |
| 33x33 | 11520 | 48.1 | 37.2 | 67.0 | 55.8 | 52.0 |
| Three kernels per hill. | | | | | | |
| 44x44 | 9720 | 41.4 | 43.0 | 64.5 | 67.3 | 54.1 |
| 44x39.6 | 10800 | 43.3 | 41.3 | 70.3 | 67.8 | 55.7 |
| 39.6x39.6 | 12000 | 45.2 | 42.1 | 66.8 | 72.5 | 56.7 |
| 36x44 | | | | | | |
| 33x44 | 13200 | 45.0 | 44.7 | 70.0 | 71.1 | 57.7 |
| 36x39.6 | | | | | | |
| 36x36 | 14520 | 43.7 | 46.1 | 75.0 | 70.8 | 58.9 |
| 33x39.6 | | | | | | |
| 33x36 | 15840 | 45.2 | 44.3 | 79.2 | 71.0 | 59.9 |
| 33x33 | 17280 | 43.3 | 49.5 | 73.6 | 77.6 | 61.0 |

The data of Table 2 indicate that for good corn land in northern Illinois hills of corn should not be checked farther apart than 36 inches each way, which is probably the closest distance practicable for cultivation, and the planter should be set to drop three kernels per hill. It is reasonable to assume that higher yields may be made by closer planting of corn in northern Illinois than is now commonly in vogue. Plots with hills essentially 36 inches apart each way averaged 2.2 bushels per acre more than plots planted 39.6 inches each way where the planter was set for dropping three kernels per hill; and 5.5 bushels per acre more where two kernels per hill were planted.

SUMMARY OF RESULTS FROM THE SOUTHERN PART OF THE CORN BELT.

For the purpose of getting a general average of the results secured from the three fields at Urbana, Sibley, and Mattoon, the yields in bushels per acre from all of the plots of each field for each of the several distances of planting are averaged. These averages are then compiled to make Table 3. Tables containing the yields of separate plots for the several years may be consulted by referring to the Appendix.

TABLE 3.—SUMMARY OF AVERAGE YIELDS FROM ALL FIELDS IN CENTRAL ILLINOIS;
URBANA, SIBLEY AND MATTOON

Figures indicate actual yields, bushels per acre.

Two kernels per hill.

| Distance between hills, (inches). | Number of stalks per acre. | Urbana Av. of 4 years. | Sibley Av. of 4 years. | Mattoon 1904, 1905. | Gen. Av. for three fields. |
|-----------------------------------|----------------------------|------------------------|------------------------|---------------------|----------------------------|
| 44x44 | 6480 | 50.2 | 45.5 | 46.9 | 47.7 |
| 44x39.6 | 7200 | 51.7 | 47.9 | 51.0 | 50.0 |
| 39.6x39.6 36x44 | 8000 | 53.8 | 48.9 | 54.3 | 51.9 |
| 33x44 36x39.6 | 8800 | 54.8 | 49.7 | 55.0 | 52.8 |
| 36x36 33x39.6 | 9680 | 58.5 | 49.6 | 56.4 | 54.5 |
| 33x36 | 10560 | 59.6 | 48.9 | 57.8 | 55.0 |
| 33x33 | 11520 | 54.9 | 49.9 | 60.4 | 54.0 |

Three kernels per hill.

| | | | | | |
|--------------------|-------|------|------|------|------|
| 44x44 | 9720 | 54.1 | 47.9 | 53.9 | 51.6 |
| 44x39.6 | 10800 | 54.1 | 47.7 | 55.7 | 51.9 |
| 39.6x39.6 36x44 | 12000 | 53.8 | 49.0 | 56.0 | 52.3 |
| 33x44 36x39.6 | 13200 | 51.8 | 48.5 | 56.6 | 51.4 |
| 36x36 33x39.6 | 14520 | 48.6 | 46.7 | 54.8 | 49.1 |
| 33x36 | 15840 | 49.8 | 45.5 | 55.1 | 49.1 |
| 33x33 | 17280 | 47.0 | 42.6 | 55.0 | 46.8 |

If the results given in Table 3 are trustworthy, as they apparently are, the highest yields of corn may be secured from average land in central Illinois by checking corn in hills substantially 36 inches by 36 inches apart and planting two kernels per hill. In the last column of Table 3, headed "Gen. Av.," the yield given for such plots is 54.5 bushels per acre. Plots planted appreciably thicker or thinner show a decreased yield with relation to the thickness of planting. It is noticeable moreover that in these average yields those from plots planted with two kernels per hill are generally higher than those from plots where three kernels per hill were planted. It is interesting to make a comparison between yields harvested from plots planted by ordinary methods and those planted 36 inches by 36 inches with two kernels per hill. In the lower part of Table 3 in the general average column it may be seen that plots planted 39.6 inches by 39.6 inches with three kernels per hill yielded 52.3 bushels per acre, which is 2.2 bushels less than by the former distribution. *It is important to reflect that a change in distribution of hills of corn over the entire area of average land in the corn belt could easily mean an increase of 2 or 3 bushels per acre.*

RELATION OF SOIL FERTILITY TO THE MOST DESIRABLE THICKNESS OF PLANTING

There is a decided opinion in the minds of practical corn growers that finds expression in the statement "Plant corn thicker if the land is rich and thinner if the land is old and thin." This consideration has led the writers to re-group the yields from plots in these distance experiments. In one group have been placed yields of over 50 bushels per acre and in the other yields less than 50 bushels per acre. Fifty bushels it has been assumed somewhat arbitrarily might mark a dividing line between the capacity of "rich" land and "thin" land. The question for settlement then is, will the distance of planting that gives the highest yield where land produces more than 50 bushels be the same distance that gives the highest yield on land producing less than 50 bushels.

The present data relating to this part of the question are expressed numerically in Table 4:

TABLE 4.—AVERAGE YIELDS FROM DISTANCE PLOTS IN NORTHERN ILLINOIS ON LAND PRODUCING OVER FIFTY BUSHELS PER ACRE, COMPARED WITH THOSE FROM LAND PRODUCING LESS THAN FIFTY BUSHELS

| Distance between hills (inches). | Number of stalks per acre. | More than 50 bushels per acre. | Less than 50 bushels per acre. |
|----------------------------------|----------------------------|--------------------------------|--------------------------------|
| Two kernels per hill. | | | |
| 44 x 44 | 6480 | 52.8 | 40.3 |
| 44 x 39.6 | 7200 | 54.5 | 41.7 |
| 39.6 x 39.6 36 x 44 | 8000 | 55.7 | 41.5 |
| 33 x 44 36 x 39.6 | 8800 | 57.3 | 41.7 |
| 36 x 36 33 x 39.6 | 9680 | 60.8 | 43.0 |
| 33 x 36 | 10560 | 62.0 | 41.7 |
| 33 x 33 | 11520 | 62.3 | 40.3 |
| Three kernels per hill. | | | |
| 44 x 44 | 9720 | 64.2 | 39.9 |
| 44 x 39.6 | 10800 | 69.4 | 42.2 |
| 39.6 x 39.6 36 x 44 | 12000 | 69.4 | 42.9 |
| 33 x 44 36 x 39.6 | 13200 | 67.7 | 43.9 |
| 36 x 36 33 x 39.6 | 14520 | 68.4 | 42.2 |
| 33 x 36 | 15840 | 70.1 | 42.6 |
| 33 x 33 | 17280 | 70.1 | 43.3 |

The conclusions to be drawn from Table 4 scarcely need emphasizing. Both columns of averages given are alike in the respect that the highest yields appear to have been taken from plots where three kernels per hill were planted, and also in the respect that the greatest yields were secured from checking hills practically thirty-six inches apart. *Without exception then, so far as the data of this bulletin may indicate, the highest yields of corn are secured in northern Illinois by checking hills not more than thirty-six inches each way and dropping three kernels per hill.*

The relation of soil fertility to the most desirable distribution of corn hills in the southern part of the Illinois corn belt is summarized in Table 5:

TABLE 5.—AVERAGE YIELDS FROM DISTANCE PLOTS IN CENTRAL ILLINOIS ON LAND PRODUCING OVER FIFTY BUSHELS PER ACRE, COMPARED WITH THOSE FROM LAND PRODUCING LESS THAN FIFTY BUSHELS

| Distance between hills (inches). | Number of stalks per acre. | Average yield Urbana, Sibley, Mattoon fields. | |
|----------------------------------|----------------------------|---|----------------------------|
| | | More than 50 bu. per acre. | Less than 50 bu. per acre. |
| Two kernels per hill. | | | |
| 44 x 44 | 6480 | 56.7 | 42.8 |
| 44 x 39.6 | 7200 | 57.5 | 43.4 |
| 39.6 x 39.6 36 x 44 | 8000 | 58.1 | 43.5 |
| 33 x 44 36 x 39.6 | 8800 | 59.3 | 44.3 |
| 36 x 36 33 x 39.6 | 9680 | 62.4 | 44.2 |
| 33 x 36 | 10560 | 64.8 | 43.1 |
| 33 x 33 | 11520 | 63.7 | 41.2 |
| Three kernels per hill. | | | |
| 44 x 44 | 9720 | 61.7 | 39.7 |
| 44 x 39.6 | 10800 | 63.6 | 41.5 |
| 39.6 x 39.6 36 x 44 | 12000 | 64.1 | 42.2 |
| 33 x 44 36 x 39.6 | 13200 | 62.3 | 41.0 |
| 36 x 36 33 x 39.6 | 14520 | 61.9 | 41.6 |
| 33 x 36 | 15840 | 62.0 | 41.1 |
| 33 x 33 | 17280 | 63.8 | 39.0 |

By inspecting Table 5, it becomes evident at a glance that the highest yields of corn in the area represented are not secured by the same distribution of stalks on "rich" land as on "thin" land.

The highest average yield from land producing over fifty bushels was secured by planting two kernels per hill at a distance of 33 by 36 inches. Almost the same yield was secured from planting hills 39.6 inches apart each way, with three kernels per hill, and the latter distribution is the more practical one for cultivation. On land yielding less than fifty bushels the highest average yield (save by one-tenth bushel) was secured by checking two kernels per hill at distances substantially 36 inches by 36 inches between hills.

To repeat, then, the general conclusions of this bulletin by way of summarizing them: *On all ordinary corn belt land of the north-*

ern part of Illinois, plant corn hills not more than 36 inches apart and plant at least three kernels per hill. Future experiments must determine whether a larger number of stalks per acre would increase the yield still more.

In central Illinois on the common brown silt loam prairie land, of a productive capacity greater than fifty bushels per acre, plant corn 39.6 inches between hills and drop three kernels per hill. (With 39.6 inches between rows there are exactly 5 rows per rod, or 10 rows per acre on a square 40-acre field).

In central Illinois on the common prairie land, of lower productive capacity than fifty bushels per acre, as for instance average corn belt land, plant the hills 36 inches apart and drop two kernels per hill.

DISCUSSION OF RELATED EXPERIMENTS

As has been suggested, very few experiments have been conducted by Experiment Stations of this country which bear directly upon the present problem. Moreover the trials showing results that throw some light upon the question have frequently been of such short duration that the results could not be considered as definite. Some of the experiments do not show anything decisive because the range of the trials did not take in the extremes.

Some yields were secured from the corn breeding work of this Experiment Station in 1907 that contribute incidentally to the question whether strong land may not produce more corn by being planted with three kernels per hill rather than two. The "ear-row" plots (described in Illinois Experiment Station Bulletin 100) were planted in 1907 on Series 300, North University Farm (See Bulletin 125), in rows 3 feet apart each way. The yield of this field as a whole was higher than 90 bushels per acre, so it was evidently from what would be called good land, of considerably more than 50 bushels per acre capacity. Twenty-four rows on the west side of Series 300 were planted with two kernels per hill, while 24 rows on the east side, covering the same area, were planted with three kernels per hill. That part planted with two kernels per hill yielded at the rate of 91.2 bushels per acre and that planted with three kernels yielded at the rate of 102.7 bushels per acre. This difference of 11.5 bushels per acre in favor of planting three kernels per hill is possibly greater than the average, but it may be remembered that much of Series 300 of the North University Farm is better than average land, being under definite systems calculated to maintain permanently the fertility of the soil.

Previous experiments conducted at the Illinois Experiment Station to test the effect of varying the thickness of planting corn have reported upon different thicknesses in the row, but at a constant distance between rows. Illinois Bulletin 31, states, "when planting in checks 3 feet 8 inches apart the largest yield of grain is from four kernels in a hill." In Illinois Bulletin 42, also, the statement is made, "planting 3 feet 8 inches each way provides 3240 hills per acre. This shows that two stalks per hill each bearing a good ear are capable of a fair yield of corn, but the result is seldom attained; and most of the fair yields and all of the great ones are from at least 10,000 stalks per acre."

The experiments of this bulletin have been tried with the hypothesis in mind that so far as practicable each hill of corn should be planted in the middle of a square. Such a theory is supported by Alabama Bulletin 88. At the Alabama Station, corn was planted in rows varying from 4 to 6 feet apart with 2 to 4 feet between plants. The number of plants per acre was from 2178 to 4356. "In both seasons the yield was largest when the constant area devoted to each plant approached a perfect square." The same conclusion is expressed in Georgia Bulletin 46.

The conclusions of this bulletin indicate that small numbers of stalks per hill, planted with hills closer together, yield more grain than larger numbers of stalks planted in hills further apart from each other. In Ohio Experiment Station Bulletin 78 it is stated that with rows 3.5 feet apart, one grain every 12 inches and 2 grains every 24 inches gave larger yields than planting 3 grains every 36 inches or 4 grains every 42 inches or 48 inches. Growing one grain every 18 inches increased the percent of sound corn but decreased the yield.

Other publications relating to the distribution of corn hills and thickness of planting corn are as follows: Kansas Bulletin 45; Texas Bulletin 49; Maine Station Report, 1895; Louisiana Bulletin 17, (second series); Maryland Bulletin 25; Canada Experiment Farms' Report, 1900; Indiana Bulletin 55; and Missouri Bulletin 32.

APPENDIX.

The following tables give in detail the yields of corn from the distance experiment plots at the several Illinois fields. From these detailed yields were constructed the tables of averages of the earlier part of this bulletin, upon which are based the conclusions given on page 368.

TABLE 6.—DISTANCE EXPERIMENT MYRTLE, SYCAMORE AND DEKALB FIELDS; SUMMARY OF ALL AVERAGE YIELDS; BUSHELS PER ACRE, ACTUAL YIELD

| Two kernels per hill. | | | | | | | | | | |
|----------------------------------|-------------------------|-----------------------|------|------|------|------|------|------|------|----------|
| Distance between hills (inches). | No. of stalks per acre. | Myrtle Field, 1904. | | | | | | | | 1904 Av. |
| | | 44 x 44 | 6480 | 37.6 | 39.2 | 38.2 | ... | 47.2 | 28.1 |  | 40.8 | ... | 38.5 |
| 44 x 39.6 | 7200 | 46.9 | 41.9 | 44.0 | .... | 47.5 | 39.0 | 42.4 | .... | 43.6 |
| 44 x 36 | 7920 | 49.5 | 39.0 | 42.6 | 54.8 | 42.2 | 39.1 | 42.7 | 51.6 | 45.2 |
| 39.6 x 39.6 | 8000 | 48.5 | 38.6 | 46.4 | .... | 51.1 | 32.6 | 44.3 | .... | 43.6 |
| 44 x 33 | 8640 | 51.9 | 41.7 | 45.4 | 53.2 | 38.0 | 40.4 | 43.5 | 46.9 | 45.1 |
| 39.6 x 36 | 8800 | 52.5 | 44.3 | 47.3 | 60.5 | 50.1 | 35.4 | 42.2 | 63.6 | 49.5 |
| 39.6 x 33 | 9600 | 52.2 | 44.3 | 45.4 | 59.2 | 48.2 | 41.4 | 43.9 | 49.8 | 48.1 |
| 36 x 36 | 9680 | 47.4 | 45.1 | 43.5 | 45.1 | 46.6 | 29.5 | 36.6 | 53.4 | 43.4 |
| 36 x 33 | 10560 | 56.9 | 42.0 | 43.8 | 45.6 | 47.5 | 34.5 | 42.7 | 57.5 | 46.3 |
| 33 x 33 | 11520 | 58.2 | 49.2 | 43.0 | 60.3 | 47.1 | 33.0 | 45.0 | 49.2 | 48.1 |
| Three kernels per hill. | | | | | | | | | | |
| 44 x 44 | 9720 | 45.7 | 38.2 | 40.3 | .... | .... | .... | .... | .... | 41.4 |
| 44 x 39.6 | 10800 | 48.8 | 39.5 | 41.7 | .... | .... | .... | .... | .... | 43.3 |
| 44 x 36 | 11880 | 45.0 | 41.7 | 39.9 | 48.7 | .... | .... | .... | .... | 43.8 |
| 39.6 x 39.6 | 12000 | 53.4 | 42.0 | 44.1 | .... | .... | .... | .... | .... | 46.5 |
| 44 x 33 | 12960 | 46.7 | 39.6 | 49.3 | 47.2 | .... | .... | .... | .... | 45.7 |
| 39.6 x 36 | 13200 | 46.0 | 42.0 | 36.3 | 52.9 | .... | .... | .... | .... | 44.3 |
| 39.6 x 33 | 14400 | 42.8 | 42.9 | 44.9 | 50.1 | .. | .... | .... | .... | 45.2 |
| 36 x 36 | 14520 | 44.8 | 30.0 | 45.4 | 48.5 | .... | .... | .... | .... | 45.2 |
| 36 x 33 | 15840 | 45.6 | 39.3 | 43.9 | 51.8 | .... | .... | .... | .... | 42.2 |
| 33 x 33 | 17280 | 41.7 | 40.1 | 49.8 | 41.7 | .... | .... | .. | .... | 43.3 |
| Two kernels per hill. | | | | | | | | | | |
| Distance between hills (inches). | No. of stalks per acre. | Sycamore Field, 1905. | | | | | | | | 1905 Av. |
| | | 44 x 44 | 6480 | 29.0 | 31.6 | 33.2 | 36.3 | 50.3 | 46.6 |  | 40.4 | 29.0 | 37.1 |
| 44 x 39.6 | 7200 | 31.9 | 36.0 | 36.9 | 37.1 | 57.1 | 50.8 | 47.7 | 41.0 | 42.3 |
| 44 x 36 | 7920 | 30.9 | 34.0 | 41.4 | 43.8 | 55.9 | 44.7 | 45.0 | 42.9 | 42.3 |
| 39.6 x 39.6 | 8000 | 36.9 | 35.8 | 35.3 | 40.5 | 63.9 | 51.4 | 50.9 | 51.4 | 45.8 |
| 44 x 33 | 8640 | 29.1 | 26.2 | 33.0 | 41.0 | 57.4 | 48.3 | 39.5 | 39.2 | 39.2 |
| 39.6 x 36 | 8800 | 34.6 | 38.5 | 43.9 | 46.0 | 63.9 | 53.8 | 46.8 | 49.4 | 47.1 |
| 39.6 x 33 | 9600 | 34.7 | 28.3 | 36.9 | 40.2 | 62.0 | 52.4 | 36.0 | 47.6 | 42.3 |
| 36 x 36 | 9680 | 45.5 | 45.5 | 52.0 | 49.9 | 58.2 | 57.1 | 49.0 | 57.1 | 51.8 |
| 36 x 33 | 10560 | 39.7 | 32.3 | 37.3 | 50.3 | 54.8 | 58.7 | 45.3 | 47.9 | 45.8 |
| 33 x 33 | 11520 | 27.8 | 26.2 | 32.5 | 39.3 | 43.5 | 41.4 | 39.1 | 47.7 | 37.2 |
| Three kernels per hill. | | | | | | | | | | |
| 44 x 44 | 9720 | 56.9 | 36.3 | 45.3 | 33.4 | .... | ... | .... | .... | 43.0 |
| 44 x 39.6 | 10800 | 45.4 | 35.8 | 43.4 | 40.6 | ... | .... | .... | .... | 41.3 |
| 44 x 36 | 11880 | 40.7 | 40.6 | 42.1 | 41.1 | ... | .... | .... | .... | 41.1 |
| 39.6 x 39.6 | 12000 | 41.1 | 45.3 | 46.9 | 38.5 | .... | .... | .... | .... | 43.0 |
| 44 x 33 | 12960 | 40.3 | 43.5 | 50.3 | 43.3 | .... | .... | .... | .... | 44.4 |
| 39.6 x 36 | 13200 | 40.6 | 46.9 | 48.0 | 44.3 | .. | .... | .... | .... | 45.0 |
| 39.6 x 33 | 14400 | 39.0 | 46.0 | 52.8 | 42.0 | ... | .... | .... | .... | 45.0 |
| 36 x 36 | 14520 | 43.9 | 55.4 | 36.6 | 52.8 | .... | .... | .... | .... | 47.2 |
| 36 x 33 | 15840 | 39.5 | 45.3 | 41.7 | 50.8 | .... | .. | .... | .... | 44.3 |
| 33 x 33 | 17280 | 47.8 | 55.9 | 55.2 | 38.9 | .. | .... | .... | .... | 49.5 |

TABLE 6.—CONTINUED

| Two kernels per hill. | | | | | | | | | | |
|----------------------------------|----------------------------|---------------------|------|------|------|----------|---------------------|------|----------|---|
| Distance between hills (inches). | Number of stalks per acre. | DeKalb Field, 1906. | | | | 1906 Av. | DeKalb Field, 1907. | | 1907 Av. | General average all fields all seasons. |
| | | | | | | | | | | |
| 44 x 44 | 6480 | 55.4 | 54.4 | 49.6 | 46.8 | 51.6 | 46.9 | 51.0 | 49.0 | 44.1 |
| 44 x 39.6 | 7200 | 59.5 | 54.4 | 43.2 | 53.1 | 52.6 | 47.6 | 52.0 | 49.8 | 47.1 |
| 44 x 36 | 7920 | 61.9 | 53.1 | 45.3 | 53.1 | 53.4 | 47.8 | 51.1 | 49.5 | 47.6 |
| 39.6 x 39.6 | 8000 | 68.8 | 57.1 | 40.0 | 60.8 | 56.7 | 49.6 | 55.5 | 52.6 | 49.7 |
| 44 x 33 | 8640 | 60.6 | 61.6 | 48.5 | 51.8 | 55.6 | 50.9 | 48.7 | 49.8 | 47.4 |
| 39.6 x 36 | 8800 | 69.3 | 61.1 | ... | 68.3 | 66.2 | 55.3 | 53.2 | 54.3 | 54.3 |
| 39.6 x 33 | 9600 | 74.4 | 70.1 | ... | 73.1 | 72.5 | 52.1 | 49.4 | 50.8 | 53.4 |
| 36 x 36 | 9680 | 76.8 | 62.9 | ... | 72.0 | 70.6 | 51.4 | 55.4 | 53.4 | 54.8 |
| 36 x 33 | 10560 | 78.1 | 74.5 | 42.7 | 74.2 | 67.4 | 57.4 | 57.6 | 57.5 | 54.3 |
| 33 x 33 | 11520 | 71.4 | 66.1 | 59.8 | 70.8 | 67.0 | 51.7 | 59.8 | 55.8 | 52.0 |

| Three kernels per hill. | | | | | | | | | | |
|----------------------------------|----------------------------|---------------------|------|------|------|----------|---------------------|------|----------|---|
| Distance between hills (inches). | Number of stalks per acre. | DeKalb Field, 1906. | | | | 1906 Av. | DeKalb Field, 1907. | | 1907 Av. | General average all fields all seasons. |
| | | | | | | | | | | |
| 44 x 44 | 9720 | 62.4 | 61.3 | 76.8 | 57.6 | 64.5 | 66.4 | 68.2 | 67.3 | 54.1 |
| 44 x 39.6 | 10800 | 69.3 | 63.2 | 81.6 | 66.9 | 70.3 | 69.3 | 66.2 | 67.8 | 55.7 |
| 44 x 36 | 11880 | 70.2 | 57.3 | 82.7 | 69.9 | 70.0 | 70.2 | 72.9 | 71.6 | 56.6 |
| 39.6 x 39.6 | 12000 | 69.8 | 45.3 | 78.9 | 60.3 | 63.6 | 72.3 | 74.2 | 73.3 | 56.6 |
| 44 x 33 | 12960 | 75.2 | 60.8 | 76.8 | 62.1 | 68.7 | 71.6 | 69.3 | 70.5 | 57.3 |
| 39.6 x 36 | 13200 | 74.9 | 60.7 | 85.4 | 64.0 | 71.3 | 70.4 | 72.8 | 71.6 | 58.1 |
| 39.6 x 33 | 14400 | 77.3 | 71.4 | 80.3 | 70.7 | 74.9 | 71.5 | 73.6 | 72.6 | 59.4 |
| 36 x 36 | 14520 | 74.6 | 64.0 | 93.9 | 67.7 | 75.1 | 62.7 | 75.2 | 69.0 | 58.4 |
| 36 x 33 | 15840 | 73.4 | 70.7 | 87.1 | 85.4 | 79.2 | 67.5 | 74.4 | 71.0 | 59.9 |
| 33 x 33 | 17280 | 62.9 | 81.1 | 74.1 | 76.3 | 73.6 | 80.0 | 75.2 | 77.6 | 61.0 |

TABLE 7.—DISTANCE EXPERIMENT URBANA FIELD: SUMMARY OF ALL YIELDS, BUSHEL PER ACRE.

| Two kernels per hill. | | | | | | | | | | |
|----------------------------------|-------------------------|-------|------|-------|------|-------|------|-------|------|------|
| Dist'nce between hills (inches). | No. of stalks per acre. | 1904. | | 1905. | | 1906. | | 1907. | | Av. |
| | | | | | | | | | | |
| 44x44 | 6480 | 39.2 | 33.0 | 36.2 | 45.0 | 60.1 | 58.9 | 68.1 | 61.1 | 50.2 |
| 44x39.6 | 7200 | 34.4 | 35.1 | 43.1 | 49.2 | 55.1 | 62.2 | 66.0 | 68.1 | 51.7 |
| 44x36 | 7920 | 35.6 | 40.6 | 43.9 | 46.0 | 56.4 | 60.1 | 70.2 | 69.1 | 52.7 |
| 39.6x39.6 | 8000 | 35.9 | 35.8 | 47.1 | 49.9 | 68.5 | 64.1 | 73.1 | 73.7 | 56.0 |
| 44x33 | 8640 | 41.1 | 40.5 | 43.8 | 47.2 | 61.4 | 64.9 | 70.3 | 65.1 | 54.3 |
| 39.6x36 | 8800 | 41.5 | 43.8 | 42.9 | 50.4 | 56.0 | 62.0 | 72.9 | 72.8 | 55.3 |
| 39.6x33 | 9600 | 43.4 | 43.2 | 47.6 | 46.5 | 67.9 | 69.2 | 72.9 | 73.9 | 58.1 |
| 36x36 | 9680 | 45.0 | 48.8 | 47.4 | 53.1 | 72.9 | 62.5 | 73.2 | 72.4 | 59.4 |
| 36x33 | 10560 | 45.9 | 46.4 | 46.3 | 49.6 | 66.3 | 65.5 | 73.7 | 83.1 | 59.6 |
| 33x33 | 11520 | 52.5 | 42.0 | 43.0 | 44.0 | 60.1 | 61.3 | 72.5 | 63.4 | 54.9 |

| Three kernels per hill. | | | | | | | | | | |
|----------------------------------|-------------------------|-------|------|-------|------|-------|------|-------|------|------|
| Dist'nce between hills (inches). | No. of stalks per acre. | 1904. | | 1905. | | 1906. | | 1907. | | Av. |
| | | | | | | | | | | |
| 44x44 | 9720 | 45.7 | 41.8 | 45.6 | 56.4 | 49.2 | 58.2 | 67.0 | 69.0 | 54.1 |
| 44x39.6 | 10800 | 48.7 | 45.2 | 44.7 | 48.9 | 49.2 | 59.1 | 68.8 | 68.2 | 54.1 |
| 44x36 | 11880 | 48.9 | 45.9 | 46.1 | 50.4 | 46.1 | 50.7 | 64.7 | 71.2 | 53.0 |
| 39.6x39.6 | 12000 | 50.0 | 45.9 | 46.4 | 53.6 | 39.5 | 66.4 | 69.0 | 72.9 | 55.5 |
| 44x33 | 12960 | 54.5 | 46.1 | 45.0 | 42.8 | 50.9 | 51.7 | 53.1 | 60.4 | 50.6 |
| 39.6x36 | 13200 | 50.1 | 50.8 | 47.0 | 52.4 | 43.0 | 55.1 | 62.1 | 63.7 | 53.0 |
| 39.6x33 | 14400 | 53.0 | 51.0 | 42.3 | 48.5 | 41.5 | 49.5 | 52.4 | 62.8 | 50.1 |
| 36x36 | 14520 | 50.7 | 52.7 | 42.6 | 47.3 | 31.4 | 48.0 | | | 45.5 |
| 36x33 | 15840 | 54.1 | 51.3 | 44.6 | 43.4 | 47.0 | 48.6 | 47.1 | 62.4 | 49.8 |
| 33x33 | 17280 | 55.4 | 55.3 | 44.1 | 42.6 | 43.3 | 47.9 | 42.4 | 47.7 | 47.3 |

TABLE 8.—CONTINUED

Two kernels per hill.

| Distance between hills (inches). | Number of stalks per acre. | 1906. | | 1907. | | Gen. Av. |
|----------------------------------|----------------------------|-------|------|-------|------|----------|
| | | Av. | Av. | Av. | Av. | |
| 44 x 44 | 6480 | 38.9 | 40.5 | 49.6 | 38.9 | 45.5 |
| 44 x 39.6 | 7200 | 44.0 | 44.3 | 43.0 | 44.3 | 47.9 |
| 44 x 36 | 7920 | 47.5 | 39.2 | 54.1 | 47.0 | 48.5 |
| 39.6j x 39.6 | 8000 | 46.9 | 50.1 | 55.5 | 45.9 | 49.6 |
| 44 x 33 | 8640 | 42.9 | 44.0 | 48.5 | 42.9 | 48.7 |
| 39.6 x 36 | 8800 | 46.1 | 47.4 | 52.6 | 46.1 | 50.7 |
| 39.6 x 33 | 9600 | 43.2 | 48.8 | 43.9 | 43.2 | 49.9 |
| 36 x 36 | 9680 | 48.0 | 42.1 | 50.6 | 48.0 | 49.0 |
| 36 x 33 | 10560 | 49.3 | 41.6 | 51.5 | 49.3 | 48.9 |
| 33 x 33 | 11520 | 50.7 | 32.0 | 33.6 | 50.7 | 49.9 |

Three kernels per hill.

| | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 44 x 44 | 9720 | 40.0 | 37.9 | 42.1 | 49.6 | 27.7 | 47.5 | 52.3 | 54.9 | 46.4 | 38.4 | 43.7 | 64.0 | 54.9 | 62.9 | 56.5 | 46.4 | 51.2 | 47.5 | 36.8 | 52.5 | 47.9 | |
| 44 x 39.6 | 10800 | 34.1 | 37.1 | 47.2 | 46.4 | 32.0 | 38.4 | 53.1 | 57.6 | 37.6 | 40.8 | 42.4 | 64.8 | 59.5 | 53.6 | 57.6 | 49.9 | 48.5 | 45.4 | 44.6 | 53.0 | 47.7 | 47.9 |
| 44 x 36 | 11880 | 37.3 | 31.0 | 43.5 | 42.7 | 30.7 | 47.7 | 49.6 | 59.8 | 43.2 | 39.5 | 42.5 | 65.6 | 63.0 | 68.5 | 68.0 | 51.5 | 48.8 | 47.0 | 46.2 | 57.3 | 49.2 | 49.2 |
| 39.6 x 39.6 | 12000 | 34.7 | 36.3 | 53.9 | 41.6 | 46.4 | 53.3 | 62.4 | 42.9 | 41.6 | 45.3 | 49.3 | 53.5 | 58.1 | 57.6 | 63.5 | 53.3 | 51.7 | 50.1 | 49.6 | 54.7 | 48.7 | 48.7 |
| 44 x 33 | 12960 | 32.8 | 32.8 | 40.5 | 41.9 | 37.9 | 35.7 | 40.2 | 56.6 | 37.6 | 37.4 | 39.3 | 58.7 | 53.9 | 72.6 | 55.2 | 61.3 | 55.8 | 39.0 | 52.8 | 56.2 | 47.6 | 47.6 |
| 39.6 x 36 | 13200 | 37.6 | 29.9 | 41.6 | 40.3 | 33.7 | 45.9 | 43.3 | 58.2 | 49.1 | 36.3 | 41.6 | 63.8 | 72.0 | 71.5 | 69.4 | 49.9 | 46.7 | 49.9 | 57.9 | 60.1 | 49.4 | 49.4 |
| 39.6 x 33 | 14400 | 45.8 | 30.7 | 47.5 | 37.6 | 40.6 | 36.3 | 45.9 | 50.6 | 45.6 | 33.9 | 41.5 | 57.4 | 55.0 | 67.0 | 48.8 | 51.7 | 50.7 | 47.2 | 63.0 | 55.1 | 46.4 | 46.4 |
| 36 x 36 | 14520 | 41.6 | 28.8 | 44.2 | 42.6 | 28.8 | 51.2 | 44.8 | 22.4 | 60.8 | 25.4 | 39.1 | 56.5 | 72.5 | 83.7 | 75.2 | 48.0 | 48.5 | 48.0 | 49.1 | 67.2 | 47.3 | 47.3 |
| 36 x 33 | 15840 | 35.5 | 28.9 | 42.1 | 42.6 | 35.5 | 37.9 | 36.0 | 34.4 | 54.7 | 25.1 | 37.3 | 52.3 | 75.5 | 70.4 | 65.1 | 49.1 | 48.8 | 45.4 | 53.6 | 50.5 | 45.5 | 45.5 |
| 33 x 33 | 17280 | 19.2 | 24.5 | 43.7 | 41.1 | 43.7 | 26.6 | 34.6 | 22.4 | 41.1 | 25.6 | 32.3 | 54.4 | 73.6 | 60.8 | 69.3 | 54.4 | 42.7 | 41.6 | 41.1 | 54.7 | 42.6 | 42.6 |

TABLE 9.—DISTANCE EXPERIMENT, MATTOON FIELD: SUMMARY OF ALL AVERAGE YIELDS, BUSHELS PER ACRE, ACTUAL YIELD

| Distance between hills (inches). | Number of stalks per acre. | Two kernels per hill. | | | | | | | | 1904 Av. | Year 1905. | | | | | | | | 1905 Av. | Gen. Av. |
|----------------------------------|----------------------------|-----------------------|------|------|------|------------|------|------|-------|----------|------------|------|-------|------|------------|------|------|------|----------|----------|
| | | Year 1904. | | | | Year 1905. | | | | | Year 1905. | | | | Year 1905. | | | | | |
| 44x44 | 6480 | 51.6 | 46.3 | 40.6 | 41.6 | 46.3 | 34.2 | 43.4 | 48.0 | 46.9 | 45.1 | 46.3 | 61.7 | 56.0 | 51.4 | 48.0 | 50.4 | 46.9 | 46.9 | |
| 44x39.6 | 7200 | 55.6 | 46.9 | 43.4 | 46.6 | 45.9 | 38.2 | 46.1 | 59.9 | 51.9 | 48.2 | 48.7 | 66.4 | 64.6 | 55.0 | 51.3 | 55.8 | 51.0 | 51.0 | |
| 44x36 | 7920 | 50.8 | 43.9 | 41.0 | 46.4 | 45.0 | 42.8 | 45.0 | 58.6 | 64.6 | 59.5 | 58.0 | 68.7 | 62.7 | 69.2 | 62.1 | 62.1 | 53.6 | 53.6 | |
| 39.6x39.6 | 8000 | 54.7 | 53.1 | 48.0 | 49.5 | 50.0 | 43.8 | 49.9 | 63.4 | 58.3 | 55.4 | 55.4 | 71.7 | 64.8 | 62.6 | 61.1 | 61.6 | 55.8 | 55.8 | |
| 44x33 | 8640 | 45.4 | 46.1 | 37.4 | 45.4 | 46.7 | 46.2 | 44.5 | 64.4 | 64.2 | 62.7 | 57.5 | 72.3 | 71.0 | 66.0 | 60.9 | 64.9 | 54.7 | 54.7 | |
| 39.6x36 | 8800 | 51.0 | 50.1 | 43.9 | 46.4 | 45.1 | 38.2 | 45.8 | 66.0 | 56.2 | 68.2 | 63.3 | 60.6 | 63.5 | 73.3 | 65.2 | 64.5 | 55.2 | 55.2 | |
| 39.6x33 | 9600 | 48.5 | 46.9 | 40.8 | 50.1 | 52.8 | 45.9 | 47.5 | 61.1 | 63.4 | 71.6 | 63.6 | 60.0 | 73.4 | 72.0 | 66.0 | 66.4 | 57.0 | 57.0 | |
| 36x36 | 9680 | 47.4 | 45.8 | 47.9 | 43.7 | 49.0 | 33.6 | 44.6 | 67.4 | 55.4 | 76.5 | 62.8 | 55.4 | 61.1 | 77.7 | 70.6 | 65.9 | 55.3 | 55.3 | |
| 36x33 | 10560 | 49.1 | 41.9 | 42.1 | 50.1 | 48.8 | 38.1 | 45.0 | 70.3 | 59.7 | 76.6 | 66.0 | ..... | 68.6 | 80.6 | 72.6 | 70.6 | 57.8 | 57.8 | |
| 33x33 | 11520 | 53.6 | 43.2 | 41.6 | 50.3 | 54.2 | 43.8 | 47.8 | ..... | 77.1 | 73.7 | 70.3 | ..... | 72.6 | 79.4 | 64.6 | 73.0 | 60.4 | 60.4 | |
| Three kernels per hill. | | | | | | | | | | | | | | | | | | | | |
| 44x44 | 9720 | 51.1 | 45.4 | 38.2 | 34.1 | 17.5 | 21.7 | 34.7 | 68.8 | 69.1 | 65.7 | 68.5 | 84.0 | 78.2 | 76.5 | 73.1 | 73.0 | 53.9 | 53.9 | |
| 44x39.6 | 10800 | 51.2 | 47.6 | 37.5 | 45.5 | 19.0 | 31.0 | 38.6 | 66.3 | 72.3 | 66.6 | 70.2 | 81.1 | 77.4 | 76.3 | 72.3 | 72.8 | 54.9 | 54.9 | |
| 44x36 | 11880 | 45.4 | 45.7 | 38.2 | 41.5 | 21.5 | 27.5 | 36.6 | 65.0 | 66.6 | 69.9 | 64.7 | 86.3 | 83.1 | 75.7 | 74.0 | 73.2 | 55.7 | 55.7 | |
| 39.6x39.6 | 12000 | 50.8 | 55.7 | 38.9 | 46.7 | 27.0 | 35.8 | 42.5 | 60.3 | 70.8 | 69.7 | 78.3 | 78.8 | 78.5 | 76.0 | 80.3 | 74.1 | 58.3 | 58.3 | |
| 44x33 | 12960 | 45.7 | 45.7 | 40.2 | 42.0 | 31.7 | 26.2 | 38.6 | 76.8 | 73.1 | 69.4 | 69.9 | 84.0 | 82.0 | 69.7 | 71.8 | 74.6 | 56.6 | 56.6 | |
| 39.6x36 | 13200 | 51.1 | 49.3 | 40.0 | 46.5 | 29.6 | 30.6 | 41.2 | 61.3 | 61.2 | 67.0 | 66.3 | 82.3 | 86.3 | 77.1 | 74.3 | 72.0 | 56.6 | 56.6 | |
| 39.6x33 | 14400 | 46.9 | 43.8 | 36.4 | 44.1 | 35.3 | 32.2 | 39.8 | 71.4 | 64.8 | 65.0 | 69.0 | 69.1 | 77.1 | 76.0 | 72.3 | 70.6 | 55.2 | 55.2 | |
| 36x36 | 14520 | 51.0 | 47.4 | 37.6 | 43.3 | 34.0 | 29.4 | 40.5 | 64.3 | 52.0 | 71.4 | 54.3 | ..... | 78.8 | 72.5 | 77.1 | 67.2 | 53.9 | 53.9 | |
| 36x33 | 15840 | 45.9 | 48.5 | 37.1 | 45.3 | 44.3 | 32.7 | 42.3 | 71.4 | 53.5 | 63.4 | 60.6 | | 83.9 | 77.4 | 65.2 | 67.9 | 55.1 | 55.1 | |
| 33x33 | 17280 | 49.0 | 46.7 | 36.1 | 43.3 | 41.7 | 37.6 | 42.4 | | 59.4 | 64.5 | 64.0 | | 89.7 | 66.9 | 60.5 | 67.5 | 55.0 | 55.0 | |





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