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**FIBER AND SPINNING
PROPERTIES OF COTTON
AS AFFECTED BY
CERTAIN HARVESTING
AND
GINNING PRACTICES**

**Yazoo - Mississippi Delta,
1959-60**

U.S. DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service • Economic Research Service
Agricultural Research Service

SUMMARY AND CONCLUSIONS

The study was made on 93 bales of Deltapine 15 cotton grown in the Delta area of Mississippi. All cotton was mechanically harvested except for six bales that were hand-picked. These bales were ginned using various combinations of drying and cleaning. Classification, fiber, and spinning tests were made on each bale.

In general, the effects of seed-cotton cleaning on the cottons in this study were relatively small. Either increasing the amount of lint cleaning or decreasing the lint moisture during ginning caused:

- (1) an increase in bale values when the premiums and discounts for grade and staple length were relatively large (1959 prices) but had less effect on bale values when the premiums and discounts were smaller (1961 prices);
- (2) adverse effects on fiber length and length distribution;
- (3) no change in fiber strength or micronaire readings;
- (4) adverse effects on break factors of yarns;
- (5) slight reductions in yarn appearance indexes;
- (6) no essential change in spinning end breakage for 40s yarns but increased end breakage for 50s yarn;
- (7) a reduction in picker and card waste but increased clean cotton costs.

The only consistent differences between hand-picked and machine-picked cottons were that the hand-picked lots had less foreign matter and were classed higher than machine-picked cottons. These test results show that the fiber and spinning quality of cotton properly harvested by mechanical pickers (spindle type) is equal to cotton harvested by hand.

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FIBER AND SPINNING PROPERTIES OF COTTON AS AFFECTED BY CERTAIN HARVESTING AND GINNING PRACTICES YAZOO-MISSISSIPPI DELTA, 1959-60

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INTRODUCTION

Cotton quality may be affected by variety and quality of the seed planted and by everything that is done to the cotton during production and ginning. Soil, fertilizer, weather and farming practices during the growing season, weather exposure from the time the bolls open until harvest, and methods of harvesting and ginning--all affect the quality. Three previous studies² have shown that ginning conditions may have a considerable influence on grade and staple length--and thereby on the price per pound paid to the producer--and may also affect fiber length and length distribution, spinning performance, and yarn quality.

The objective of the series of tests reported here was to determine the effects of certain cotton harvesting and ginning practices on return to growers, gin costs, cotton fiber properties, mill-processing performance, and quality of end products. The present study specifically deals with the effects of fiber lint moisture resulting from drying, seed-cotton cleaning, and lint cleaning during ginning on fiber properties and spinning performance and compares the quality of mechanically harvested and hand-picked lots of cotton.

PROCEDURE

Ginning

Cotton for this study was Deltapine 15, grown in the Delta section of Mississippi between the Yazoo and Mississippi Rivers. The entire study consisted of three replications, or a total of 93 bales. Each replication, comprising 31 bales, was picked on 1 day and ginned during the following 2 days.

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² U. S. Agricultural Marketing Service. Effects of Cleaning Practices at Gins on Fiber Properties and Mill Performance of Cotton. A Progress Report. U. S. Dept. Agr. Mktg. Res. Rpt. No. 269, 20 pp. Aug. 1958.
Ross, John E., Leonard, Clarence G., and Shanklin, Edward H. Cotton Fiber and Spinning Properties as Affected by Certain Ginning Practices in San Joaquin Valley, California, Season 1958-59. U. S. Dept. Agr. Mktg. Res. Rpt. No. 486, 24 pp. July 1961.

Shanklin, Edward H., Calkins, E. W. S., and McCaskill, Oliver L. Effects of Cotton Ginning Practices on Market Quality of Cotton, A Mississippi Delta Variety, 1958-59. U. S. Dept. Agr. Mktg. Res. Rpt. No. 576, 31 pp. Jan. 1963.

The picking dates were September 24, September 30, and October 4. The pickers (spindle type) used in this study were examined before and during picking to insure proper operating condition, and cotton in the picker basket was examined frequently during harvesting to insure that the lubricating oil on the picker head was not contaminating the cotton. The first basket of cotton picked each morning did contain oil and was discarded.

Each replication included 27 one-bale lots of machine-picked cotton covering all the combinations for three levels of drying, three degrees of seed-cotton cleaning, and three degrees of lint cleaning; plus 2 bales ginned from machine-picked cotton at moisture levels outside the range of the main test and 2 bales ginned from hand-picked seed cotton, making a total of 31 bales.

Fiber moisture levels obtained by drying were very low (averaging 2.6 percent), low (4.0 percent), and moderate (6.1 percent). The two additional machine-picked lots were ginned at an extremely low moisture level (averaging 2.2 percent) and a normal moisture level (6.9 percent), using moderate seed-cotton cleaning and one lint cleaner. The two bales of hand-picked seed cotton were ginned under the extreme ginning conditions; namely, (1) maximum seed-cotton cleaning, plus two lint cleaners at very low moisture, and (2) minimum seed-cotton cleaning with no lint cleaning at the moderate moisture level.

Details of the ginning procedure are given in Appendix I.

Fiber Tests

After removal of the bale ties and before processing, samples for fiber tests and for moisture tests were taken at intervals throughout each bale. One sample was also taken from the card sliver of each lot. These samples were mechanically blended, and Suter-Webb array, Fibrograph, Micronaire, and "0" and 1/8-inch gauge Pressley strength tests were made on each sample.³

Spinning Tests

Each test lot was processed to produce one full doff of 40s yarn. In addition, portions of the three replications of each treatment were combined and blended to produce 1 full doff of 40s yarn and a full doff of 50s yarn, using standard processing procedures throughout. Ends down were recorded at 15-minute intervals during spinning, and tests were made for yarn size, skein strength, and yarn appearance.

Details of the spinning procedure are given in Appendix II.

RESULTS

Only the most important and significant findings are discussed in this section. Full details of the test results and statistical analyses are given in Appendix III.

³ The use of trade names in this report is for identification only and does not constitute endorsement of the products by the U. S. Department of Agriculture.

Effects on Cotton Quality

No combination of the ginning conditions used in this study had any significant effect on fiber strength or on micronaire readings.

In general, increased seed-cotton cleaning resulted in less foreign matter in the seed cotton at the feeder, less nonlint content in the ginned lint, some improvement in grade, and higher nep counts in the card web. But the effects of seed-cotton cleaning were very small when compared with those of moisture levels and lint cleaners. Seed-cotton cleaning also had statistically significant but small effects on yarn strength. For the remainder of this discussion, conclusions will be based on the average effects of moisture and lint cleaners across all three seed-cotton cleaning treatments.

Fiber length. -- Mean fiber lengths for the various treatments, as measured by the Suter-Webb sorter, are given in the following tabulation:

Lint cleaners	Mean length (array)			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>	<u>Inches</u>
0.....	1.07	1.04	1.03	1.05
1.....	1.05	1.03	1.02	1.03
2.....	1.06	1.02	1.00	1.03
Average.....	1.06	1.03	1.02	1.04

Drying from moderate to low moisture reduced the mean length by 0.02 to 0.04 inches at any level of lint cleaning, and further drying to the very low moisture level resulted in a further reduction of 0.01 to 0.02 inches. The effect of lint cleaning on mean length was negligible with moderate moisture, but at very low moisture, two lint cleaners reduced the mean length by 0.03 inches.

Upper quartile length showed a similar trend (table 6, Appendix III), but the overall reduction from moderate moisture and no lint cleaning to very low moisture and two lint cleaners was only 0.04, compared with 0.07 inches for mean length. Fibers shorter than 1/2 inch increased from 7.2 percent to 10.8 percent (table 7, Appendix III), and the coefficient of length variation increased from 28 percent at moderate moisture without lint cleaning to 33 percent at very low moisture with two lint cleaners (table 6, Appendix III).

Fibrograph measurements of length and length uniformity in general showed the same trends as array measurements, but the differences were smaller.

In measurements made by classers, the staple length tended to be longer for moist cotton than for drier cotton and also for cotton cleaned in lint cleaners than for uncleaned cotton or cotton cleaned in fewer lint cleaners, as shown by the following tabulation:

Lint cleaners	Staple length			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>32ds</u>	<u>32ds</u>	<u>32ds</u>	<u>32ds</u>
0.....	33.2	33.0	33.0	33.1
1.....	33.5	33.6	33.1	33.4
2.....	33.8	33.6	33.4	33.6
Average.....	33.5	33.4	33.2	33.4

When the array was used to measure cotton in the laboratory, the length of the moist cotton also appeared to be longer than that of the drier cotton (table 6, Appendix III); but, in contrast to measurements by classers, additional lint cleaning resulted in shorter fiber length.

Foreign matter, grade, and price. -- Total waste as measured by the Shirley Analyzer in the ginned lint ranged from 6.8 percent at moderate moisture without lint cleaning to 2.1 percent at very low moisture with two lint cleaners as shown in the following tabulation:

Lint cleaners	Total waste (Shirley Analyzer)			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
0.....	6.8	5.0	4.8	5.6
1.....	3.8	2.8	2.7	3.1
2.....	2.8	2.1	2.1	2.3
Average.....	4.4	3.3	3.2	3.6

The following tabulation shows estimated bale weights obtained by assigning a bale weight of 500 pounds to the treatment that showed the highest total moisture and foreign

matter, and deducting for all other treatments the weight loss due to drying and the difference in nonlint content as measured by the Shirley Analyzer:⁴

Lint cleaners	Bale weight ¹ (estimated)			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>	<u>Pounds</u>
0.....	500.0	475.1	466.8	481.6
1.....	478.6	464.5	457.7	466.9
2.....	473.7	462.3	454.8	463.6
Average.....	484.1	467.3	459.8	470.4

¹ Lint loss in cleaning not deducted.

Grades varied from Good Ordinary Plus with minimum drying and cleaning to Middling with very low moisture and two lint cleaners (table 10, Appendix III). In general, the second lint cleaner improved the grade less than the first cleaner, especially at very low moisture. Grades cannot be averaged, but in this test the differences in staple length were so small that the differences in price per pound depended almost entirely on grade. Average prices at Greenwood, Miss., for November 1959, which are summarized in the following tabulation, reflect trends in grade improvement due to lint cleaning and drying:

Lint cleaners	Price per pound, 1959			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Cents</u>	<u>Cents</u>	<u>Cents</u>	<u>Cents</u>
0.....	24.29	28.07	28.41	26.92
1.....	28.78	30.36	30.47	29.87
2.....	29.96	31.46	31.55	30.99
Average.....	27.68	29.96	30.14	29.26

The higher price due to grade improvement is partially offset by the loss of up to 5.8 percent moisture and 6.4 percent foreign matter in drying and cleaning, which reduces the bale weights by as much as 12 percent, or about 60 pounds.

⁴ Actual bale weights are likely to be about 5 pounds less than those shown for one lint cleaner and 8 pounds less for two lint cleaners, because of the lint removed along with the foreign matter. It was not practical to collect and weigh lint cleaner waste in this test.

Multiplying the prices per pound above by the bale weights in a previous tabulation gives the following bale values:

Lint cleaners	Average return to grower, per bale, 1959 ¹			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
0.....	121.45	133.36	132.62	129.14
1.....	137.74	141.02	139.46	139.37
2.....	141.92	145.44	143.49	143.62
Average.....	133.70	139.94	138.52	137.38

¹ Averages of the bale values shown in table 10, Appendix III for 3 seed-cotton cleaning treatments.

The first lint cleaner added approximately \$16 to the bale value at moderate moisture and \$7 at low or very low moisture, and the second lint cleaner added only about \$4 at any moisture level. Drying from moderate to low moisture added approximately \$6 per bale, but further drying resulted in a net loss of \$1 to \$2 because the increase in price per pound was not enough to offset the loss in bale weight.

By November 1961, the discounts for low grades had narrowed considerably, with the result that price increases due to lint cleaning and drying were approximately half as great as in 1959. The following tabulation summarizes the average prices in November 1961:

Lint cleaners	Price per pound, 1961			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Cents</u>	<u>Cents</u>	<u>Cents</u>	<u>Cents</u>
0.....	30.26	32.26	32.50	31.67
1.....	32.72	33.57	33.63	33.31
2.....	33.34	34.16	34.19	33.90
Average.....	32.11	33.33	33.44	32.96

These 1961 prices and the estimated bale weights give the following bale values.

Lint cleaners	Average return to grower, per bale			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
0.....	151.30	153.27	151.71	152.09
1.....	156.60	155.93	153.92	155.48
2.....	157.93	157.92	155.50	157.17
Average.....	155.28	155.71	153.71	154.70

Lint cleaning was still profitable to the grower if this service was performed by the ginner at no extra charge, and if no allowance was made for the lint taken out of the bale by the lint cleaner along with the waste. Allowing for an average lint loss of 5 pounds at the first lint cleaner and 3 pounds at the second, the average gain due to lint cleaning was reduced to \$1.65 for the first lint cleaner and 59 cents for the second.

Spinning Performance

Yarn quality. -- Yarn strength was adversely affected by drying and lint cleaning. The break factor of 40s yarn was reduced from 2069 at moderate moisture without lint cleaning to 1812 at very low moisture with two lint cleaners. On the average, removal of each one percent of moisture lowered the break factor 55 units, and each lint cleaner lowered the break factor 32 units. The following tabulation shows the break factor of 40s yarn:

Lint cleaners	Break factor of 40s yarn			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Units</u>	<u>Units</u>	<u>Units</u>	<u>Units</u>
0.....	2069	1964	1875	1969
1.....	2036	1920	1850	1935
2.....	2012	1890	1812	1905
Average.....	2039	1925	1846	1936

Yarn appearance was similarly affected, but not so consistently, as shown in the following tabulation:

Lint cleaners	Appearance index			
	Moderate moisture	Low moisture	Very low moisture	Average
0.....	102.2	94.4	93.3	96.7
1.....	¹ 95.0	91.1	88.9	91.7
2.....	89.9	86.7	94.1	89.3
Average.....	95.7	90.7	91.1	92.5

¹ Corrected for two low micronaire lots. (See table 11, Appendix III).

Spinning efficiency. --Ends down per 1,000 spindle hours (EDMSH) in spinning showed different trends in 40s yarn than in 50s:

Size of yarn and number of lint cleaners	Ends down per 1,000 spindle hours			
	Moderate moisture	Low moisture	Very low moisture	Average
<u>40s yarn</u>				
0.....	32.9	38.1	30.4	33.8
1.....	¹ 30.4	31.7	29.8	30.6
2.....	29.8	27.3	30.0	29.0
Average.....	31.0	32.4	30.1	31.2
<u>50s yarn</u>				
0.....	76.3	110.3	124.7	103.8
1.....	² 99.0	94.0	129.7	107.6
2.....	71.7	99.3	324.7	165.2
Average.....	82.3	101.2	193.0	125.5

¹ Corrected for two low micronaire lots. (See table 11, Appendix III).

² High ends down probably due to low micronaire lots. (See table 11, Appendix III).

In spinning 40s yarn, the treatments that gave the lowest EDMSH were, in general, those that resulted in the least Shirley Analyzer waste in the ginned lint. That is, more cleaning was associated with fewer ends down in spinning.

In spinning 50s yarn, on the other hand, the fewest ends down occurred with the treatments that resulted in the least fiber breakage and highest yarn strength. At moderate moisture, the difference due to lint cleaners was slight and inconsistent, but at very low moisture, when fibers are most subject to breakage in cleaning, the effect of lint cleaners in increasing ends down was more pronounced.

The difference in ends down between treatments was much greater in spinning 50s than 40s yarn, as if the two effects of drying and cleaning (less foreign matter and more fiber breakage) nearly offset each other in 40s, but the finer yarns were more sensitive to fiber breakage.

Manufacturing waste. --Effects of drying and lint cleaning on total picker and card waste are shown in the following tabulation:

Lint cleaners	Picker and card waste			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
0.....	9.45	8.00	7.63	8.36
1.....	7.20	6.13	5.90	6.41
2.....	6.25	5.60	5.43	5.75
Average.....	7.63	6.58	6.32	6.84

By adding 4.4 percent for bagging and ties to the waste percentages in the tabulation and subtracting from 100, it is possible to estimate the yield of card sliver per 100 pounds of bale weight. Dividing the price of raw cotton by these yield percentages gives the "clean cotton cost," or cost of raw cotton per pound of card sliver produced. Since waste percentages at processes subsequent to carding are not appreciably affected by raw cotton quality, but do vary quite widely from one mill to another, these costs per pound of card sliver are more meaningful, and more generally applicable than costs per pound of yarn produced under pilot plant conditions.

The following tabulation shows the costs of clean cotton, per pound, based on 1959 and 1961 prices:

Lint cleaners	Cost of clean cotton, per pound			
	Moderate moisture	Low moisture	Very low moisture	Average
	<u>Cents</u>	<u>Cents</u>	<u>Cents</u>	<u>Cents</u>
<u>1959 prices</u>				
0.....	28.20	32.04	32.30	30.84
1.....	32.56	33.93	33.97	33.48
2.....	33.53	34.97	34.99	34.49
Average.....	31.43	33.64	33.75	32.94
<u>1961 prices</u>				
0.....	35.12	36.83	36.94	36.29
1.....	37.01	37.52	37.49	37.34
2.....	37.31	37.96	37.92	37.73
Average.....	36.48	37.43	37.45	37.12

The difference between the highest and lowest clean cotton costs was 6.79 cents in 1959 and only 2.84 cents in 1961. But for either year, on the average, the lowest cost cotton was that which produced the highest yarn break factor, highest yarn appearance index, and the least or next to least end breakage in spinning 50s yarn. Cotton that showed the highest clean cotton cost in 1959 produced 12.4 percent weaker yarn, 11.1 points lower yarn appearance index, and more than four times as many ends down in spinning 50s as the lowest cost cotton. There appears to be little or no relationship between clean cotton cost and ends down in spinning 40s yarn.

These conclusions apply only to different qualities of cotton produced from the same seed cotton by varying the drying and cleaning treatments and the resulting leaf content.

Effects of Extreme Moisture Conditions

The fiber and processing data for lots ginned with five levels of lint-slide moisture are given in table 1. These lots were all ginned with moderate seed-cotton cleaning and one lint cleaner.

As the lint-slide moisture decreased from 6.9 to 2.7 percent, the grade improved from Low Middling Plus to Strict Low Middling Plus. A further reduction in moisture did not cause any additional grade improvement. These grade improvements coincide with a reduction in the foreign matter from 4.1 to 2.2 percent as indicated by the Shirley Analyzer nonlint content. For both 1959 and 1961 prices, the bale value tended to increase as the moisture level at which the cotton was ginned increased. As the moisture content decreased from 6.9 to 3.8 percent, the manufacturing waste was reduced from 7.6 to 6.0 percent. However, a further reduction in the moisture content did not cause any significant further reduction in the manufacturing waste.

As the grade was improved and as the foreign matter was reduced with a reduction in moisture content, other factors of quality were adversely affected. For example, as the moisture content during ginning was reduced from 6.9 to 2.2 percent, the staple length was reduced from 34.2 to 33.0 thirty-seconds of an inch, upper quartile length was reduced from 1.31 to 1.23 inches, mean length was reduced from 1.10 inches to 1.00 inch, coefficient of length variation was increased from 27 to 33 percent, fibers shorter than 1/2 inch were increased from 6.3 to 11.0 percent, break factor for 40s yarn was reduced from 2125 to 1715, and break factor for 50s yarn from 1995 to 1580.

When the moisture content was reduced from 6.9 to 3.8 percent, ends down for 50s yarn were not consistently affected, but further reduction in the moisture content caused a rapid increase in ends down.

Other differences were less important and generally not significant.

Comparison of Hand-Picked and Machine-Picked Cottons

Cotton quality data for hand-picked and machine-picked cotton ginned with two ginning conditions are given in table 2. The hand-picked cotton was graded higher than the machine-picked cotton for both ginning conditions--two grades higher for the minimum cleaning setup and one grade higher for the more elaborate cleaning setup. The hand-picked cotton had less foreign matter (as indicated by Shirley Analyzer and manufacturing waste) than the machine-picked cotton for both ginning conditions, but the differences were much smaller under the elaborate ginning setup.

Table 1.--Effects of extreme lint moisture conditions on fiber and yarn properties and on spinning performance, Yazoo-Mississippi Delta, 1959-60 season

Quality measure ¹	Lint-slide moisture (percent) during ginning ²				
	6.9	5.8	4.8	3.7	2.1
Grade.....	LM+	LM+	LM	LM+	LM
Staple.....32d inch..	34.2	33.7	33.2	33.1	33.1
Bale value, 1959.....dollars..	140.81	137.37	133.47	136.55	136.80
Bale value, 1961.....dollars..	157.44	164.03	152.59	150.53	149.82
Array					
Upper quartile length.....inches..	1.31	1.29	1.26	1.23	1.23
Mean length.....inches..	1.10	1.09	1.03	1.11	1.09
Coef. of length var.....percent..	27	28	31	31	33
Fibers shorter than 1/2".....percent..	6.3	6.9	9.3	10.5	11.0
Fiber strength					
"0" gauge.....1000 p.s.i..	78	79	77	79	77
1/8" gauge.....grams/tex..	22.4	22.1	21.5	21.2	21.0
Micronaire.....reading..	4.4	4.3	4.5	4.4	4.4
Nonlint content (S.A.).....percent..	4.1	3.5	2.8	2.7	2.2
Manufacturing waste.....percent..	7.6	7.2	6.0	5.8	6.0
Neps per 100 square inches.....	10	13	9	26	10
Yarn appearance					
40s.....grade..	C	C	C	C	C
50s.....grade..	C+	C	C	C	C
Break factor					
40s.....units..	2125	2068	1948	1880	1715
50s.....units..	1995	1925	1790	1670	1580
Ends down per 1,000 spindle hours					
40s.....	32	35	25	30	29
50s.....	85	68	79	140	340

¹ Average of three replications for all quality measures except spinning data for 50s yarn.

² All lots were ginned with moderate seed-cotton cleaning and with one lint cleaner.

Table 2.--Hand-picked and machine-picked cotton ginned under extreme cleaning conditions, Yazoo-Mississippi Delta, 1959-60 season

Quality measures ¹	Simple seed-cotton cleaning; no lint cleaners; lint-slide moisture--		Elaborate seed-cotton cleaning; 2 lint cleaners; lint-slide moisture--	
	6.2 percent; hand-picked cotton	7.1 percent; machine-picked cotton	2.8 percent; hand-picked cotton	2.5 percent; machine-picked cotton
Grade.....	LM+	G0+	SM	M
Staple.....32d inch..	33.5	33.2	33.3	33.5
Array				
Upper quartile length.....inches..	1.27	1.27	1.24	1.25
Mean length.....inches..	1.07	1.05	1.01	1.01
Coef. of length var.....percent..	28	29	32	32
Fibers shorter than 1/2"..percent..	7.1	8.0	10.4	10.4
Fiber strength				
"0" gauge.....1000 p.s.i..	80	79	78	78
1/8" gauge.....grams/tex..	21.6	21.7	20.6	20.7
Micronaire.....reading..	4.5	4.4	4.6	4.4
Nonlint content (S.A.).....percent..	4.3	7.6	1.4	1.7
Manufacturing waste.....percent..	7.0	10.4	5.1	5.3
Neps per 100 square inches.....	9	6	19	10
Yarn appearance				
40s.....grade..	C+	C+	C	C+
50s.....grade..	C+	C+	D+	C
Break factor				
40s.....units..	2040	2039	1792	1871
50s.....units..	1895	1915	1650	1735
Ends down per 1,000 spindle hours				
40s.....	13	36	22	20
50s.....	62	64	232	182

¹ Average of three replications for all quality measures except spinning data for 50s yarn.

There were no consistent differences between harvesting methods in staple length, length measurements by array method, fiber strength, or micronaire reading. For the elaborate ginning setup, the machine-picked cotton had slightly higher yarn appearance grades and break factors than the hand-picked cotton. The spinning performance for the minimum ginning setup showed that the hand-picked cotton had fewer ends down than the machine-picked cotton and a reverse trend was noted for the more elaborate ginning conditions.

APPENDIX I

Ginning Test Procedure

The seed cotton was taken from the trailer through a suction pipe to the drying and cleaning machinery, then distributed to three extractor feeders, each feeding one gin stand. Each gin stand was followed by a unit lint cleaner, and the lint from all three unit cleaners then converged on one bulk lint cleaner and the bale press.

The seed-cotton cleaning machinery sequences were as follows:

Simple: Tower drier, tower drier, extractor feeders, and gin stands.

Moderate: Tower drier, tower drier, 6-cylinder cleaner, 7-cylinder cleaner, extractor feeders, and gin stands.

Elaborate: Tower drier, 6-cylinder cleaner, bur machine, tower drier, 6-cylinder cleaner, 7-cylinder cleaner, extractor feeders, and gin stands.

The ginning setup also included zero, one, and two lint cleaners. The bulk-lint cleaner was used when only one lint cleaner was required, the unit lint cleaner being bypassed.

Because the test plan called for predetermined fiber moisture levels and because the lots were ginned in random order, fixed temperatures could not be used in the drying system. The lint moisture content of each lot was monitored by a portable electric moisture meter, and drying conditions were adjusted as necessary. Average Fahrenheit temperatures at the air-cotton mix-point and at the exhaust for each drier are shown in table 3. The extremely low moisture content lots (desired level 1.0 - 1.5 percent) were put through the drying system twice at the temperatures used for the very low moisture lots, and the normal moisture lots (desired level 7 percent) were put through the drier without the use of artificial heat.

Table 3.--Average mix-point and exhaust temperatures used in drying test cotton to desired moisture levels

Desired moisture level (percent)	Drier No. 1		Drier No. 2	
	Mix-point	Exhaust	Mix-point	Exhaust
	<u>°F.</u>	<u>°F.</u>	<u>°F.</u>	<u>°F.</u>
1.5 - 2.5 (very low)	420	146	268	249
3.5 - 4.5 (low)	319	135	235	210
5.5 - 6.5 (moderate)	248	102	130	129

Because of variations in the temperature and humidity of the air and in the moisture content of the incoming seed cotton, it was not possible to control lint moisture to exactly the desired levels. Actual moisture levels were determined by the oven-drying method, which is more accurate than the spot-check meter, but was too slow to be used to control lint moisture during the running of the test. Moisture levels (oven method) actually obtained varied within the following limits:

	<u>Low</u>	<u>High</u>	<u>Average</u>
Normal	6.1	7.6	6.9
Moderate	4.6	7.8	6.1
Low	3.0	4.9	4.0
Very low	2.0	3.5	2.6
Extremely low	1.7	2.7	2.2

APPENDIX II

Spinning Test Procedure

Each bale, with the bale ties removed, was conditioned for 24 hours in the opening room before processing. A portion weighing approximately 250 pounds was taken from each bale to make a spinning lot for processing into 40s yarn. The remaining poundage from the three bales (replications) of each ginning condition were composited to make a spinning lot for processing into 40s and 50s yarn. Then, each spinning lot was processed through the opening and picking line which consisted of two blender feeders, a lattice opener, hopper feeder, and a picker equipped with a blade beater and a Kirschner beater. The cotton fed to the opening line, the cotton delivered by the picker, and the waste removed at each beater section were weighed. The 14-ounce picker laps produced at the picker were delivered to the card room and conditioned for at least 12 hours before carding.

A 50-grain sliver was produced at the card at a production rate of 9-1/2 pounds per hour. Samples of the card web were taken on three nep boards at four different times during the carding operation. Separate nep counts were made by two technicians on each of the 12 nep boards. The card was stripped and cleaned after processing each lot and the waste from each lot was weighed.

A 53-grain sliver was produced at the first drawing process with an operating speed of 265 feet per minute from eight ends of card sliver. A 55-grain sliver was produced at the second drawing process from eight ends of first drawing sliver.

At the roving process, 1.25 hank roving was produced from single, second-drawing sliver using a twist multiplier of 1.30 and a spindle speed of 900 rpm.

Roving was creeled singly into four 252-spindle spinning frames. New travelers were used for each spinning doff; the frames were run for 30 minutes to break in the travelers and to obtain yarn for sizing. Draft gears were changed, if necessary, to obtain the specified yarn size, and ends down were recorded at 15-minute intervals during the spinning of a full doff of yarn, which ran for about 8 hours for 40s and 11 hours for 50s.

All the yarn was spun with a twist multiplier of 3.75 and at a spindle speed of 11,000 rpm. A full doff of 40s yarn was spun from each replication and the composite lots were used for one full doff of 40s and one of 50s. Yarn size, skein strength, and yarn appearance tests were made on each doff of yarn.

The card room and spinning room were kept at a temperature of 75°F. and 55 percent relative humidity throughout the tests.

Test Results and Statistical Analysis

The seed cotton used in this test was harvested from land that was believed to be uniform in fertility and moisture supply and to have been treated alike as far as fertilizer application and agronomic practices during the growing season were concerned. However, after the ginning test had been run and fiber tests were made on samples from each lot, it was found that two lots in the third replication had micronaire readings of 3.3 to 3.4, and in one other lot, one sample read 3.4 and the other 4.2. These are distinctly different from the 4.4 to 4.6 micronaire readings for corresponding treatments in the first two replications. These three lots also showed higher nep counts, and the first two had poorer yarn appearance grades and higher ends down in spinning than the ones with normal micronaire readings.

Since all three of the questionable lots were ginned with one lint cleaner, two were ginned at the moderate moisture level, and two with elaborate seed-cotton cleaning, their inclusion in the statistical analysis would have falsely ascribed some harmful effects to these treatments that were really due to unknown agronomic causes. Accordingly, the nep counts on these three lots, as well as the yarn appearance grades and ends down in spinning 40s for the two lowest micronaire lots, have been discarded. Values given in table 11 for the treatments affected are the averages of the first two replications, which had normal micronaire readings. Since the analysis of variance requires that a figure be placed in every square, the average of the other two replications was substituted for the discarded values.

Since 50s yarn was spun from a blend of the three replications of each treatment, there was no basis for correcting the ends down values for 50s. The two questionable figures are indicated by a footnote to table 11.

The tables that follow list average values of the test results for the three replications of each treatment, with the exceptions noted above. The "analysis of variance" section, at the bottom of each table, shows which ginning variables had significant effects, either singly or in combination, on the test results.

Table 4.--Foreign matter and moisture content of cotton for specified cotton cleaning and drying conditions, Yazoo-Mississippi Delta, 1959-60 season

Cotton cleaning	Seed-cotton		Seed-cotton		Lint	
	foreign matter		moisture		moisture	
	Wagon	Feeder	Wagon	Feeder	Lint slide	Opening room
	Percent	Percent	Percent	Percent	Percent	Percent
<u>Simple seed-cotton cleaning</u>						
Moderate lint-slide moisture:						
No lint cleaner.....	7.1	3.6	13.3	11.1	7.6	5.8
1 lint cleaner.....	6.5	4.0	14.0	11.3	5.7	4.2
2 lint cleaners.....	8.4	3.7	13.9	11.3	5.9	3.6
Low lint-slide moisture:						
No lint cleaner.....	6.5	2.8	9.9	7.5	3.7	4.1
1 lint cleaner.....	6.5	2.6	10.8	7.8	4.2	4.2
2 lint cleaners.....	7.1	2.6	10.7	8.0	4.4	3.7
Very low lint-slide moisture:						
No lint cleaner.....	5.3	2.6	12.0	8.5	2.9	4.0
1 lint cleaner.....	6.8	2.9	10.2	7.4	2.6	3.7
2 lint cleaners.....	6.1	2.8	11.5	7.2	2.3	4.4
<u>Moderate seed-cotton cleaning</u>						
Moderate lint-slide moisture:						
No lint cleaner.....	6.6	2.6	14.3	11.7	6.5	4.9
1 lint cleaner.....	5.7	2.7	14.3	12.4	5.8	3.6
2 lint cleaners.....	5.9	2.6	13.0	10.6	5.8	4.4
Low lint-slide moisture:						
No lint cleaner.....	5.8	2.0	12.7	9.1	4.1	5.2
1 lint cleaner.....	6.8	1.9	12.3	8.3	3.8	6.0
2 lint cleaners.....	6.9	2.3	11.5	8.8	3.9	4.3
Very low lint-slide moisture:						
No lint cleaner.....	6.7	2.0	10.1	7.5	2.2	3.4
1 lint cleaner.....	6.8	1.9	10.5	7.4	2.7	4.6
2 lint cleaners.....	6.0	1.9	10.2	7.4	2.6	4.1
<u>Elaborate seed-cotton cleaning</u>						
Moderate lint-slide moisture:						
No lint cleaner.....	7.8	2.8	14.2	12.6	6.0	4.0
1 lint cleaner.....	7.5	2.6	13.1	11.2	6.1	4.6
2 lint cleaners.....	6.7	2.5	12.6	10.4	5.6	4.0
Low lint-slide moisture:						
No lint cleaner.....	7.2	1.7	11.4	9.1	4.2	4.8
1 lint cleaner.....	6.9	1.8	11.3	8.9	3.9	4.0
2 lint cleaners.....	6.6	2.0	12.1	9.2	4.0	3.7
Very low lint-slide moisture:						
No lint cleaner.....	7.2	1.3	13.0	7.9	2.6	4.5
1 lint cleaner.....	6.1	1.5	9.9	8.5	2.7	5.4
2 lint cleaners.....	6.1	1.5	11.7	7.7	2.5	5.6
<u>Analysis of variance: 1/</u>						
(1) Seed-cotton cleaning.....	NS	**	NS	NS	NS	**
(2) Lint moisture.....	NS	**	*	**	**	NS
(3) Lint cleaners.....	NS	NS	NS	NS	*	**
(4) (1) x (2) interaction.....	NS	NS	NS	NS	NS	**
(5) (1) x (3) interaction.....	NS	NS	NS	NS	NS	**
(6) (2) x (3) interaction.....	NS	NS	NS	NS	**	**
(7) (1) x (2) x (3) interaction..	NS	NS	NS	NS	*	**
Coefficient of variation (%).....	16.9	14.5	14.6	14.9	11.6	6.9

1/ ** = significant at 1 percent level; * = significant at 5 percent level; NS = not significant.

Table 5.--Effects of specified cotton cleaning and drying conditions on Shirley Analyzer waste in ginned lint and card sliver and on picker and card waste, Yazoo-Mississippi Delta, 1959-60 season

Cotton cleaning	Ginned lint		Card sliver		Adjusted total picker and card waste
	waste (S.A.)	waste (S.A.)	waste (S.A.)	waste (S.A.)	
	Total	Visible	Total	Visible	
	Percent	Percent	Percent	Percent	Percent
<u>Simple seed-cotton cleaning</u>					
6.4% average lint moisture at ginning:					
No lint cleaner.....	7.62	6.60	1.13	.41	10.4
1 lint cleaner.....	4.15	3.28	1.07	.32	7.3
2 lint cleaners.....	3.10	2.42	1.28	.34	6.6
4.1% average lint moisture at ginning:					
No lint cleaner.....	5.83	4.80	1.50	.35	8.2
1 lint cleaner.....	2.96	2.24	1.17	.30	6.5
2 lint cleaners.....	2.07	1.38	1.41	.55	5.6
2.6% average lint moisture at ginning:					
No lint cleaner.....	6.02	5.10	.82	.29	8.6
1 lint cleaner.....	3.03	2.07	.81	.22	6.0
2 lint cleaners.....	2.70	1.78	.82	.20	5.4
<u>Moderate seed-cotton cleaning</u>					
6.0% average lint moisture at ginning:					
No lint cleaner.....	5.98	5.15	1.51	.30	8.8
1 lint cleaner.....	3.54	2.66	1.12	.36	7.1
2 lint cleaners.....	2.49	1.83	1.21	.35	6.1
3.9% average lint moisture at ginning:					
No lint cleaner.....	5.12	4.05	1.44	.30	8.2
1 lint cleaner.....	2.83	1.77	.74	.26	6.0
2 lint cleaners.....	2.06	1.35	1.28	.25	5.6
2.5% average lint moisture at ginning:					
No lint cleaner.....	4.20	3.15	.97	.24	7.4
1 lint cleaner.....	2.71	1.64	1.32	.22	5.8
2 lint cleaners.....	1.88	1.01	.91	.20	5.6
<u>Elaborate seed-cotton cleaning</u>					
5.9% average lint moisture at ginning:					
No lint cleaner.....	6.91	6.01	1.08	.33	9.1
1 lint cleaner.....	3.61	2.85	1.54	.28	7.2
2 lint cleaners.....	2.69	1.88	1.12	.25	6.1
4.0% average lint moisture at ginning:					
No lint cleaner.....	4.20	3.31	1.42	.23	7.6
1 lint cleaner.....	2.55	1.69	.94	.19	5.9
2 lint cleaners.....	2.12	1.29	1.05	.33	5.6
2.6% average lint moisture at ginning:					
No lint cleaner.....	4.13	3.16	1.49	.25	6.9
1 lint cleaner.....	2.23	1.48	.56	.23	5.9
2 lint cleaners.....	1.71	.99	.72	.24	5.3
<u>Analysis of variance: 1/</u>					
(1) Seed-cotton cleaning.....	**	**	NS	**	**
(2) Lint moisture.....	**	**	NS	*	**
(3) Lint cleaners.....	**	**	*	NS	**
(4) (1) x (2) interaction.....	NS	NS	NS	*	NS
(5) (1) x (3) interaction.....	**	**	NS	NS	**
(6) (2) x (3) interaction.....	**	**	NS	**	**
(7) (1) x (2) x (3) interaction.....	NS	NS	*	*	*
Coefficient of variation (%).....	14.45	14.74	27.32	22.31	5.3

1/ ** = significant at 1 percent level; * = significant at 5 percent level; NS = not significant.

Table 6.--Effects of specified cotton cleaning and drying conditions on array upper quartile length, mean length, and coefficient of variation for ginned lint and card sliver, Yazoo-Mississippi Delta, 1959-60 season

Cotton cleaning	Ginned lint			Card sliver		
	Upper quartile length	Mean length	Coefficient of variation	Upper quartile length	Mean length	Coefficient of variation
	Inches	Inches	Percent	Inches	Inches	Percent
<u>Simple seed-cotton cleaning</u>						
6.4% average lint moisture at ginning:						
No lint cleaner.....	1.27	1.05	29	1.24	0.99	33
1 lint cleaner.....	1.26	1.04	30	1.22	.96	35
2 lint cleaners.....	1.27	1.06	29	1.23	.97	35
4.1% average lint moisture at ginning:						
No lint cleaner.....	1.25	1.03	31	1.21	.95	36
1 lint cleaner.....	1.26	1.04	30	1.21	.95	36
2 lint cleaners.....	1.25	1.03	31	1.20	.93	37
2.6% average lint moisture at ginning:						
No lint cleaner.....	1.27	1.04	31	1.21	.94	36
1 lint cleaner.....	1.25	1.03	30	1.20	.93	37
2 lint cleaners.....	1.22	.99	33	1.17	.90	38
<u>Moderate seed-cotton cleaning</u>						
6.0% average lint moisture at ginning:						
No lint cleaner.....	1.29	1.09	27	1.25	1.00	32
1 lint cleaner.....	1.29	1.09	28	1.24	1.00	33
2 lint cleaners.....	1.29	1.07	29	1.24	.99	34
3.9% average lint moisture at ginning:						
No lint cleaner.....	1.26	1.04	30	1.22	.97	34
1 lint cleaner.....	1.26	1.03	31	1.23	.97	35
2 lint cleaners.....	1.24	1.01	31	1.21	.94	36
2.5% average lint moisture at ginning:						
No lint cleaner.....	1.25	1.03	31	1.20	.93	37
1 lint cleaner.....	1.23	1.01	31	1.20	.93	37
2 lint cleaners.....	1.24	1.00	33	1.19	.91	38
<u>Elaborate seed-cotton cleaning</u>						
5.9% average lint moisture at ginning:						
No lint cleaner.....	1.28	1.08	27	1.24	1.00	33
1 lint cleaner.....	1.26	1.04	30	1.22	.95	36
2 lint cleaners.....	1.27	1.06	29	1.23	.97	34
4.0% average lint moisture at ginning:						
No lint cleaner.....	1.26	1.04	29	1.21	.96	34
1 lint cleaner.....	1.24	1.02	31	1.19	.92	37
2 lint cleaners.....	1.25	1.03	31	1.22	.95	36
2.6% average lint moisture at ginning:						
No lint cleaner.....	1.24	1.02	31	1.20	.94	36
1 lint cleaner.....	1.25	1.01	32	1.22	.95	36
2 lint cleaners.....	1.25	1.01	32	1.22	.94	36
<u>Analysis of variance: 1/</u>						
(1) Seed-cotton cleaning.....	NS	NS	NS	**	*	**
(2) Lint moisture.....	*	**	**	*	**	**
(3) Lint cleaners.....	*	**	**	**	**	**
(4) (1) x (2) interaction.....	**	*	*	**	*	**
(5) (1) x (3) interaction.....	*	**	*	**	*	*
(6) (2) x (3) interaction.....	**	**	NS	*	*	NS
(7) (1) x (2) x (3) interaction.....	**	**	NS	*	NS	NS
Coefficient of variation (%).....	.9	1.3	3.4	1.0	1.5	2.5

1/ ** = significant at 1 percent level; * = significant at 5 percent level; NS = not significant.

Table 7.--Effects of specified cotton cleaning and drying conditions on Suter-Webb array length distribution, Yazoo-Mississippi Delta, 1959-60 season

Cotton cleaning	Length distribution					
	Ginned lint			Card sliver		
	Fibers shorter than 1/2"	Fibers 1/2" - 1"	Fibers longer than 1"	Fibers shorter than 1/2"	Fibers 1/2" - 1"	Fibers longer than 1"
	Percent	Percent	Percent	Percent	Percent	Percent
<u>Simple seed-cotton cleaning</u>						
6.4% average lint moisture at ginning:						
No lint cleaner.....	8.0	22.4	69.6	11.5	29.6	59.0
1 lint cleaner.....	9.2	24.7	66.1	13.6	31.3	55.1
2 lint cleaners.....	8.0	22.9	69.1	12.7	30.3	57.1
4.1% average lint moisture at ginning:						
No lint cleaner.....	9.2	25.3	65.4	13.8	33.3	52.9
1 lint cleaner.....	8.7	25.0	66.3	14.0	32.4	53.7
2 lint cleaners.....	9.6	26.0	64.4	14.8	33.3	51.9
2.6% average lint moisture at ginning:						
No lint cleaner.....	9.2	25.1	65.7	14.3	33.8	51.9
1 lint cleaner.....	9.0	26.0	64.9	14.6	34.8	50.6
2 lint cleaners.....	11.3	29.9	58.8	16.7	37.2	46.1
<u>Moderate seed-cotton cleaning</u>						
6.0% average lint moisture at ginning:						
No lint cleaner.....	6.8	20.6	72.6	10.6	28.6	60.8
1 lint cleaner.....	6.9	20.1	73.0	11.4	29.1	59.5
2 lint cleaners.....	7.8	21.7	70.5	11.7	29.5	58.7
3.9% average lint moisture at ginning:						
No lint cleaner.....	8.4	25.6	66.0	13.1	31.3	55.6
1 lint cleaner.....	9.3	25.4	65.3	12.9	31.2	55.9
2 lint cleaners.....	9.8	27.9	62.3	13.9	34.3	51.7
2.5% average lint moisture at ginning:						
No lint cleaner.....	9.1	26.4	64.5	15.3	33.9	50.8
1 lint cleaner.....	10.0	27.8	62.2	14.7	34.8	50.5
2 lint cleaners.....	10.7	28.7	60.6	15.7	36.6	47.7
<u>Elaborate seed-cotton cleaning</u>						
5.9% average lint moisture at ginning:						
No lint cleaner.....	6.8	20.3	72.9	11.3	28.1	60.6
1 lint cleaner.....	9.2	24.6	66.1	13.7	31.9	54.5
2 lint cleaners.....	7.8	23.8	68.5	11.9	31.1	56.9
4.0% average lint moisture at ginning:						
No lint cleaner.....	8.2	23.6	68.2	12.8	32.2	55.0
1 lint cleaner.....	9.4	27.0	63.6	15.4	35.4	49.2
2 lint cleaners.....	9.4	25.5	65.1	13.9	31.9	54.2
2.6% average lint moisture at ginning:						
No lint cleaner.....	9.5	27.3	63.3	14.3	33.3	52.4
1 lint cleaner.....	10.1	27.4	62.5	14.1	31.6	54.2
2 lint cleaners.....	10.4	27.3	62.3	14.5	33.4	52.2
<u>Analysis of variance: 1/</u>						
(1) Seed-cotton cleaning.....	NS	NS	NS	**	NS	*
(2) Lint moisture.....	**	**	**	**	**	**
(3) Lint cleaners.....	**	**	**	**	**	**
(4) (1) x (2) interaction.....	*	*	*	**	**	**
(5) (1) x (3) interaction.....	NS	**	*	*	*	*
(6) (2) x (3) interaction.....	*	NS	*	*	*	*
(7) (1) x (2) x (3) interaction.....	NS	**	**	NS	**	*
Coefficient of variation (%).....	7.69	5.60	2.86	6.57	4.00	3.55

1/ ** = significant at 1 percent level; * = significant at 5 percent level; NS = not significant.

Table 8.--Effects of specified cotton cleaning and drying conditions on Fibrograph upper half mean, mean length, and uniformity ratio for ginned lint and card sliver, Yazoo-Mississippi Delta, 1959-60 season

Cotton cleaning	Ginned lint			Card sliver		
	Upper half: Mean		Uniformity:	Upper half: Mean		Uniformity
	mean	length:	ratio	mean	length:	ratio
	Inches	Inches	Percent	Inches	Inches	Percent
<u>Simple seed-cotton cleaning</u>						
6.4% average lint moisture at ginning:						
No lint cleaner.....	1.12	.91	81	1.10	.88	80
1 lint cleaner.....	1.12	.90	80	1.09	.85	78
2 lint cleaners.....	1.11	.90	81	1.10	.88	80
4.1% average lint moisture at ginning:						
No lint cleaner.....	1.10	.89	81	1.07	.84	79
1 lint cleaner.....	1.10	.87	79	1.08	.86	79
2 lint cleaners.....	1.08	.87	81	1.06	.82	77
2.6% average lint moisture at ginning:						
No lint cleaner.....	1.11	.90	82	1.07	.83	78
1 lint cleaner.....	1.09	.87	80	1.07	.84	79
2 lint cleaners.....	1.07	.86	79	1.04	.81	78
<u>Moderate seed-cotton cleaning</u>						
6.0% average lint moisture at ginning:						
No lint cleaner.....	1.14	.95	83	1.12	.90	80
1 lint cleaner.....	1.12	.92	81	1.12	.89	80
2 lint cleaners.....	1.12	.91	81	1.11	.87	79
3.9% average lint moisture at ginning:						
No lint cleaner.....	1.10	.89	80	1.08	.84	78
1 lint cleaner.....	1.11	.88	80	1.09	.83	78
2 lint cleaners.....	1.10	.90	81	1.07	.83	78
2.5% average lint moisture at ginning:						
No lint cleaner.....	1.09	.85	78	1.06	.83	78
1 lint cleaner.....	1.09	.88	81	1.05	.83	79
2 lint cleaners.....	1.08	.84	78	1.05	.81	78
<u>Elaborate seed-cotton cleaning</u>						
5.9% average lint moisture at ginning:						
No lint cleaner.....	1.13	.92	81	1.11	.89	80
1 lint cleaner.....	1.12	.89	80	1.09	.86	79
2 lint cleaners.....	1.13	.93	82	1.10	.87	79
4.0% average lint moisture at ginning:						
No lint cleaner.....	1.09	.89	82	1.08	.83	77
1 lint cleaner.....	1.11	.89	81	1.05	.82	78
2 lint cleaners.....	1.09	.87	80	1.08	.84	77
2.6% average lint moisture at ginning:						
No lint cleaner.....	1.10	.89	81	1.06	.83	78
1 lint cleaner.....	1.09	.87	80	1.07	.83	77
2 lint cleaners.....	1.08	.86	80	1.07	.82	77
<u>Analysis of variance: 1/</u>						
(1) Seed-cotton cleaning.....	NS	NS	*	NS	NS	NS
(2) Lint moisture.....	**	*	NS	**	**	**
(3) Lint cleaners.....	**	**	NS	NS	NS	NS
(4) (1) x (2) interaction.....	NS	**	**	NS	NS	NS
(5) (1) x (3) interaction.....	NS	NS	NS	*	NS	NS
(6) (2) x (3) interaction.....	*	NS	NS	NS	NS	*
(7) (1) x (2) x (3) interaction.....	NS	NS	NS	NS	NS	NS
Coefficient of variation (%).....	1.1	2.2	1.5	1.3	1.9	1.2

1/ ** = significant at 1 percent level; * = significant at 5 percent level; NS = not significant.

Table 9.--Effects of specified cotton cleaning and drying conditions on Pressley strength and micronaire readings for ginned lint and card sliver, Yazoo-Mississippi Delta, 1959-60 season

Cotton cleaning	Ginned lint			Card sliver		
	Pressley strength	Micronaire	gauge	Pressley strength	Micronaire	gauge
	"0" : 1/8"	"0" : 1/8"	1,000 p.s.i.	"0" : 1/8"	"0" : 1/8"	1,000 p.s.i.
<u>Simple seed-cotton cleaning</u>						
6.4% average lint moisture at ginning:						
No lint cleaner.....	79	21.7	4.4	77	22.0	4.4
1 lint cleaner.....	79	22.4	<u>1/</u> 4.2	78	21.9	<u>1/</u> 4.1
2 lint cleaners.....	78	21.7	4.4	79	22.5	4.4
4.1% average lint moisture at ginning:						
No lint cleaner.....	78	21.4	4.4	79	21.8	4.5
1 lint cleaner.....	81	21.2	4.5	79	21.8	4.5
2 lint cleaners.....	77	21.2	4.5	79	21.9	4.5
2.6% average lint moisture at ginning:						
No lint cleaner.....	79	21.1	4.5	79	21.3	4.4
1 lint cleaner.....	77	20.8	4.5	77	21.4	4.5
2 lint cleaners.....	79	21.3	4.4	79	21.3	4.4
<u>Moderate seed-cotton cleaning</u>						
6.0% average lint moisture at ginning:						
No lint cleaner.....	79	22.0	4.5	79	22.1	4.4
1 lint cleaner.....	79	22.1	4.3	79	22.5	4.4
2 lint cleaners.....	78	21.6	4.4	78	22.1	4.4
3.9% average lint moisture at ginning:						
No lint cleaner.....	77	21.3	4.4	76	21.7	4.5
1 lint cleaner.....	77	21.5	4.5	78	21.9	4.4
2 lint cleaners.....	77	20.9	4.4	78	21.6	4.5
2.5% average lint moisture at ginning:						
No lint cleaner.....	78	20.8	4.5	77	21.4	4.4
1 lint cleaner.....	79	21.2	4.4	79	21.4	4.6
2 lint cleaners.....	78	21.3	4.4	78	21.4	4.4
<u>Elaborate seed-cotton cleaning</u>						
5.9% average lint moisture at ginning:						
No lint cleaner.....	80	21.4	4.5	78	21.9	4.5
1 lint cleaner.....	79	21.7	<u>1/</u> 4.0	79	22.3	<u>1/</u> 4.2
2 lint cleaners.....	78	21.5	4.5	79	21.7	4.4
4.0% average lint moisture at ginning:						
No lint cleaner.....	78	21.3	4.4	76	21.6	4.4
1 lint cleaner.....	80	21.2	<u>1/</u> 4.3	79	22.0	<u>1/</u> 4.3
2 lint cleaners.....	78	21.0	4.4	79	22.3	4.5
2.6% average lint moisture at ginning:						
No lint cleaner.....	75	21.0	4.4	77	21.3	4.5
1 lint cleaner.....	79	20.8	4.5	77	21.7	4.4
2 lint cleaners.....	78	20.7	4.4	78	21.7	4.4
<u>Analysis of variance: 2/</u>						
(1) Seed-cotton cleaning.....	NS	NS	NS	NS	NS	NS
(2) Lint moisture.....	NS	NS	NS	NS	NS	NS
(3) Lint cleaners.....	*	NS	NS	NS	NS	NS
(4) (1) x (2) interaction.....	NS	NS	NS	NS	NS	NS
(5) (1) x (3) interaction.....	NS	NS	NS	NS	NS	NS
(6) (2) x (3) interaction.....	*	NS	NS	NS	NS	NS
(7) (1) x (2) x (3) interaction.....	*	NS	NS	NS	NS	NS
Coefficient of variation (%).....	1.94	2.55	3.93	2.29	2.17	3.92

1/ One replication had low micronaire (3.3 to 3.8), other two were normal.

2/ ** = significant at 1 percent level; * = significant at 5 percent level; NS = not significant.

Table 10.--Cotton grade, staple length, price, bale weight, and bale value resulting from specified cotton cleaning and drying treatments, Yazoo-Mississippi Delta, 1959-60 season

Cotton cleaning	Grade	Staple length	Price per pound		Bale weight	Bale value	
			1959	1961		1959	1961
		32ds	Cents	Cents	Pounds	Dollars	Dollars
<u>Simple seed-cotton cleaning</u>							
6.4% average lint moisture at ginning:							
No lint cleaner.....	GO+	33.2	24.21	30.07	494.7	119.74	148.75
1 lint cleaner.....	LM	33.3	27.90	32.19	467.7	130.43	150.52
2 lint cleaners.....	LM+	34.0	29.91	33.26	464.7	138.98	154.55
4.1% average lint moisture at ginning:							
No lint cleaner.....	LM	33.0	27.98	32.18	465.7	130.31	149.88
1 lint cleaner.....	LM+	33.3	29.82	33.25	455.8	135.90	151.55
2 lint cleaners.....	SIM+	33.5	30.69	33.76	452.6	138.91	152.81
2.6% average lint moisture at ginning:							
No lint cleaner.....	SGO+	33.0	26.55	31.44	463.1	122.92	145.60
1 lint cleaner.....	SIM	33.0	29.86	33.33	447.6	133.67	149.19
2 lint cleaners.....	SIM+	33.3	30.77	33.81	445.2	137.00	150.52
<u>Moderate seed-cotton cleaning</u>							
6.0% average lint moisture at ginning:							
No lint cleaner.....	GO+	33.3	23.95	30.12	481.4	115.29	146.47
1 lint cleaner.....	LM+	33.7	29.51	33.09	465.5	137.38	154.05
2 lint cleaners.....	SIM	33.8	30.34	33.55	461.1	139.91	154.71
3.9% average lint moisture at ginning:							
No lint cleaner.....	LM	33.0	27.52	32.11	463.9	127.66	148.90
1 lint cleaner.....	SIM	33.8	30.87	33.84	451.8	139.48	152.90
2 lint cleaners.....	SIM+	33.7	31.63	34.22	450.2	142.38	154.05
2.5% average lint moisture at ginning:							
No lint cleaner.....	LM	33.0	28.95	32.84	450.6	130.46	148.00
1 lint cleaner.....	SIM+	33.2	30.59	33.72	446.4	136.56	150.54
2 lint cleaners.....	M	33.5	31.94	34.38	443.2	141.53	152.37
<u>Elaborate seed-cotton cleaning</u>							
5.9% average lint moisture at ginning:							
No lint cleaner.....	SGO	33.2	24.70	30.59	487.2	120.33	149.04
1 lint cleaner.....	LM	33.5	28.93	32.89	467.6	135.27	153.77
2 lint cleaners.....	LM+	33.5	29.63	33.21	460.6	136.46	152.97
4.0% average lint moisture at ginning:							
No lint cleaner.....	SIM	33.0	28.70	32.51	460.7	132.20	149.75
1 lint cleaner.....	SIM	33.5	30.39	33.63	451.7	137.26	151.90
2 lint cleaners.....	M	33.8	32.06	34.51	450.3	144.57	155.40
2.6% average lint moisture at ginning:							
No lint cleaner.....	LM+	33.2	29.75	33.21	452.5	134.61	150.28
1 lint cleaner.....	SIM+	33.2	30.95	33.88	445.5	137.90	150.79
2 lint cleaners.....	M	33.5	31.94	34.38	442.5	141.32	152.15
<u>Analysis of variance: 1/</u>							
(1) Seed-cotton cleaning.....		NS	**	*	**	*	NS
(2) Lint moisture.....		NS	**	**	**	*	NS
(3) Lint cleaners.....		**	**	**	**	**	**
(4) (1) x (2) interaction.....		NS	NS	NS	NS	NS	NS
(5) (1) x (3) interaction.....		NS	NS	NS	**	NS	NS
(6) (2) x (3) interaction.....		NS	**	**	**	*	NS
(7) (1) x (2) x (3) interaction.....		NS	NS	NS	NS	NS	NS
Coefficient of variation (%).....		0.82	3.62	1.82	0.70	3.53	1.78

1/ ** = significant at 1 percent level; * = significant at 5 percent level; NS = not significant.

Table 11.--Effects of specified cotton cleaning and drying conditions on neps per 100 square inches, yarn appearance, break factor, and ends down for 40s and 50s yarn, Yazoo-Mississippi Delta, 1959-60 season

Cotton cleaning	: Neps per		: Yarn		: Break		: Ends down per	
	: 100 sq. in.:		: appearance		: factor		: 1,000 spindle	
	: card web	:	: 40s	: 50s	: 40s	: 50s	: 40s	: 50s
	Number	Index	Index	Units	Units	Number	Number	
<u>Simple seed-cotton cleaning</u>								
6.4% average lint moisture at ginning:								
No lint cleaner.....	6	103	100	2039	1915	36	64	
1 lint cleaner.....	<u>2/</u> 8	<u>2/</u> 100	90	2012	1885	<u>2/</u> 24	<u>3/</u> 98	
2 lint cleaners.....	13	90	90	2004	1860	27	70	
4.1% average lint moisture at ginning:								
No lint cleaner.....	15	93	90	1939	1830	36	92	
1 lint cleaner.....	11	90	90	1909	1820	26	83	
2 lint cleaners.....	12	90	90	1852	1690	21	104	
2.6% average lint moisture at ginning:								
No lint cleaner.....	9	93	90	1909	1765	31	110	
1 lint cleaner.....	10	90	90	1840	1740	32	138	
2 lint cleaners.....	20	90	90	1791	1605	38	308	
<u>Moderate seed-cotton cleaning</u>								
6.0% average lint moisture at ginning:								
No lint cleaner.....	10	103	100	2100	1965	32	88	
1 lint cleaner.....	13	90	90	2068	1925	35	68	
2 lint cleaners.....	15	90	90	2035	1900	32	65	
3.9% average lint moisture at ginning:								
No lint cleaner.....	26	100	100	1988	1855	37	108	
1 lint cleaner.....	9	93	90	1948	1790	25	79	
2 lint cleaners.....	38	80	80	1933	1775	34	91	
2.5% average lint moisture at ginning:								
No lint cleaner.....	11	93	90	1840	1685	29	114	
1 lint cleaner.....	26	90	90	1880	1670	29	140	
2 lint cleaners.....	15	87	80	1776	1575	32	484	
<u>Elaborate seed-cotton cleaning</u>								
5.9% average lint moisture at ginning:								
No lint cleaner.....	10	100	90	2068	1910	30	77	
1 lint cleaner.....	<u>2/</u> 22	<u>2/</u> 90	90	2029	1850	<u>2/</u> 32	<u>3/</u> 131	
2 lint cleaners.....	21	90	90	1997	1890	30	80	
4.0% average lint moisture at ginning:								
No lint cleaner.....	26	90	90	1972	1835	41	131	
1 lint cleaner.....	<u>2/</u> 20	90	90	1901	1730	44	120	
2 lint cleaners.....	16	90	90	1885	1780	27	103	
2.6% average lint moisture at ginning:								
No lint cleaner.....	25	93	90	1876	1715	32	150	
1 lint cleaner.....	10	87	90	1829	1765	28	111	
2 lint cleaners.....	10	97	90	1871	1735	20	182	
<u>Analysis of variance: 4/</u>								
(1) Seed-cotton cleaning.....	**	NS	--	*	--	NS	--	
(2) Lint moisture.....	**	NS	--	**	--	NS	--	
(3) Lint cleaners.....	**	**	--	**	--	**	--	
(4) (1) x (2) interaction.....	**	NS	--	*	--	*	--	
(5) (1) x (3) interaction.....	**	**	--	NS	--	**	--	
(6) (2) x (3) interaction.....	**	**	--	NS	--	*	--	
(7) (1) x (2) x (3) interaction.....	**	*	--	*	--	**	--	
Coefficient of variation (%).....	8.5	3.7		3.7		17.4		

1/ Ends down corrected to yarn size.

2/ Average of two normal micronaire lots.

3/ High EDMSH probably due to low micronaire reading.

4/ ** = significant at 1 percent level; * = significant at 5 percent level; NS = not significant. Analysis of variance was not made for 50s yarn because no replications were made.

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