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Factors Affecting Cotton Planting For Mechanized Production

Progress Report, 1948-1952

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OBTAINING SATISFACTORY STANDS OF COTTON AS A MEANS OF REDUCING COST OF PRODUCTION

One of the problems confronting cotton producers today is that of obtaining a satisfactory stand of cotton. If the stand is too thick, a thinning operation may be required, and if the stand is too thin, replanting may be necessary. Thinning and replanting are expensive, time consuming operations; and eliminating the necessity for either of them is desirable as a means of reducing the cost of cotton production.

Many factors may influence satisfactory stand establishment. This bulletin presents the results of investigations on hill spacing, planting rate, planter performance, and some physical characteristics of cottonseed. The influence of these, and other factors, is closely related to satisfactory stand establishment for mechanized cotton production. Since this bulletin is a progress report, certain results are based on completed studies, other results are based on studies still in progress.

CONTENTS

THE RESEARCH on which this report is based is in cooperation with the state agricultural experiment stations in other cotton-growing states, and with the Bureau of Plant Industry, Soils, and Agricultural Engineering of the U. S. Department of Agriculture, as part of a regional research project on cotton mechanization (S-2).

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The present method of achieving a satisfactory stand of cotton consists essentially of planting considerably more seed than is required for the eventual stand, and then hoeing or chopping the excess plants from the row after emergence. This method uses excessive amounts of seed and labor, and these costs may be eliminated if other methods of obtaining a satisfactory stand can be developed.

Two separate series of studies of cotton planting, planters, and seedbeds are being made at the Oklahoma Agricultural Experiment Station. One study, conducted in the field, was designed to investigate the spacing of the cotton hills, the number of seeds per hill, and the influence of the planter boot valve. This planter boot valve is located at the lower end of the seed tube. The second study, conducted in the laboratory, was designed to evaluate planter performance and the possibility of obtaining a given spacing and rate with either present planting equipment or modified planting equipment. Some physical properties of acid delinted cottonseed were also measured in the laboratory.

This bulletin is a progress report of test work designed to evaluate hill spacing, planting rate, planter performance, and the physical characteristics of cottonseed.

FIELD TESTS

In 1949, a test of factorial design was initiated to determine the influence of hill spacing, rate (number of seed per hill), and use of the planter boot valve on plant population, preharvest and harvest losses, and yield. This test has been repeated in substantially the same form each succeeding year.

The six spacings selected for testing were 6, 8, 10, 12, 15, and 19 inches between hills. Two rates of planting were tested, a low rate and a high rate. The low rate was about 2 seeds per hill, and the high rate about 3.5 seeds per hill. The spacing and rate tests were made both with and without actuation of the boot valve on the planter. Each of the variables was replicated three times, and a statistical analysis was made on each year's data.

Planter Boot Valve

Data shown in Table I summarize the results of a four-year investigation of the planter boot valve. No significant difference was obtained between using the boot valve and not using the boot valve for any of the variables measured. In 1952, the sticks in the stripper harvested cotton were measured from plots planted with and without the boot valve. No significant difference in stick content of the stripper harvested cotton was found to exist between the two planting methods. The interactions of boot valve with spacing and rate were not significant for any attribute measured. (**Tables I-XIII appear on pages 19-27.**)

Investigation of the planter boot valve was discontinued at the end of the 1952 season. On the basis of the data obtained, it was concluded that use or omission of the planter boot valve had no significant effect on the number of plants per acre, preharvest loss, machine loss, or gross lint yield.

Planting Rate

(Number of Seeds per Hill)

Table II shows the plants per acre at harvest time for two different planting rates. The low rate gave a plant population near the lower limit (20,000 plants per acre) recommended by numerous investigators for stripper harvesting. The high rate gave a population near the average (40,000 plants per acre) recommended for stripper harvesting.

Preharvest loss was significantly greater for the high planting rate. This may be due to the influence of hill size on maturity or competition for moisture. High plant populations due to the number of plants per hill may require earlier harvesting to minimize preharvest loss.

Machine loss was not significantly different for the two planting rates. The configuration of the plants may affect stripper performance. Both rates gave plant populations high enough to result in desirable stripper-type plants.

A significantly higher lint yield was obtained in 1952 from the low planting rate. The difference in lint yield in 1949 and 1951 was not significantly different for the two rates. Availability of moisture may have more influence on lint yield than does hill size.

The rates tested influence preharvest loss and do not influence harvest loss. This test is being continued for further study of the relation of planting rate to lint yield.

Hill Spacing

With a given number of plants in each hill, the spacing between hills is the principal factor influencing the plant population. Table III shows the range of plant populations obtained from several hill spacings.

The preharvest loss was significantly higher at close hill spacings in 1951 and 1952. In 1949, there were no significant differences in preharvest loss among the several hill spacings. These results may be influenced by the high yield in 1949, and the low yield the other two years. It appears that preharvest loss may increase as plant population increases, whether the population is increased by higher rates or closer hill spacing.

The machine loss was significantly affected by hill spacing in 1952. The differences among the several spacings were not significant in 1949 and 1951. Machine losses may be directly influenced by the size, shape, and fruiting characteristics of cotton plants. Numerous investigators have found that the height of the low boll increases and the

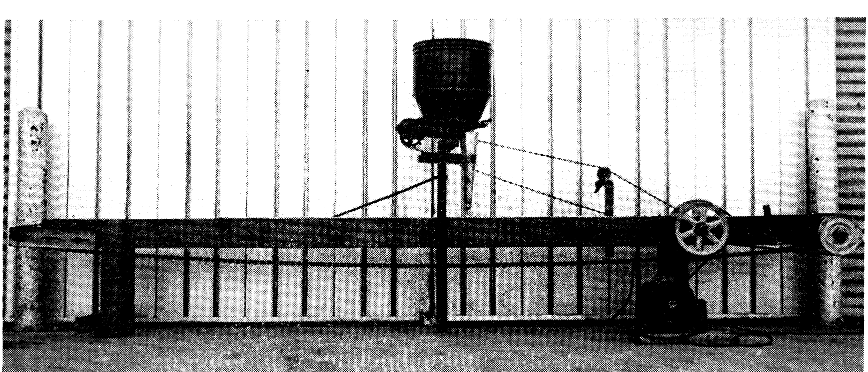

Figure 1.—Test stand used in laboratory study of planters.

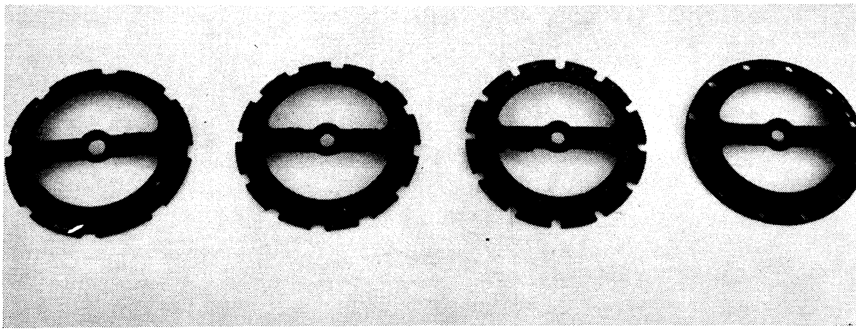

Figure 2.—Plates used in planter test stand studies. From left to right, plates A, B, C, and D.

height of the high boll decreases as plant population increases. The width of the plant decreases as plant population increases.

The data gave no evidence of a real difference in lint yield due to hill spacing. The cotton plant is adaptable to nearly constant production over a wide range of plant populations. Factors other than yield may determine optimum plant population.

The spacings tested may influence both preharvest loss and harvest loss. They apparently do not influence yield. This test is being continued.

PLANTER STUDY

Laboratory Equipment

Tests were made to determine if a specific rate and a specific spacing could be obtained with present planting equipment. In order to evaluate the performance of presently available planting equipment, and to determine the factors that influence its performance, the laboratory test stand shown in Figure 1 was constructed. A conventional type corn planter with horizontal plate, yielding cut-off, roller knock-out, and a smooth seed tube was mounted on a stand and driven from an electric motor. Figure 2 shows some of the plates used. These plates vary in thickness, and in size and shape of the seed cells. Provision was made for varying the speed at which the plates were driven. Under the planter an endless chain conveyor was placed to carry boards ten feet long. The speed of the conveyor could be varied to duplicate varying rates of travel of a planter. The board carried under the planter was greased so that a seed falling on it would remain in the position where it fell. With this set-up, the plate speed, the ground speed, plate height, and position of the box could be varied within rather wide ranges.

Cell Fill

Any seed cell in the seed plates containing 3, 4, or 5 seeds was within an acceptable degree of accuracy. Cells which contained seeds other than this number were unacceptable. Cell fill accuracy was determined by dividing the number of cells containing 3, 4, or 5 seeds by the total number of cells in any one test. Table IV shows the influence of plate speed on mean cell fill, and the percent of accuracy for four different plates. There appears to be no significant difference in cell fill or accuracy among the different plates at any one plate speed. All plates show a decrease in accuracy as plate speed increases.

A test was made using the same types of plates, but having different numbers of cells in each plate. The number of seed cells showed no significant effect on cell fill accuracy within the range of cells tested.

Dispersion at Seed Cell

The dispersion of seeds as they were discharged from the seed cell was evaluated by recording the dispersion, in inches, for each seed in the hill and assigning a progressively greater penalty to badly scattered seed. The overall score was obtained by averaging the scores of the individual hills. This value is called Y. Table V shows the score chart for evaluating dispersion. The hills are more compact as Y approaches one. If Y is less than the mean dispersion, the hills are compact and there are few badly scattered hills. If Y is greater than the mean, there are more scattered hills even though the mean may still be low. By observing Y and comparing it to the mean dispersion, the dispersion characteristics may be evaluated.

In the test planter, the seed must fall from the cell, through an opening in the false ring, and into the seed tube. The false ring opening was 1.312 inches in length with the knock-out centered in this space.

A series of tests was run with this size opening. The opening was then restricted on the forward end by an amount sufficient to cause the cell to open just as the knock-out was ready to eject the seed, and the same series of tests was run again. Table VI shows the results of these two tests. Figure 3 shows the performance of plate "C" using both restricted and unrestricted openings. The performance of the other plates was similar to plate "C". The restriction seemed to increase the dispersion at higher plate speeds, but reduced dispersion at low plate speeds. The cell fill for the restricted opening was less at low plate speeds but greater at high plate speeds. At the highest plate speed there were so many scattered hills that no attempt was made to evaluate the results. All plates seemed to have increased dispersion at low plate speed and again at the extremely high plate speed.

Dispersion in Seed Tube

In addition to the dispersion of the seed leaving the seed cell, the influence of the seed tube on the final dispersion of the seed as it reaches the ground was investigated. A conventional seed tube was compared with one designed to fit the trajectory of the seed as it leaves the seed cell. A study of the velocity components of the seed as it leaves the seed cell showed that the path of free fall of the seed after leaving

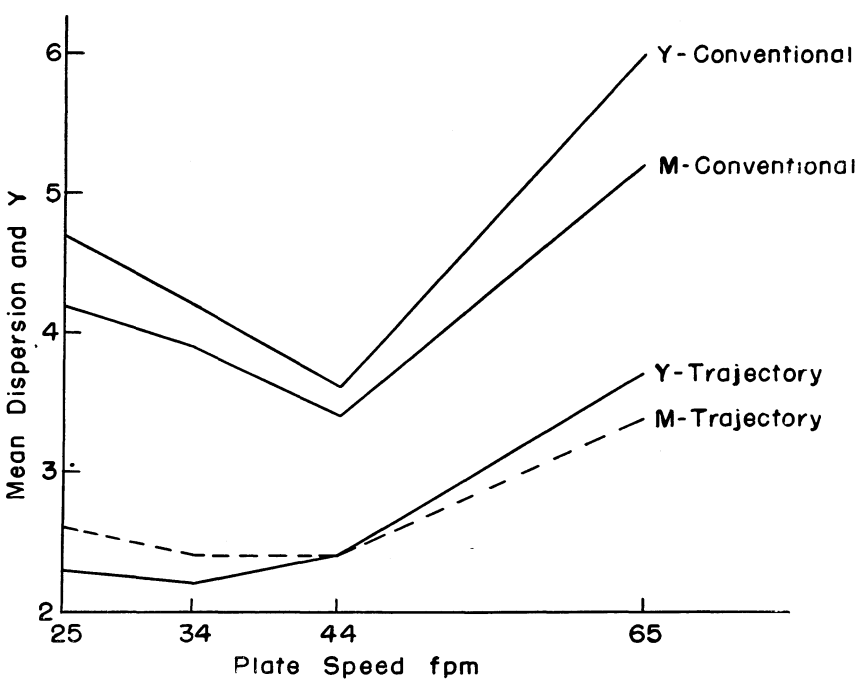

Figure 3.—Mean dispersion and Y for plate "C" using both restricted and unrestricted false ring openings.

the cell was nearly that of a parabola. A tube to fit this trajectory was constructed, as shown in Figure 4. Table VII shows the results of dispersion when using the trajectory tube. Comparison with Table VI makes it evident that the trajectory tube considerably reduced the dispersion at all plate speeds. Figure 5 shows the performance of plate "C" at several plate speeds when used with both the conventional and trajectory seed tubes. Performance of other plates was similar to the one shown.

Ground Speed and Height of Seed Fall

The previous data were evaluated to find the combination of plates, speeds, and seed tubes that gave the best performance. Plate "C" with an unrestricted opening in combination with a trajectory tube was selected. The plate speed chosen was 45 feet per minute. Tests were then made to determine the effect of height of fall and ground speed on the dispersion.

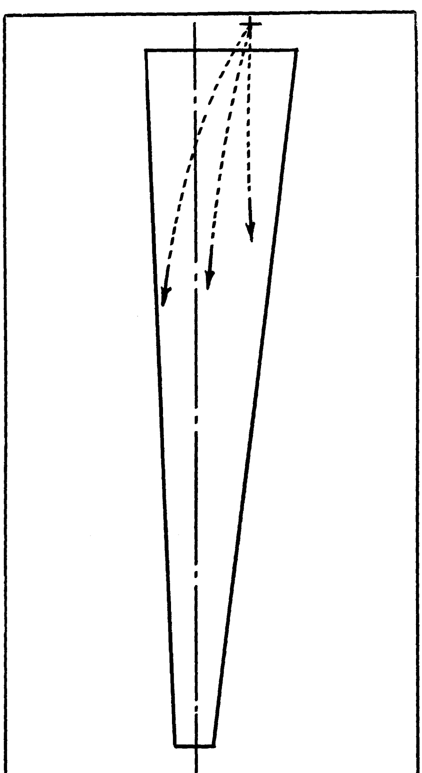

Figure 4. — Trajectory seed tube used in laboratory planter studies.

Table VIII shows the effects of several ground speeds and several plate heights on dispersion. The height of fall had no significant effect on dispersion. The ground speed seemed to have an appreciable effect on dispersion. As the ground speed increased, the dispersion became greater.

Dispersion of the seed upon hitting the soil was also studied. It was apparent that the effect of low dispersion from the seed cell and the seed tube might be nullified by high dispersion occurring when the seed hit the soil. Restricting the seed by changing the furrow opening device could reduce the amount of dispersion occurring at ground level.

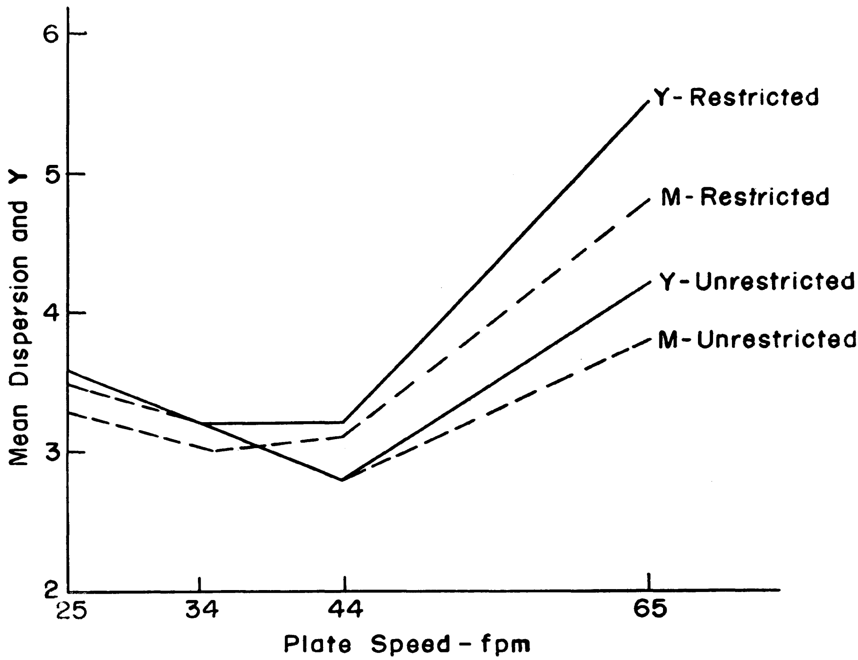

Figure 5.—Mean dispersion and Y for plate "C" at several plate speeds with conventional and trajectory seed tubes.

Seed Hopper Position and Height

A study of the velocity components of cottonseed as it was issued from the seed cell led to the investigation of hopper position relative to the furrow opener. Figure 6 shows schematically the positioning of the conventionally mounted hopper as compared to left and right-mounted hoppers. There was little evidence to indicate that the position of the hopper relative to the furrow opener would have any appreciable affect on cell fill. Therefore, this phase of the investigation was not repeated for the different hopper positions.

Hopper position tests were made for several plate speeds, hopper heights, and ground speeds. Table IX shows the dispersion for these speeds at two hopper positions, and three hopper heights. Table VIII shows dispersion for the conventionally mounted hopper at several heights. The dispersion from the left-mounted hopper was greater than the dispersion from the conventionally mounted hopper and less than the dispersion from a right-mounted hopper.

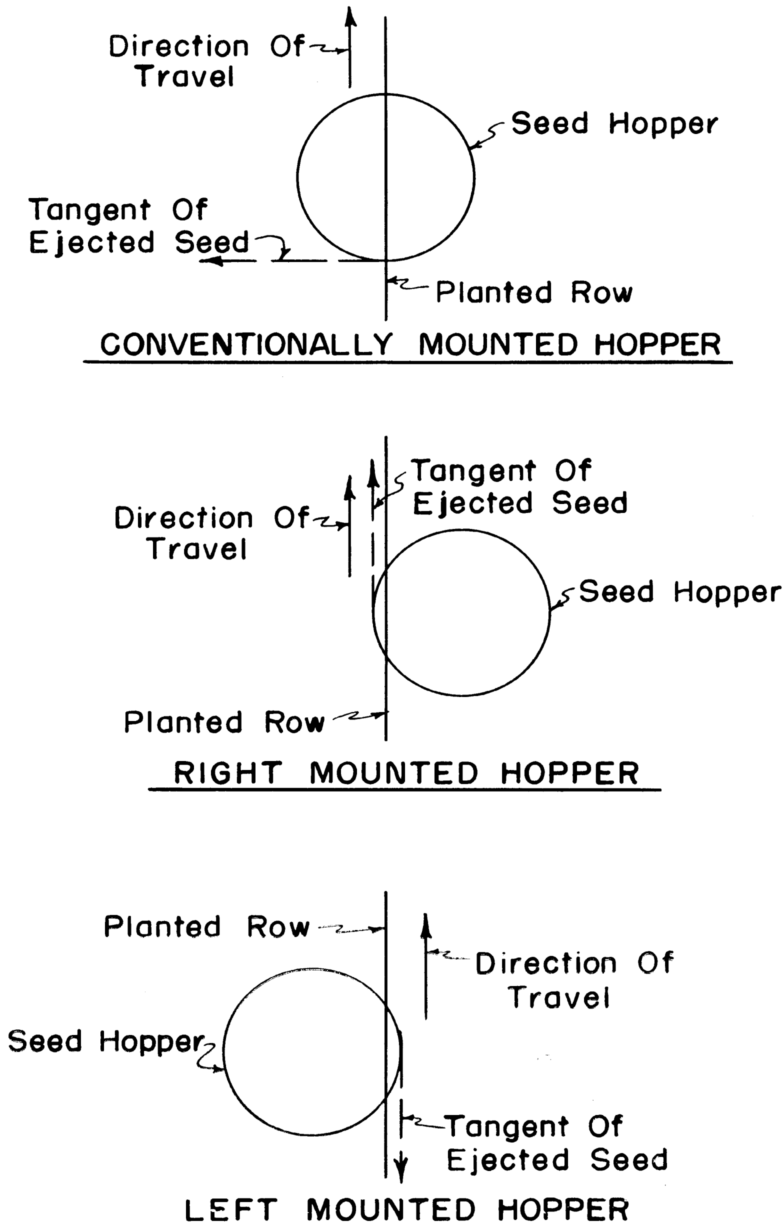

Figure 6.—Hopper mountings used in laboratory study of planter performance.

Low ground speed and medium plate speed gave the best dispersion characteristics regardless of hopper position. There was no best hopper height for all speeds and positions. There is an apparent trend toward lower dispersion at higher hopper heights.

GRADED SEED AND PLANTER PERFORMANCE

In 1952, a study was initiated to evaluate the performance of graded seed in cotton planters used at the Cotton Research Station at Chickasha. Figure 7 shows one of the seed boxes used in this work. Figure 8 shows the various plates used in the individual tests. The principal objective of this work was to determine the influence of plate speed and ground speed on cell fill and hill spacing, using both graded and ungraded seed.

HOW THE COTTONSEED WAS GRADED

All graded seed referred to in this bulletin had been acid delinted, flotation treated and separated into diameter classes by passing over and through round hole screens. Ungraded seed was acid delinted and flotation treated.

Graded Seed Size	Round Hole Screen Size (64th Inches) Through	Over
0	10	--
1	11	10
2	12	11
3	13	12
4	14	13
5	15	14
6	16	15
7	17	16
8	18	17

Table X shows the influence of mean cell fill using both graded and ungraded seed. The mean cell fill decreased as ground speed increased in each case. Table XI shows the influence of spacing on mean cell fill. Using graded seed, the cell fill of both plates was significantly influenced by hill spacing. With ungraded seed, the cell fill of both plates was influenced to a highly significant degree. Considerably less variability existed among the seeds per cell at all spacings for the graded seed than for the ungraded seed.

Another series of tests was run to determine the effect of ground speed, type of plate, and seed size on cell fill.

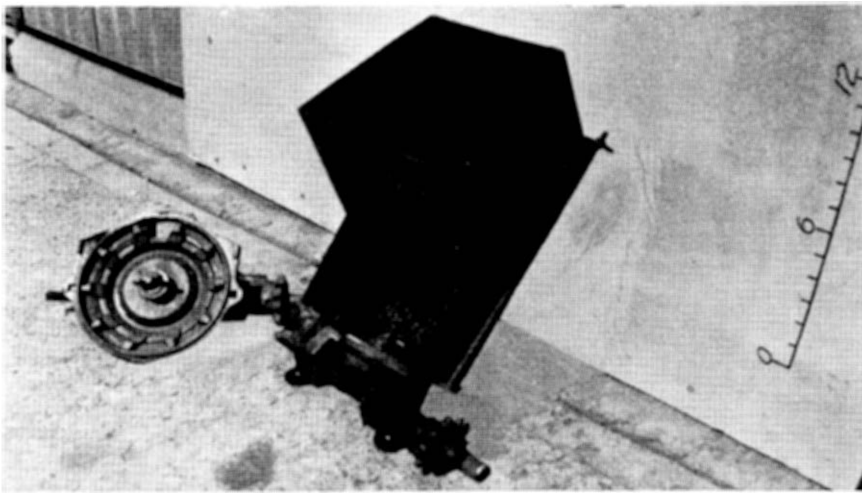

Figure 7.—Planter box used with plate "H."

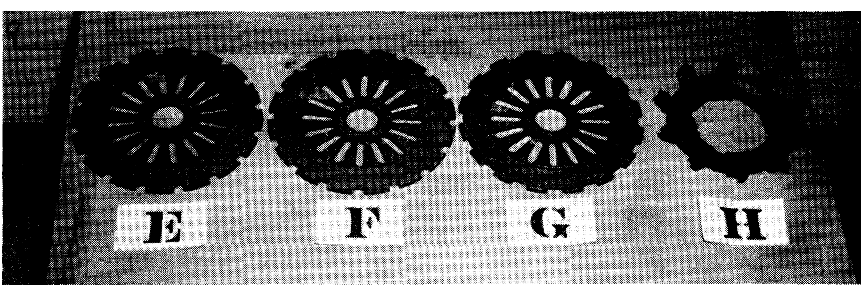

Figure 8.—Planter plates used with graded and ungraded cottonseed.

A statistical analysis of the data summarized in Table XII indicates that:

> Ground speed did not influence cell fill of any plate to a significant degree; however the cell fill tends to decrease as ground speed is increased.
>
> Plate "H" had significantly less variability in cell fill than did plates "F" and "G".
>
> Seed sizes 5 and 6 did not show more variability in cell fill than did seed sizes 3 and 4.

Tests are being continued, using graded seed in combination with various plates, ground speeds, plate speeds, and other planter variables.

SOME PHYSICAL CHARACTERISTICS OF COTTONSEED

The studies of planter performance clearly emphasized the need for additional information on the physical properties of delinted cottonseed. Several hundred pounds of two varieties of acid delinted, flotation cleaned cottonseed were divided into small lots. Each lot was then carefully separated into several diameter classes by screens. Table XIII shows the percentage of each seed size obtained from grading.

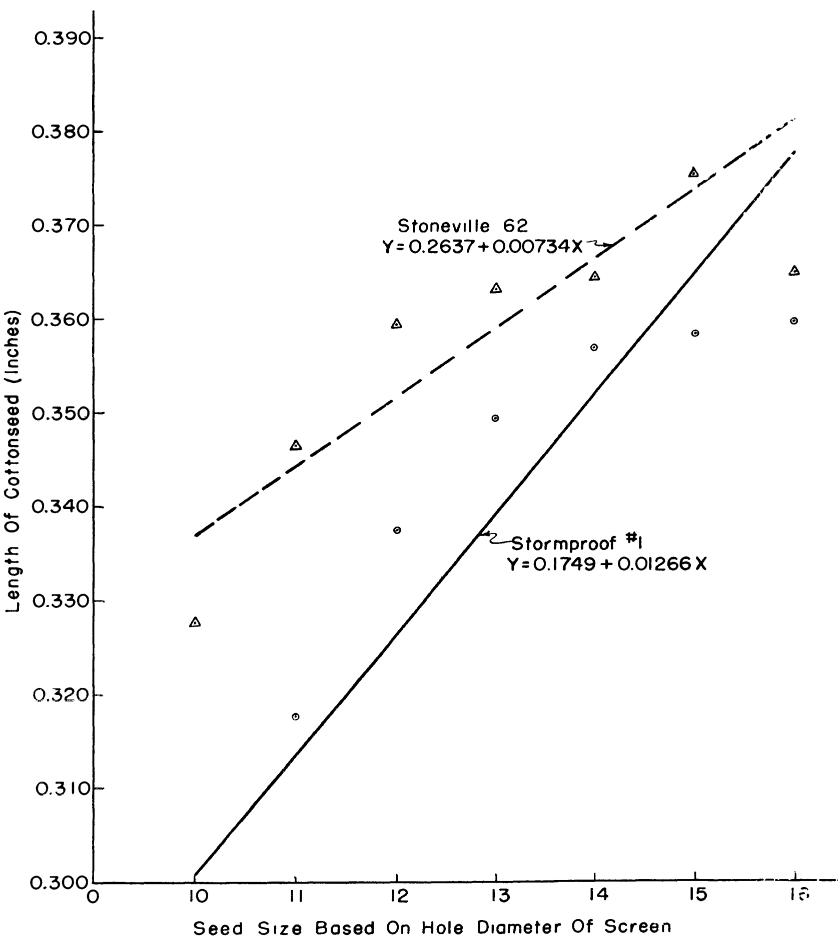

Figure 9.—Relationship of length to diameter of two varieties of acid delinted cottonseed.

Samples of each seed size were taken to determine the length of seed in each size class. Each sample of both varieties consisted of 100 seed for each size. The length of each seed was measured to the nearest ten thousandth of an inch with a micrometer. Figure 9 shows the length of each class of seed. The correlation coefficient of diameter to length was 0.88 for the Stormproof #1 and 0.77 for Stoneville 62.

Samples were also taken to determine the number of seeds of each size in one pound of graded seed. Figure 10 shows this relationship. When expected percent emergence is known the plant population expected from a given number of pounds of any size seed may be predicted.

SUMMARY

1. The planter boot valve had no significant influence on the number of plants per acre obtained, preharvest loss, machine loss, or lint yield.

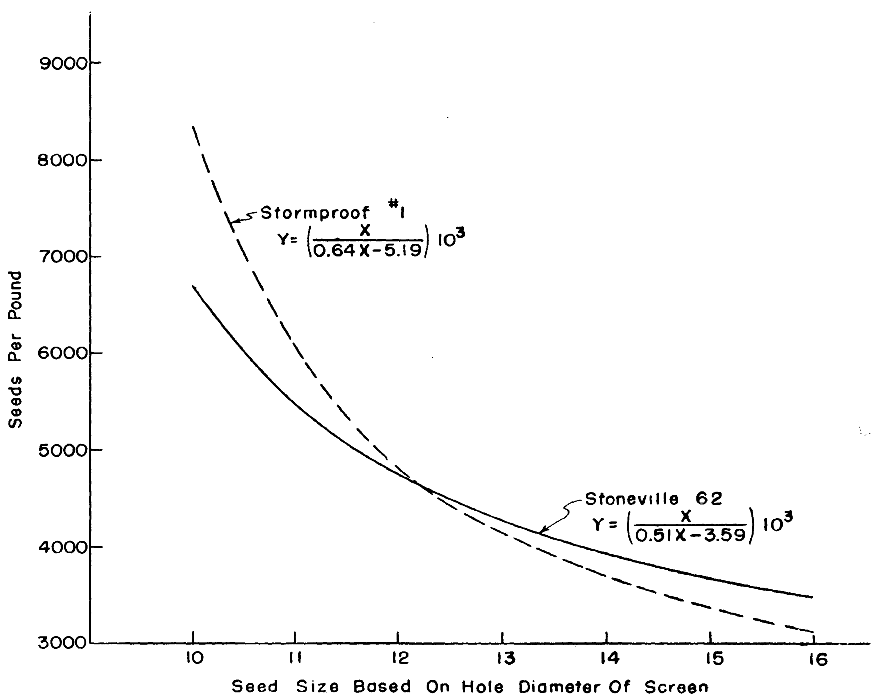

Figure 10—Relationship of seed size to number of acid delinted cottonseeds per pound.

2. Within the range of recommended plant populations for stripper harvesting, the preharvest loss increases as the plant population increases.

3. Within the range of recommended plant populations for stripper harvesting, machine loss is not influenced by the rate of planting, and may not be influenced by the spacing between hills.

4. Within the range of recommended plant populations for stripper harvesting, the yield was not influenced by hill spacing but may be influenced by rate of planting.

5. Cell fill accuracy decreases as plate speed increases.

6. Dispersion from the seed cell is higher at both high and low plate speeds than at a medium plate speed.

7. Dispersion is less through a trajectory tube than through a conventional tube.

8. For a trajectory seed tube, dispersion was not significantly affected by the height from which the seed fell.

9. Dispersion increased as ground speed increased.

10. The dispersion from a left-mounted hopper was greater than from a conventionally mounted hopper and less than from a right-mounted hopper.

11. Low ground speed and medium plate speed gave the best dispersion characteristics for any hopper position.

12. For the left- and right-mounted hoppers, dispersion was not significantly affected by height of fall, but tended to decrease as hopper height increased.

13. Graded cottonseed gave less variability in cell fill than did ungraded seed.

14. A high correlation exists between the length and diameter of cottonseed.

15. A relationship between the average seed diameter and the number of seeds per pound is given.

Table I.—Influence of Planter Boot Valve.

Year	Plants per acre at harvest time	Preharvest loss (percent)	Machine loss (percent)	Gross yield (lbs. lint/A.)
		With Boot Valve		
1949	----	2.66	4.08	375.6
1950	28,880	---	---	---
1951	27,835	2.08	6.98	58.1
1952	29,142	3.31	14.31	104.0
		Without Boot Valve		
1949	---	3.83	4.15	382.1
1950	30,318	---	---	---
1951	25,613	2.67	7.61	67.4
1952	30,710	2.94	13.35	110.6

Table II.—Influence of Planting Rate.

Year	Plants per acre at harvest time	Preharvest loss (percent)	Machine loss (percent)	Gross yield (lbs. lint/A.)
		Low Planting Rate		
1949	15,943	2.53	4.31	362.6
1950	20,125	---	---	----
1951	18,557	1.62	7.64	67.1
1952	23,392	2.89	13.65	126.6
		High Planting Rate		
1949	28,488	3.50	3.83	395.8
1950	39,073	---	---	----
1951	35,153	3.13	6.96	58.3
1952	36,590	3.36	14.01	92.7

Table III.—Influence of Hill Spacing.

Year	Hill spacing (inches)	Plants per acre at harvest time	Preharvest loss (percent)	Machine loss (percent)	Gross yield (lbs. lint/A.)
1949	6	-----	2.49	4.08	449.9
	8	-----	2.64	3.70	385.1
	10	-----	3.10	4.00	408.0
	12	-----	2.93	4.59	358.4
	15	-----	3.64	4.27	362.2
	19	-----	3.28	4.08	358.4
1950	6	39,727	---	---	----
	8	38,681	---	---	----
	10	28,358	---	---	----
	12	24,699	---	---	----
	15	22,085	---	---	----
	19	23,914	---	---	----
1951	6	37,505	3.77	7.41	61.2
	8	30,448	2.36	6.36	70.5
	10	29,142	2.70	6.98	59.3
	12	21,693	1.60	9.06	62.7
	15	24,306	2.56	7.02	57.5
	19	17,250	1.26	6.94	65.3
1952	6	47,306	4.52	12.34	91.4
	8	36,590	3.43	12.12	107.4
	10	32,539	2.37	15.28	97.0
	12	26,267	2.60	12.64	116.3
	15	20,647	3.04	14.94	108.8
	19	16,858	2.14	15.69	123.3

Table IV.—Plate Speed and Number of Cells With Resulting Mean Cell Fill and Cell Fill Accuracy.

Cells in Plate	Plate Speed FPM	Plate A		Plate B		Plate C		Plate D	
		Seeds per Cell	Percent Accuracy	Seeds per Cell	Percent Accuracy	Seeds per Cell	Percent Accuracy	Seeds per Cell	Percent Accuracy
4	100	3.3	85.5	3.3	86.4	3.4	93.3	3.0	86.5
4	65	3.6	93.2	3.7	96.2	3.5	95.7	3.5	93.0
4	44	3.6	94.0	4.0	96.2	3.7	95.9	3.6	98.7
4	34	3.8	94.9	3.9	97.6	3.8	97.0	3.5	98.3
4	25	3.9	96.7	4.1	96.0	3.9	97.7	3.7	98.7
8	25	4.0	95.6	4.2	96.1	3.8	97.5	3.6	98.5
12	25	4.1	97.5	4.1	96.8	3.8	98.7	3.7	97.5
16	25	3.9	95.7	4.1	95.5	3.9	93.3	3.7	94.5

Table V.—Score Chart for Dispersion Tests.
(Dispersion of hill—Inches.)

3 Seeds per hill	4 Seeds per hill	5 Seeds per hill	Individual Y
1.5 or less	2.0 or less	2.5 or less	1
1.6 to 2.1	2.1 to 2.8	2.6 to 3.5	2
2.2 to 2.7	2.9 to 3.6	3.6 to 4.5	3
2.8 to 3.3	3.7 to 4.4	4.6 to 5.5	4
3.4 to 3.9	4.5 to 5.2	5.6 to 6.5	5
4.0 to 4.5	5.3 to 6.0	6.6 to 7.5	6.5
4.6 or more	6.1 or more	7.6 or more	9

Table VI.—Dispersion from Restricted and Unrestricted Seed Cells Using a Conventional Seed Tube.*

Plate	Plate Restricted	25 Y	25 Mean Dispersion	34 Y	34 Mean Dispersion	44 Y	44 Mean Dispersion	65 Y	65 Mean Dispersion	100 Y	100 Mean Dispersion
A	No	5.9	5.3	5.2	4.9	4.1	3.8	5.5	4.4		**
	Yes	5.3	4.1	4.5	4.2	5.3	4.2	6.6	5.4		**
B	No	5.1	4.9	4.6	4.2	4.0	3.9	5.8	4.8		**
	Yes	4.6	4.3	3.9	3.6	2.8	2.9	6.1	5.7		**
C	No	4.4	4.1	4.0	3.9	3.1	3.6	5.2	4.5		**
	Yes	3.5	3.0	3.1	2.8	2.9	2.9	7.4	7.0		**
D	No	4.6	4.3	4.3	4.0	3.5	3.3	5.4	4.8		**
	Yes	4.3	3.6	4.0	3.5	3.2	3.0	6.4	5.4		**

Plate Speed in Feet per Minute: 25, 34, 44, 65, 100.

* Ground speed 2.8 mph; height of seed fall 18″.
** Hill dispersion unacceptably high.

Table VII.—Dispersion from Restricted and Unrestricted Seed Cells Using A Trajectory Seed Tube.*

		Plate Speed in Feet per Minute									
		25		34		44		65		100	
Plate	Plate Restricted	Y	Mean Dispersion	Y	Mean Dispersion	Y	Mean Dispersion	Y	Mean Dispersion	Y	Mean Dispersion
A	No	3.2	3.5	2.6	2.7	2.1	2.3	2.6	3.0	4.2	3.7
	Yes	3.6	3.9	3.7	3.3	3.7	3.5	5.5	4.4	**	**
B	No	2.2	2.6	1.9	2.4	2.2	2.1	2.8	2.7	3.6	3.4
	Yes	2.9	3.0	3.2	3.4	3.8	3.5	5.3	4.2	**	**
C	No	1.7	1.8	1.5	2.0	1.6	1.8	2.6	2.8	3.5	3.1
	Yes	1.3	1.9	1.4	1.6	1.5	1.7	3.4	2.7	4.8	3.8
D	No	1.3	1.5	1.4	1.7	1.4	1.8	3.8	3.4	5.0	3.7
	Yes	2.4	2.4	1.8	1.8	2.5	2.8	3.5	3.6	4.7	3.9

*Ground speed 2.8 mph. height of seed fall 18″.

** Hill dispersion unacceptably high.

Table VIII.—Dispersion from Trajectory Seed Tube with Conventionally Mounted Hopper.*

Height of Seed Fall (Inches)	Ground Speed							
	2. MPH		2.8 MPH		3.5 MPH		4.5 MPH	
	Y	Mean Dis-persion	Y	Mean Dis-persion	Y	Mean Dis-persion	Y	Mean Dis-persion
30	1.6	1.9	1.5	1.9	1.5	1.8	2.0	2.1
24	1.5	1.7	1.4	1.8	1.8	1.8	1.9	1.9
18	1.4	1.8	1.4	1.8	1.4	1.6	2.0	2.2
12	1.7	1.9	1.3	1.7	1.9	2.0	2.0	2.8
6	1.7	1.9	1.2	1.5	1.7	2.0	2.2	2.2

* Plate "C" used for this test was run at 45 Feet Per Minute.

Table IX.—Dispersion from Trajectory Seed Tube for Two Hopper Positions and Three Hopper Heights.*

Ground Speed (MPH)	Hopper Height (Inches)	Dispersion Y				
		Plate Speed FPM				
		28	36	42	45	55
		Left-Mounted Hopper				
2.0	12	2.22	2.38	---	2.67	7.60
	19	1.96	1.81	---	2.47	8.50
	29	1.76	2.50	---	2.68	4.33
4.7	12	2.97	---	4.47	---	3.93
	19	2.73	---	3.24	---	3.06
	29	2.73	---	3.37	---	4.01
		Right-Mounted Hopper				
2.0	12	2.48	---	---	6.25	7.07
	19	2.40	---	---	5.06	6.78
	29	1.84	---	---	3.43	4.74
4.7	12	4.10	---	5.10	---	3.74
	19	2.50	---	3.42	---	4.70
	29	2.83	---	2.50	---	4.58

* Plate "C" used for this test.

Table X.—Seeds per Cell at Different Planter Speeds For Graded and Ungraded Cotton Seed.

Plate	Ground Speed MPH	Seeds per Cell	
		Graded Seed	Ungraded Seed
E	0.75	2.08	2.19
	1.00	2.07	2.17
	1.50	2.04	2.16
	2.00	1.99	2.07
F	0.75	3.48	3.77
	1.00	3.39	3.72
	1.50	3.38	3.67
	2.00	3.31	3.60

Table XI.—Seeds per Cell at Different Hill Spacings for Graded and Ungraded Cottonseed.

Plate	Hill Spacing Inches	Seeds per Cell	
		Graded Seed	Ungraded Seed
E	6	2.01	2.08
	8	2.03	2.16
	10	2.07	2.21
	12	2.05	2.11
	16	2.06	2.14
	20	2.05	2.18
F	6	3.37	3.58
	8	3.42	3.66
	10	3.42	3.73
	12	3.31	3.64
	16	3.41	3.75
	20	3.42	3.78

Table XII.—Seeds per Cell Using Seed Sizes, Plates, and Ground Speeds.

Plate	Seed Sizes	Seeds per Cell			
		1.5 MPH	2.0 MPH	2.5 MPH	3.0 MPH
F	5 and 6	1.94	1.90	1.92	1.79
G	5 and 6	3.40	3.27	3.24	3.19
H	5 and 6	1.74	1.78	1.76	1.78
F	3 and 4	2.30	2.28	2.22	2.16
H	3 and 4	2.16	2.17	2.14	2.13

Table XIII.—Percentage of Cottonseed In Several Size Classes.

Seed Size	Stoneville 62 (percent)	Stormproof #1 (percent)
0	0.48	0.21
1	2.53	1.56
2	16.47	13.57
3	56.53	46.39
4	21.76	31.60
5	1.83	5.80
6	0.24	0.68
7	0.16	0.17
8	0.01	---