Effects of TANDEM LINT CLEANING on Bale Values, Weight Changes, and Prices Received by Farmers

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CONTENTS

PREFACE

The effects of using single lint cleaners upon the quality of cotton as it is measured by conventional methods, and upon returns to growers, have been studied in a number of major cotton-producing areas. However, the increase in recent years in the number of gins installing and using two, three, and even four lint cleaning devices made it apparent that information must be developed on the effects of the multiple use of such equipment. The effects of double lint cleaning upon mill performance under commercial conditions were reported in a previous publication, "Effects of Cleaning Practices at Gins on Fiber Properties and Mill Performance of Cotton, A Progress Report," Marketing Research Report No. 269, U. S. Department of Agriculture, August 1958. The report that follows provides information on the effects of double lint cleaning upon market prices, bale weights, and returns to growers.

Washington, D. C. May 1960

SUMMARY AND CONCLUSIONS

This study evaluates the effect of tandem lint cleaning on the grade of cotton and bale values at different levels of premiums and discounts, and the effects of this cleaning on bale weight and average price per pound. The study was undertaken as part of a broad marketing research program aimed at increasing marketing efficiency and expanding the market for farm products.

The study was conducted in east-central Arkansas during the ginning seasons of 1957-58 and 1958-59. During these two seasons, 413 bales of cotton were sampled at 4 gins. Samples of lint were taken from each bale before any lint cleaning, after one lint cleaning, and after two lint cleanings. The classification of these samples, together with the weight of waste removed by the lint cleaners, provided the basis for evaluating the effects of these machines. The gins were similarly equipped, with fairly elaborate overhead cleaning and conditioning equipment.

Major findings in the study were:

Grade.--The use of either one lint cleaner alone, or two in tandem, resulted in substantial grade improvement. One-third of the Strict Middling White was raised to Good Middling, and two-thirds of Middling White was raised to Strict Middling or better by one lint cleaner. Only 31 percent of the Strict Low Middling White was raised to Middling by one lint cleaner. Use of two lint cleaners raised practically all Middling and most Strict Middling to higher grades, but raised only 60 percent of Strict Low Middling.

Less than half of the bales classed as Light Spotted before any lint cleaning were classed as White after going through one lint cleaner, and approximately one-third remained in the Light Spotted category after two lint cleaners. Only one bale classed as Spotted before lint cleaning was given a White designation even after two lint cleaners.

The importance of color in determining the grade of cotton has become increasingly apparent since mechanization has become widespread. Specifically, cleaning cotton which is Strict Low Middling in both leaf and color to the point where it is Middling in leaf will not raise the composite grade above the original Strict Low Middling designation.

Staple Length.--The effect of lint cleaning on staple length designation varied from bale to bale. However, there was generally a slight increase in average staple length with successive stages of lint cleaning.

Lint Cleaner Waste.--More waste was removed by both the first and second lint cleaners for the lower grades than for the higher grades. Also, slightly more waste was removed from the Spotted cottons than from the White grades. Approximately 60 percent of total lint cleaner waste was removed by the first lint cleaner and 40 percent by the second lint cleaner.

Bale Weight and Value.--Waste removed by lint cleaners is reflected directly in reduced bale weight. The use of two lint cleaners in tandem reduced the bale weight almost 30 pounds for some of the lower grades. Whether or not lint cleaning is profitable to the grower is determined by the extent to which this weight loss is offset by the increased price per pound resulting from better grades.

When premiums and discounts for grade are at minimum levels, the use of only one lint cleaner causes a reduction in net bale value for some grades, with very little increase for the remainder. Use of tandem lint cleaning under similar market conditions may be expected to result in some increase in net bale value for all grades of Light Spotted and Spotted cotton, but only a few small gains and some losses for White cotton.

When premiums and discounts are near maximum levels, greater benefits may be expected from both one and two lint cleaners. Even under these conditions, however, losses in bale value may be expected from lint cleaning cotton grading Strict Middling White before such cleaning, and very little increase in bale value may be expected from cleaning Middling White cotton.

Estimated Effect of Overdrying.--Research has shown that excessive drying of seed cotton improves grade because of better cleaning, but at the same time lowers bale weight because of additional loss of moisture and foreign matter, and also reduces staple length.

Of the 70 bales of Strict Low Middling cotton before lint cleaning, it is estimated that the proportion raised into the next higher grade could have been increased from 50 percent after tandem lint cleaning to 66 percent by reducing the moisture content of lint at time of ginning from 5 percent to 3 percent. This would have reduced bale weight 9.6 pounds because of extra loss of moisture and by an estimated 3 pounds because of extra cleaning. It can also be reasonably assumed that staple length would have been reduced 1/32 inch. Under these assumptions, the average bale value would have decreased from $166.66 to $160.86, a reduction of approximately $6 per bale for the 70 bales, based on 1957-58 prices. With similar assumptions for the 103 bales of Low Middling cotton before lint cleaning, except that 72 percent would be raised to the next higher grade instead of 47 percent, and with 4 pounds of additional weight removed, the average bale value would be reduced from $150.50 to $146.71, causing a loss of $3.79 per bale.

Thus it appears that overdrying is unprofitable to the producer, especially if double lint cleaning is used.

EFFECTS OF TANDEM LINT CLEANING ON BALE VALUES, WEIGHT CHANGES, AND PRICES RECEIVED BY FARMERS

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A major recent development in cotton gin equipment is the lint cleaner. This equipment has been readily accepted by the ginning industry in its effort to process satisfactorily the roughly harvested cotton that is being received in increasing amounts. As recently as the 1948-49 ginning season, lint cleaners were in operation in only 28 commercial gins in the United States. 1/ In 1954-55, almost one-third of the Nation's gins, processing more than half of the United States crop, were equipped with these machines. 2/

A further development has been the use of lint cleaners in tandem. At least a few gins were so equipped during the 1955-56 ginning season. Of approximately 6,800 active gins in the United States in 1956-57, half were equipped with lint cleaners, and 207 plants had such equipment installed in tandem. 3/ The number of such installations increased rapidly in the 1956-59 period, especially in the areas of highly mechanized production of cotton.

OBJECTIVES

This study was designed (1) to determine the effect of tandem lint cleaning on grade, bale values, and returns to farmers at different levels of premiums and discounts and (2) to determine the effect of this equipment on bale weight changes and average price per pound. The study did not include the effects of such cleaning on processing performance or use value of cotton. These latter effects are being studied separately under more controlled commercial and pilot-plant conditions. 4/ The overall objective of this work is to improve the efficiency of cotton marketing and thereby help expand markets for cotton.

SCOPE AND METHOD OF STUDY

The study was conducted in east-central Arkansas during the 1957-58 and 1958-59 seasons. Four gins, equipped with two drying systems, 14 to 21 cylinders of

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1/ Gerdes, Francis L., "Cotton Lint Cleaning at Gins - An Evaluation from the Standpoint of Quality and Economic Factors," (processed) U. S. Dept. Agr., May 1951, p. 2.

2/ Fortenberry, A. J., "Charges for Ginning Cotton," Mktg. Res. Rept. No. 120 Agr. Mktg. Serv., U. S. Dept. Agr., June 1946, p. 24.

3/ "Cotton Gin Equipment, United States," Cotton Div., Agr. Mktg. Serv., U. S. Dept. Agr., 1957 (processed).

4/ "Effects of Cleaning Practices at Gins on Fiber Properties and Mill Performance of Cotton, A Progress Report," Mktg. Res. Rept. No. 269, Agr. Mktg. Serv., U. S. Dept. Agr., Aug. 1958.

overhead cleaning, master bur extractors, and two lint cleaners in tandem, were included in the study. Widely separated gins were chosen, to achieve variation in the condition of the seed cotton as received at the gins.

The study was set up to obtain samples from 16 bales of machine-picked cotton and 16 bales of handpicked cotton from each of the gins at biweekly intervals. However, because of weather conditions and harvesting practices, this plan could not always be carried out. A total of 413 bales were sampled during the 2-year period.

Lint samples were taken after the cotton had left the gin stand, after the first lint cleaner, and after the second lint cleaner. These samples were classed for grade and staple by the Cotton Classing Office of the Cotton Division, U. S. Department of Agriculture, Greenwood, Miss. The result of this classification provides the basis for this report.

It was originally intended to report results on the basis of harvest methods employed and basic lint cleaner setup. However, it was found that, generally, there was no appreciable difference in the way cotton harvested by hand or by machine responded to lint cleaner treatment in terms of grade improvement. This was true for cotton classed as either White or Light Spotted in color before lint cleaning. It was also found that, while there were some differences in the weight of material removed by different types of cleaners in both the first and second positions, the total amount of material removed by any combination of types in tandem was about the same.

The weather in 1957-58 was generally unfavorable in the Midsouth for harvesting high grades of cotton by any method. However, the weather in the vicinity of the gins included in this study was considerably better than that found elsewhere in the region. In 1958, more nearly normal weather prevailed throughout the area during harvest, so the crop was of relatively high grade.

Two levels of premiums and discounts were used in the analysis to show the effect of differences in premiums and discounts upon changes in bale values associated with lint cleaning. One level was based upon the average premiums and discounts reported for the Memphis, Tenn., market for the season 1950-51. During this period, the spread between Low Middling and Middling was relatively narrow. The second level was based on quotations in the same market for the season 1957-58, when the spread between these grades was at its highest point in recent years (see table 7, p. 19, and table 8, p. 20).

A base price of 34.45 cents per pound for Middling 1-inch cotton (the seasonal average in 1957-58) was used in all calculations. Thus, the only difference in price between the two periods was that associated with the differences in premiums and discounts for the several qualities involved.

EFFECT OF LINT CLEANERS ON GRADE DISTRIBUTION

The proportion of bales raised in grade by the use of one lint cleaner varied considerably among the several grades and did not appear to follow any

particular pattern. In the White category, about one-third of the bales grading Strict Middling before lint cleaning and two-thirds of those grading Middling and Middling Plus were raised to a higher grade by using one lint cleaner (table 1). Although only 31 percent of the Strict Low Middling and 38 percent of the Strict Good Ordinary Plus bales were raised in grade by one lint cleaner, from 50 to 100 percent of the remaining grades were improved.

About 37 percent of the 57 bales classed as Light Spotted grades before lint cleaning were classed as White after passing through one lint cleaner, 31 percent were raised to a higher Light Spotted grade, 28 percent were unchanged, and the remaining 4 percent were lowered to Spotted. None of the 59 bales designated as Spotted cotton before lint cleaning was classed as White after one lint cleaning, 10 percent were raised to a higher Light Spotted grade, 51 percent were unchanged, but 7 percent were classed as Tinged.

When two lint cleaners were used, over 90 percent of the cotton grading Middling through Strict Middling White, before any lint cleaning, was moved to a higher grade and none was lowered in grade (table 2). However, when Strict Low Middling and Strict Low Middling Plus cotton was subjected to two lint cleaners, only 60 percent was raised to a higher grade, 36 percent remained the same, and 4 percent was lowered. Comparable figures after the use of only one lint cleaner were 34, 56, and 10 percent.

About 78 percent of Low Middling and Low Middling Plus White cotton was raised to a higher grade by two lint cleaners, compared with 52 percent raised by one lint cleaner. Less than a fifth of the 103 bales originally classed as Low Middling remained in that category after being passed through 2 lint cleaners, about 4 percent moved to a lower White grade, and 3 percent moved into the Light Spotted category. Ninety-seven percent of the cotton grading below Low Middling before lint cleaning was improved in grade after two cleanings, and the remaining 3 percent remained in the same category.

The use of two lint cleaners was particularly effective in improving the grade of Light Spotted cotton, moving 68 percent of the bales from a Light Spotted to a White category and 30 percent to a higher Light Spotted category.

The use of either one or two lint cleaners did little to move cotton from a Spotted designation to the White grades. However, the second lint cleaner was consistent in moving these cottons to a higher Spotted grade, and also to higher grades within the Light Spotted designation. Evidently the large amount of material of the type removed by the first lint cleaner from this kind of cotton was not enough to affect grade appreciably. However, the condition of the cotton after the first cleaning was such that grade changes within the Spotted designation could be obtained easily by the second cleaner even with substantially less weight reduction.

Although new ginning equipment is very efficient in removing foreign material and raising the grade of cotton, the results of this study further emphasize that it often is impossible to attain outturns of the higher grades from cotton which would be of low grade without the use of the new equipment. Unless

Table 1.--Effect of one lint cleaner upon grade distribution of cotton, east-central Arkansas, seasons 1957-58 and 1958-59

Grade before lint cleaning	Total	Grade after lint cleaning																						
		White													Light Spotted					Spotted			Tinged	
		GM	SM	M+	M	SLM+	SLM	LM+	LM	SGO+	SGO	GO+	GO	SM	M	SLM	LM	SGO	M	SLM	LM	SLM
	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
White																						
GM	--																					
SM	1/ 26	8	17	1																		
M+	1/ 14	4	5	2	3																	
M	1/ 47	4	25	2	15									1								
SLM+	8			1	4	2	1															
SLM	62				15	4	37								5	1						
LM+	36				4	4	11	12	3								2					
LM	67						8	27	25	1						3	3					
SGO+	29							6	5	14	1					1	2					
SGO	7							1	1	5												
GO+	1									1												
Light Spotted																						
SM	1/ 3		3																			
M	12		3		1									1	7							
SLM	17						5								6	5				1		
LM	25						1	6	2							11	4			1		
Spotted																						
M	1/ 4																		4			
SLM	25																		2	19		4
LM	30															6				17	7	
Total	413	16	53	6	42	10	63	52	36	21	1			2	18	27	11		6	38	7	4

1/ All bales were handpicked.

Table 2.--Effect of two lint cleaners upon grade distribution of cotton, east-central Arkansas, seasons 1957-58 and 1958-59

Grade before lint cleaning	Total	Grade after lint cleaning																						
		White													Light Spotted				Spotted			Tinged	
		GM	SM	M+	M	SLM+	SLM	LM+	LM	SGO+	SGO	GO+	GO		SM	M	SLM	LM	SM	SLM	LM	SM	SLM
	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Bales
White																								
GM	--																							
SM	1/ 26	20	6																					
M+	1/ 14	9	5																					
M	1/ 47	21	24	1	1																			
SLM+	8			1	5		2																	
SLM	62		1	1	27	7	25										1							
LM+	36				9	6	15	4	1								1							
LM	67				1		17	32	15							2								
SGO+	29						5	16	7	1														
SGO	7						1	1	2	3														
GO+	1							1																
Light Spotted																								
SM	1/ 3	1	1		1																			
M	12	2	2		5										2	1								
SLM	17				6		5								2	4								
LM	25				1	1	4	8	2								9							
Spotted																								
M	1/ 4															2			2					
SLM	25															3	8	1	2	7		1	3	
LM	30				1												15			11	2		1	
Total	413	53	39	3	57	14	74	62	27	4				4	12	34	1	4	18	2	1	4		

1/ All bales were handpicked.

producers can bring to the gin relatively clean, dry cotton of good color, it is useless to expect a ginner to produce a high grade from the cotton and preserve the inherent qualities that are associated with cotton.

Of particular importance to farmers and ginners, especially in areas where rain and not irrigation is the chief source of moisture, is the influence of color in determining the grade of cotton. The importance of this factor, along with leaf content, has become increasingly recognized, particularly since mechanization has become widespread. As the weather causes gradual deterioration in color, the producer gains no financial benefit by insisting on cleaning such cotton to a foreign matter content level better than that associated with the existing color element of grade. Specifically, cleaning cotton which is Strict Low Middling in both leaf and color to the point where it is Middling in leaf will not raise the composite grade above the original Strict Low Middling designation. In this situation, a substantial loss will result, since there will be no increase in price per pound, although a reduction in bale weight will occur.

This is so because the color element of grade must be higher than the leaf element in order for a "plus" to be assigned. Therefore, cleaning serves no useful purpose on such cotton and it is conceivable that such cleaning can result in this cotton being designated in the Spotted or Gray categories. Price per pound would be essentially the same, and the farmer would lose the weight removed in achieving such a condition.

EFFECT OF LINT CLEANERS ON STAPLE LENGTH

Staple length, along with grade, is one of the major quality factors considered in classing, pricing, and marketing cotton. It is generally agreed that staple is not actually lengthened as a result of lint cleaning. However, there is evidence that lint cleaning may straighten and parallel the fibers, or improve the appearance in some other way, to such an extent that the classer may assign a longer staple to the samples that are cleaned. This has been noted also in other investigations of the effect of lint cleaning on cotton quality. 5/

Changes in staple length associated with lint cleaning were determined for each of the bales sampled. The staple designation was actually reduced for 6.5 percent of the bales put through one lint cleaner and for 2.9 percent of those through two lint cleaners. However, for most bales, the staple remained unchanged, and 30 percent were increased in staple up to 1/16 of an inch as a result of two lint cleanings, as compared to no lint cleaning.

5/ See Anderson, Robert F., Smith, Harvin R., and Looney, Zolon M., "An Evaluation of the Costs and Quality of Ginning in the Piedmont Area of Georgia, Seasons of 1950-51 and 1951-52," Ga. Agr. Expt. Sta. Bul. 280, April 1953; Fortenberry, William H., and Looney, Zolon M., "Cotton Ginning Efficiency and Costs in the Rio Grande and Pecos Valley, Seasons of 1949-50 and 1950-51," Prod. and Mktg. Admin., U. S. Dept. Agr., October 1952; and Stedronsky, Victor L., and Shaw, Charles S., "The Flow-Through Lint-Cotton Cleaner," U. S. Dept. Agr., Circ. 858, November 1950.

There was little difference in the effect of lint cleaners on average staple length for different grades of either White or Spotted cotton (table 3). However, there was generally a slight increase in average staple length with successive stages of lint cleaning for most of the grade levels.

Table 3.--Effects of one and two lint cleaners on classers' staple length of cotton, by grade, east-central Arkansas, seasons 1957-58 and 1958-59

Grade before lint cleaning	Total	Average staple length		
		No lint cleaning	One lint cleaner	Two lint cleaners
	Number	32nds inch	32nds inch	32nds inch
White				
SM	1/ 26	34.0	34.0	34.0
M	1/ 61	34.0	34.0	34.2
SLM	70	33.3	33.5	33.6
LM	103	33.8	33.9	34.0
SGO	36	33.9	34.0	34.2
GO	1	34.0	34.0	34.0
Weighted average	--	33.8	33.8	34.0
Light Spotted				
SM	1/ 3	34.0	34.0	34.0
M	12	33.4	33.6	33.8
SLM	17	33.4	33.4	33.5
LM	25	33.4	33.5	33.8
Weighted average	--	33.4	33.5	33.7
Spotted				
M	1/ 4	33.0	33.2	33.5
SLM	25	33.4	33.8	33.8
LM	30	33.0	33.4	33.7
Weighted average	--	33.2	33.6	33.7

1/ All bales were handpicked.

LINT CLEANER WASTE REMOVAL

Waste removed by lint cleaners in the first and second positions increased as grade levels decreased, ranging, for White cotton, from 9.4 pounds for lint grading Strict Middling before any lint cleaning to 32.0 pounds for Good Ordinary (table 4). For cotton in the White range, the first lint cleaner accounted for approximately 60 percent of the total waste removed for all grade levels.

For cottons grading Light Spotted before lint cleaning, the amount of waste removed by lint cleaners was slightly higher than for each comparable grade in the White category, averaging about 2 pounds more per bale for all grades. The proportion of waste removed by the first lint cleaner also increased slightly for these cottons, compared with that removed from White cottons. Somewhat similar results were noted for the limited quantity of Spotted cotton.

Table 4.--Lint cleaner waste removed per 500-pound bale of cotton, by grade, east-central Arkansas, seasons 1957-58 and 1958-59

Grade before lint cleaning	Total	Average weight loss from: One lint cleaner	Average weight loss from: Second lint cleaner	Total weight loss
	Number	Pounds	Pounds	Pounds
White				
SM	1/ 26	5.6	3.8	9.4
M	1/ 61	4.7	4.4	9.1
SLM	70	8.5	5.4	13.9
LM	103	12.4	9.1	21.5
SGO	36	16.0	10.2	26.2
GO	1	21.5	10.5	32.0
Light Spotted				
SM	1/ 3	7.5	2.3	9.8
M	12	6.9	3.1	10.0
SLM	17	10.0	6.1	16.1
LM	25	13.8	9.0	22.8
Spotted				
M	1/ 4	6.8	4.7	11.5
SLM	25	10.0	5.8	15.8
LM	30	11.8	7.2	19.0

1/ All bales were handpicked.

In terms of weight removed, it is evident that the first lint cleaner bears the brunt of the cleaning, while the second cleaner evidently removes smaller trash. The grade improvement obtained by the second lint cleaner more than offsets the amount of waste removed, which permits a relatively larger net bale value improvement from use of the second cleaner. However, the addition of a third or fourth lint cleaner would result in removal of successively smaller amounts of waste, with improvements in grade becoming less likely.

BALE WEIGHT AND VALUE

As previously indicated, lint cleaning increases the value or price per pound of lint cotton to the extent that grade may be improved. The loss in weight resulting from this cleaning, however, reduces the total value of the bale. These two offsetting effects can be combined to determine the net effect of lint cleaning on the bale value of cotton for a given price situation.

In some instances, particularly when premiums and discounts are narrow, the loss in weight may offset or more than offset improvements in grade. Substantial losses often are suffered from lint cleaning Middling or better cotton, and sometimes even lower grades. In other instances, when premiums and discounts are wide, substantial benefits generally are derived from lint cleaning Strict Low Middling or lower grades and sometimes from lint cleaning higher grades. Because of the effect of the level of premiums and discounts upon the potential benefits from lint cleaning, both the near-minimum premiums and discounts of 1950-51 and the near-maximums of 1957-58 have been used in the analysis which follows.

Waste removed by lint cleaners is reflected directly in reduced bale weight (table 5). In estimating the effect of reduced bale weight on bale value, all bale weights and waste removed were corrected to an average bale weight of 500 pounds before lint cleaning. The bale weight after one lint cleaning was 500 pounds minus the waste removed by the first lint cleaner, and the bale weight after two lint cleanings was 500 pounds minus waste removed by both lint cleaners.

Cotton that had graded Strict Middling and Good Ordinary White, before any lint cleaning, averaged 494.4 pounds down to 478.5 pounds per bale, respectively, after one lint cleaner was used. The respective weights were reduced still further by the second lint cleaner, and ranged from 490.6 to 468.0 pounds. Bale weights after lint cleaning for the Spotted cottons were generally somewhat lower than for corresponding grades of White cotton, although these differences were small.

To determine the value of a specific bale before it was subjected to lint cleaning, the price associated with its classification was multiplied by 500 pounds. To determine its value after each stage of lint cleaning, the appropriate price was multiplied by the calculated bale weight after lint cleaning. These bales were grouped according to grade before lint cleaning, and the average bale values were obtained for grade. These values were then divided by the corrected bale weights to give average price per pound.

Table 5.--Effect by grade of one and two lint cleaners on bale weights of cotton, and values per pound and net bale values, for two levels of premiums and discounts, east-central Arkansas, seasons 1957-58 and 1958-59

Grade before lint cleaning	Total	Bale weight after			Average value 1/						Average value 2/					
					Per pound			Per bale			Per pound			Per bale		
		No L/C	One L/C	Two L/C	No L/C	One L/C	Two L/C	No L/C	One L/C	Two L/C	No L/C	One L/C	Two L/C	No L/C	One L/C	Two L/C
	Bales	Pound	Pound	Pound	Cents	Cents	Cents	Dollars	Dollars	Dollars	Cents	Cents	Cents	Dollars	Dollars	Dollars
White																
SM	3/ 26	500	494.4	490.6	36.10	36.12	36.20	180.50	178.60	177.60	37.61	37.66	37.78	188.05	186.20	185.34
M	3/ 61	500	495.3	490.9	35.28	35.78	36.27	176.42	177.20	178.05	36.53	37.20	37.84	182.67	184.28	185.78
SLM	70	500	491.5	486.1	32.41	33.22	33.81	162.05	163.26	164.35	32.30	33.39	34.28	161.51	164.12	166.66
LM	103	500	487.6	478.5	31.01	31.39	32.19	155.06	153.08	154.02	28.60	29.70	31.45	143.01	144.80	150.50
SGO	36	500	484.0	473.8	29.76	30.33	31.43	148.78	146.82	148.91	26.18	27.46	29.95	130.91	132.90	141.92
GO	1	500	478.5	468.0	28.55	29.90	31.55	142.75	143.07	147.65	23.42	26.51	30.26	117.10	126.85	141.62
Lt. Spotted																
SM	3/ 3	500	492.5	490.2	34.30	36.09	35.81	171.50	177.75	175.54	34.29	37.66	37.27	171.45	185.49	182.71
M	12	500	493.1	490.0	32.96	34.01	35.14	164.80	167.72	172.17	32.13	33.93	36.00	160.67	167.32	176.40
SLM	17	500	490.0	483.9	30.71	31.86	33.66	153.54	156.13	162.86	28.85	30.76	33.73	144.27	150.73	163.23
LM	25	500	486.2	477.2	29.09	30.48	31.47	145.44	148.18	150.16	25.47	28.26	30.32	127.37	137.41	144.69
Spotted																
M	3/ 4	500	493.2	488.5	30.88	30.88	32.78	154.40	152.32	160.13	28.22	28.35	31.40	141.10	139.82	153.39
SLM	25	500	490.0	484.2	29.15	28.96	30.23	145.77	141.89	146.39	25.63	25.27	27.46	128.17	123.84	132.99
LM	30	500	488.2	481.0	27.53	29.07	29.98	137.64	141.94	144.21	23.20	25.70	27.43	115.98	125.46	131.92

1/ Premiums and discounts on Memphis market for 1950-51 applied to base price in 1957-58.
2/ Average price on Memphis market in 1957-58
3/ All bales were handpicked.

Thus, the average price per pound reflects differences in grade due to lint cleaning, and average bale values reflect differences in both the grade and staple length of lint and the bale weight.

The average price per pound was increased as a result of tandem lint cleaning for all grades under both price situations. This was also true when only one lint cleaner was used, except for the cotton which was Strict Low Middling Spotted before lint cleaning. Of these 25 bales, 2 became Middling Spotted after one lint cleaning and 4 were classed as Tinged. The effect of the four bales which were classed Tinged after one lint cleaning more than offset the increase in price per pound of the two bales which were raised to Middling Spotted. Therefore, for narrow premiums and discounts equaling those of 1950-51, the average price per pound of these 25 bales was reduced from 29.15 cents for no lint cleaning to 28.96 cents for one lint cleaning. The average price per pound of these bales with two lint cleanings was raised to 30.23 cents.

With the wide premiums and discounts prevailing in 1957-58, the average price per pound for the 25 bales grading Strict Low Middling Spotted before any lint cleaning was 25.63 cents for the samples which received no lint cleaning, and 25.27 cents for those with one lint cleaning. With two lint cleanings, the average price per pound was 27.46 cents.

With the narrow premiums and discounts in 1950-51, there would have been little or no increase in net bale value from use of only one lint cleaner on White grades. Under these conditions, there was an actual decrease in bale value for Strict Middling, Low Middling, and Strict Good Ordinary, and a relatively small increase in bale value for Middling, Strict Low Middling, and Good Ordinary. Light Spotted cotton was improved in quality enough to increase net bale value for every grade, while Low Middling Spotted also was increased up to Middling Spotted and Strict Low Middling Spotted. With the 1950-51 premiums and discounts, net bale value was increased by two lint cleaners for all grades except Strict Middling White and Low Middling White, when compared to cottons with no lint cleaning and with one lint cleaning. For cotton of Strict Middling quality, the net bale value was decreased by almost $3 per bale as a result of tandem lint cleaning.

With the 1957-58 premiums and discounts when the spread between grades was unusually wide, the use of one lint cleaner on these same bales would have increased net bale value for all grades except Strict Middling White, Middling Spotted, and Strict Low Middling Spotted. The bale value for Strict Middling White was reduced almost $2 per bale by one lint cleaning under these price conditions, while the reduction for Strict Low Middling Spotted was almost $5 per bale. Under this situation, tandem lint cleaning failed to increase bale value only for cotton which was originally classified as Strict Middling White. The reduction for Strict Middling White was over $2.50 per bale, compared to about $2 for only one lint cleaner. The difference in bale value for two lint cleaners over none, using 1957-58 prices, ranged from the decrease of $2.50 per bale for the Strict Middling cotton up to an increase of about $19 per bale for Strict Low Middling Light Spotted cotton. Therefore, the major benefits from lint cleaning came with two lint cleaners and the lower grades of cotton.

POSSIBLE EFFECT OF OVERDRYING ON BALE VALUES

For several years, there has been an increased use of driers in cotton gins. Drying was done primarily to handle increasing amounts of damp, roughly harvested cotton so as to facilitate cleaning and to prevent rough preparation. Over the years, the industry has substantiated the research findings that more efficient overhead seed cotton cleaning could be accomplished at a lower lint moisture level than was considered essential for smooth ginning and for preserving the inherent spinning qualities of cotton. 6/ Relatively large grade improvements could be attained by the combination of elaborate overhead seed cotton cleaning facilities and multiple drying systems operated to reduce lint moisture content to a low level. However, it became quite evident that grade improvement could be carried only to a certain level without causing considerable damage to the inherent quality of the ginned lint. With the advent of lint cleaning, it became evident that the higher grade levels could be attained without extreme drying. In fact, the evidence available suggested that producers might suffer monetary loss in value per bale from too much drying. Additional evidence suggested that improved harvesting practices represented the only practical alternative to overdrying for grade improvement, as the diminishing effect of drying and cleaning is readily apparent at the Strict Low Middling range for machine-picked cotton in the Midsouth.

Although data were not collected in this study on the effect of changes in moisture content upon grade, weight, or bale values, the results of other research done by the Department of Agriculture, when applied to the results of this study, provide a reasonable basis for estimating such effects. In developing these estimates, certain assumptions must be made regarding the changes in grade and removal of waste associated with variations in moisture of cotton during ginning. It is believed that the information available on gin operations, both from the ginning laboratory and from commercial gins in the Delta, provide a realistic basis for these assumptions.

This study showed that, of the 70 bales of cotton in the Strict Low Middling range before lint cleaning, 50 percent was raised to the next higher grade by use of two lint cleaners. The average value of these bales was $166.66 after two lint cleaners were used (table 6).

The assumption was then made that, when the lint moisture content was reduced from 5 percent to 3 percent, for a loss of 9.6 pounds per bale, the proportion of bales raised to Middling from Strict Low Middling would increase from 50 percent to 66 percent. This was accomplished by arbitrarily raising every third remaining Strict Low Middling to Middling. Another assumption was that three additional pounds of waste material per bale would be removed by the elaborate overhead seed cotton cleaning and two lint cleaners when the cotton was dried to 3 percent. This additional weight would be removed from

6/ Griffin, A. C., and Merkel, C. M., "Moisture Content of Seed Cotton in Relation to Cleaning and Ginning Efficiency and Lint Quality." U. S. Dept. Agr. Sept. 1953 (processed).

Table 6.--Proportion of Strict Low Middling and Low Middling bales of cotton raised to higher grades, and net bale values under assumed drying conditions 1/

Drying conditions	Grade before lint cleaning	Total	Grade distribution of bales after 2 lint cleaners						Average bale value 3/	Proportion of bales raised one grade or more
			SM	M	SLM	SLM lt sp 2/	LM	M lt sp 2/		
	Grade	Bales	Bales	Bales	Bales	Bales	Bales	Bales	Dollars	Percent
Normal	SLM	70	1	34	34	1	--	--	166.66	50
Overdried	SLM	70	1	45	23	1	--	--	160.86	66
Normal	LM	103	--	10	38	1	52	2	150.50	47
Overdried	LM	103	--	10	64	--	26	3	146.71	72

1/ Assumptions made for overdrying include: Lint moisture reduced from 5 to 3 percent for overdried condition. Additional waste material removed from SLM bales, 3 pounds; from LM bales, 4 pounds. Loss of 1/32 inch in staple length for all bales. Increase every third remaining SLM bale to M by overdrying. Increase every other remaining LM bale to SLM by overdrying.

2/ Light spotted.

3/ Based on 1957-58 premiums and discounts, Memphis, Tenn.

all bales. A third assumption was that, because of the extreme drying employed to obtain this grade improvement and weight removal, 1/32 inch could be removed from the original staple length of all bales. Under these assumptions, the average net bale value of the entire lot would now amount to $160.86, or a net loss of about $6 per bale for the producer.

For the 103 bales of cotton that was Low Middling before lint cleaning, it was found that tandem lint cleaning raised 47 percent of the bales to Strict Low Middling or higher. Average bale values for these 103 bales, after two lint cleanings, amounted to $150.50. Under the same assumed drying conditions, with an assumed loss of four additional pounds of waste per bale for all bales, and an assumed loss of 1/32 inch in staple length, half of the remaining Low Middling bales would be raised by one grade, and the proportion raised to the next higher grade would be increased from 47 percent to 72 percent. However, the net bale value, after accounting for decreased staple length, additional moisture and waste removal, and increased grade improvement, was only $146.71. This represents a loss of $3.79 per bale to the producer from overdrying cotton originally Low Middling in grade. Moisture weight losses due to overdrying are certain, and, if there is any additional cleaning, additional waste probably will be taken out of each bale because of overdrying. However, this latter factor could be ignored and substantial losses would still occur under the assumptions made. That there is a reduction in staple length by drying to extremely low levels of lint moisture has consistently been proved by the use of fiber length measuring devices; it results from fiber breakage in ginning. Grade improvement assumptions are probably liberal in the examples used above, as they apply to cotton which has already been ginned in elaborately equipped plants with two lint cleaners. If so, the net bale losses to farmers resulting from overdrying may be even greater than those calculated under the assumptions made above. In addition, these values are based on 1957-58 premiums and discounts. These calculated losses would be even larger with narrower premiums and discounts.

Table 7.--Estimated average cotton prices per pound based on Memphis, Tenn., 1950-51 premiums and discounts and a 1957-58 base of 34.45 for Middling 1-inch

Grade	Staple (32nds inch)				
	32	33	34	35	36
	Cents	Cents	Cents	Cents	Cents
White					
GM	35.48	35.93	36.19	36.95	38.41
SM+	35.43	35.88	36.14	36.90	38.36
SM	35.38	35.83	36.09	36.85	38.31
M+	34.92	35.36	35.62	36.24	37.62
M	34.45	34.88	35.14	35.62	36.92
SLM+	33.20	33.54	33.76	34.22	35.26
SLM	31.96	32.19	32.39	32.81	33.60
LM+	31.15	31.44	31.55	31.88	32.32
LM	30.34	30.68	30.71	30.94	31.04
SGO+	29.62	29.88	29.90	30.02	30.08
SGO	28.89	29.08	29.09	29.10	29.13
GO+	28.35	28.54	28.55	28.62	28.63
GO	27.81	28.00	28.01	28.13	28.13
Lt. Spotted					
SM	33.82	34.16	34.30	34.82	35.66
M	32.58	32.88	33.07	33.46	34.24
SLM	30.56	30.67	30.78	31.02	31.42
LM	28.92	29.10	29.12	29.32	29.38
Spotted					
M	30.70	30.88	31.00	31.31	31.56
SLM	29.15	29.15	29.16	29.24	29.24
LM	27.49	27.53	27.54	27.71	27.71

Table 8.--Average cotton prices per pound quoted in Memphis, Tenn., crop year 1957-58

Grade	Staple (32nds inch)				
	32	33	34	35	36
	Cents	Cents	Cents	Cents	Cents
White:					
GM	35.52	36.66	37.76	38.64	39.61
SM+	35.47	36.61	37.71	38.59	39.56
SM	35.42	36.56	37.66	38.54	39.51
M+	34.94	36.00	37.02	37.91	38.88
M	34.45	35.44	36.39	37.28	38.24
SLM+	32.74	33.66	34.46	35.16	35.89
SLM	31.02	31.88	32.54	33.04	33.54
LM+	29.06	29.68	30.26	30.63	31.00
LM	27.11	27.47	27.97	28.22	28.47
SGO+	25.70	26.14	26.51	26.64	26.76
SGO	24.28	24.80	25.05	25.05	25.05
GO+	22.84	23.22	23.42	23.42	23.42
GO	21.40	21.65	21.78	21.78	21.78
Lt. Spotted:					
SM	32.54	33.40	34.29	35.22	36.17
M	30.90	31.83	32.56	33.46	34.28
SLM	28.02	28.66	29.21	29.48	29.72
LM	24.97	25.34	25.71	25.84	25.96
Spotted					
M	27.36	28.22	28.73	29.65	30.33
SLM	25.02	25.44	25.88	25.91	25.91
LM	22.83	23.20	23.45	23.45	23.45

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