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PREPROCESSING PRACTICES AND COSTS
OF UNITED STATES TEXTILE MILLS

as Affected by the Cotton Bale Package

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Washington D. C.

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7 PREPROCESSING PRACTICES AND COSTS OF UNITED STATES TEXTILE MILLS
AS AFFECTED BY THE COTTON BALE PACKAGE x

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SUMMARY

During the last few years the domestic cotton industry, the United States Department of Agriculture, and others, have been concerned about criticisms of the American cotton bale package, and have made concerted efforts to improve the package. As a part of this effort (and upon the recommendations of and in active cooperation with industry representatives), the Agricultural Marketing Service inaugurated in 1955-56 a fairly broad study of the problems and economic considerations involved. This report deals with those phases of the study which relate to (1) the cleaning of cotton bale surfaces and other preprocessing problems and practices of domestic spinners resulting from the condition of the bale packages as received by the mills, and (2) the effects of these practices and problems on mill costs.

In the first phase of the study, mail questionnaires were returned by mills which in 1955 consumed approximately four-fifths of the total cotton consumption of all domestic mills. The information furnished by these mills showed that about 85 percent of them cleaned the outer surface of at least some of the bales consumed and that approximately one-half of all bales consumed received some surface cleaning before the cotton was placed in the processing machinery. It also indicated that picking or brushing or both were by far the most frequently used methods in the preprocessing cleaning of bales. Of the bales cleaned, nearly one-half were reported to have been cleaned on all surfaces, and one-third on the heads and one or two sides.

In the second phase of the study, information was obtained in the summer of 1957 by personal interviews with officials of 114 mills selected to represent the methods, practices, and costs of all domestic mills which do any significant amount of cleaning before processing. From the information obtained in this more intensive part of the study and that available from

1/ Mr. Lafferty transferred to the Arkansas Agricultural Experiment Station, Fayetteville, Ark., in October 1957.

the earlier phase, it is estimated that in 1956 the preprocessing cleaning operations of domestic mills cost them an average of about 25 cents for each bale cleaned. Of this, the loss in value of the contaminated cotton removed from the surface of the bales accounted for nearly two-thirds, labor costs about one-third, and equipment costs less than 4 percent. Estimates for individual mills indicate that nearly 75 percent of the bales cleaned were in mills with an average of under 30 cents per bale cleaned, 16 percent in mills with averages of 30 to 50 cents, and 10 percent in mills with averages of 50 cents and above.

All domestic mills have at least some preprocessing costs not associated with bale cleaning which result from either the condition of the bales or the adherence of cotton to the bale covers when they are removed. These costs are estimated to have averaged about 20 cents per bale for all bales consumed. Labor--for removing cotton from the bale covers and for the time lost in handling bales with loose and ragged bagging and those that are distorted--accounted for about one-fourth of these costs and losses in value of cotton, about three-fourths. The latter was mainly due to the reduced salvage or waste value of the cotton removed from or remaining with the bagging. The average of these noncleaning costs for individual mills ranged from about 4 cents to approximately 68 cents per bale consumed.

The total preprocessing costs to domestic mills attributable to the faults of the bale package are estimated to have been almost \$3 million. This is equivalent to a little over 33 cents per bale for each of the bales consumed. The estimated average preprocessing cost per bale to mills for all bales that were cleaned is 45.6 cents, with labor representing nearly one-third and loss in value of cotton over two-thirds. In addition to the costs described in this report, the total cost to the cotton industry includes (1) additional direct costs to domestic mills, (2) similar costs to foreign mills, and (3) various types of direct costs to other segments of the industry. To answer the question of how badly an improved package for American cotton is needed, consideration should be given not only to all the direct marketing costs of the present package, but to the overall effects of such costs on farm value, production, competitive position, and consumption of American cotton.

Conventional sampling practices and improper application of bale covers are the cause of many of the complaints against the American cotton bale and of the costs given in this report. These, together with the domestic system of buying and selling cotton on a gross-weight basis, are among the most important obstacles to the improvement of the American cotton bale package. Efforts to correct or reduce the major faults of the bale package should include special attention to ways of changing these practices.

INTRODUCTION

For decades the American cotton bale package has been the subject of criticism. As far back as 1896 this Department released a publication in which the cotton bale package was described as "the clumsiest, dirtiest, most expensive and most wasteful package in which cotton, or in fact any commodity of like value, is anywhere put up." ^{2/} The present partially covered and frequently cut bales continue to receive extensive criticism both in domestic and foreign markets. The contamination of bales, weather damage, fire losses, and need for picking sample holes, together with the unattractive appearance of the bales, are often said to be responsible for sizable economic losses in marketing channels. Poorly applied and rusty bands and buckles, which result in broken or distorted bales and in rust contamination, as well as overweight and lightweight bales, are also the source of considerable complaint.

The increased attention being given to the packaging of all commodities, together with the growing competition from manmade fibers and foreign-grown cotton, have focused attention on the unfavorable aspects of the American cotton bale package. Synthetic fibers are delivered to consuming mills completely free from contamination in neat, uniformly shaped, easily handled packages. Most foreign cottons are also said to reach the manufacturers in a much more desirable package than American cotton does.

As a result of these and other developments, the domestic cotton industry, through the National Cotton Council and its Packaging Subcommittee of the Industrywide Committee on Cotton Quality, and the manufacturers of experimental materials, ties, and buckles, have devoted much attention to the problem of bale packaging during the last few years. As a part of this overall effort and upon the recommendations of industry groups and with their assistance, the Agricultural Marketing Service developed a project in 1955 and 1956 concerned with problems and economic considerations in modifying the American cotton bale wrappings.

The objectives of this project were to collect and analyze economic data to determine the nature and extent of (1) the problems and costs resulting from existing methods of packaging American cotton, and (2) the problems involved and the possible net benefits to be derived from the adoption of new or improved packaging materials. The project was designed to cover all segments of the domestic cotton industry as well as the transporters of cotton. This report, however, is limited largely to (1) the preprocessing problems and practices of domestic cotton spinners resulting from the condition of the American cotton bale package as delivered to the mills, and (2) the nature and extent of the effects of these problems and practices on mill costs prior to the actual processing of the cotton.

^{2/} U. S. Department of Agriculture. The Cotton Plant. 1896.

In the first phase of the study, information was obtained in 1956 by mail questionnaire from, roughly, four-fifths of all United States mills known or believed to be spinning raw cotton. ^{3/} The information called for included the origin and amount of cotton consumed in 1955, the number of bales cleaned before being processed, the method of cleaning used, the parts of the bales cleaned, and the major end products made from bales which were cleaned and from those which were not cleaned. This information was used primarily to reduce the time and expense of conducting the second phase of the study which involved personal contacts with officials and workers at a relatively small number of mills using different methods and practices. It also provided helpful information for developing the details of the personal interview schedule. This schedule called for information on (1) practices and costs of cleaning bales before processing; (2) number of bales consumed and cleaned by area of growth and method of cleaning; (3) major textiles produced from, and the grade, staple length, and average price of the cotton used in mixes at each of the mills; (4) costs other than for cleaning incurred as a result of the outer surface condition of the bale; (5) types of bale surface contaminants encountered most frequently; and (6) opinions as to the most important shortcomings of the conventional bale package.

Personal interview schedules were obtained during the summer of 1957 from 114 mills, with a reported 1956 consumption of cotton equal to about 20 percent of the total consumption of all domestic mills. Few mills had any estimates of the preprocessing costs based on actual time studies and other specific checks. Consequently special efforts were made in designing the schedule and conducting the interviews with mill officials and workers to help insure reasonably accurate estimates where such time studies and checks were not available.

PREPROCESSING PRACTICES AND PROBLEMS OF SPINNERS

Shortcomings of the Package

Complaints over a period of years, as evidenced by a review of trade literature and the information obtained in the course of this study, indicate that the average American cotton bale package as delivered to domestic mills falls far short of being the type of bale package the spinners would like. The more

^{3/} An effort was made to obtain separate data on each plant since it was known that the separate plants of a given firm often if not generally produced different qualities and types of yarns and fabrics. Consequently, it was believed that the practices and costs in the preprocessing cleaning and handling of bales would vary more nearly by plants than by firms, and that the practices and costs would, in any event, need to be determined for individual plants. Officials of some firms, however, combined the data for two or more plants. In most instances throughout this report the term "mill" is used to designate the particular operations reported by mill officials.

commonly cited shortcomings include: (1) Failure of the package to protect the contents of the bale from contaminants, including jute fibers from the bale covers, and other surface damage; (2) excessive adherence of cotton to the bale cover; (3) extra time required in handling bales with loose, ragged bagging; and (4) extra space and time required in storing and handling bales of extra size and irregular shape. Since the work covered in this report is limited to those aspects of the bale package directly relating to the bale cover and the bale ties, the material which follows is concerned almost entirely with the first three of these groups.

Failure to Protect the Cotton

The type of bagging and ties used, together with the sampling, handling, and storing practices followed in marketing American cotton result in a major proportion of bales reaching domestic mills with large areas of the surfaces contaminated with various kinds of foreign materials.

A study made in 1933 indicated that about 58 percent of the total surface of the average-size, gin-pressed, unsampled American bale wrapped with conventional jute bagging was exposed as a result of the open mesh or open weave of the fabric. ^{4/} This did not take into consideration the completely exposed space between the two bagging patterns, or the areas on the ends or heads of the bales frequently exposed because of failure to properly fasten the bagging under the ties. On the smaller, standard-density compressed bale, which represents a large proportion of the bales consumed by domestic mills, the exposed surface would be considerably smaller due to the reduction or elimination of the exposed space between the bagging patterns. Furthermore, sugar-cloth bagging, which is estimated to have been used in packaging about two-fifths of the 1954-55 crop, compared with three-fifths for which open-weave jute was used, is considered more protective than the open-weave material. ^{5/} But even with sugar-cloth bagging, the average unsampled gin-pressed bale has a relatively large proportion of its surface exposed, despite the efforts now being made to see that the bagging is of adequate length, and is overlapped on the heads of the bales and properly tucked under the ties.

The types of exposures referred to above may not be as serious as those resulting from the mutilation of the bale package after it leaves the gin press, and from the improper application of the bagging. During the 1949-50 season, it was found that by the time American cotton bales reached domestic mills and were ready for moving to the opening rooms to be consumed, they had been sampled an average of 3 times, and some bales were sampled as many as 6 times. ^{6/} This meant that each of 2 sides of the average bale had 3 holes cut through

^{4/} Wright, J. W., and Cheatham, R. J. Comparative Advantages of Jute and Cotton Bagging for American Cotton. U. S. Dept. Agr., Bur. Agr. Econ. Mar. 1933.

^{5/} Fortenberry, A. J. Charges for Ginning Cotton, Seasons 1947-48 to 1954-55. U. S. Dept. Agr., Agr. Mktg. Serv., Mktg. Res. Rpt. No. 120. June 1956.

^{6/} Soxman, R. C., and Gaus, G. E. The Sampling of Cotton Bales as Related to Marketing, U. S. Dept. Agr., Prod. & Mktg. Admin. Nov. 1950.

the bagging and well into the outer surface of the cotton, from which a sizable amount of cotton was pulled. These cuts, which are generally 18 to 20 inches long and 4 to 6 inches wide, and the holes torn in the bagging by the rough treatment the bales often receive, represent a considerable proportion of the outer surface of the bale.

More than three-fifths of the cotton spinners from whom mail questionnaires were obtained reported in 1956 that contamination (either on the outer surfaces or inside the bales) of the cotton consumed by their plants affected their opening-room costs and processing costs, and sometimes reduced the quality of the finished yarns and fabrics. The types of contaminants or foreign materials encountered most frequently, as reported by 114 mill operators interviewed, were: Rust stains, reported by 91 mills; weather stains, 71 mills; hard fibers, 71; tar, 69; grease, 67; dirt, 52; ink dye, 49; colored fibers, 27; dust and sand, 16; and water damage, 11 mills. Representatives of 17 mills reported encountering such other contaminants as lime, smoke, crushed gravel, floor stains, straw, lampblack, wood shavings, paint, feed, seed, bark, and fertilizer. Most of these probably cause at least some difficulty in spinning, weaving, or finishing, or extra loss as waste. Failure of the conventional bale package to protect the contents of the average bale directly affects cotton spinners in two other ways: (1) Added fire hazards and (2) added amounts of raw cotton going into warehouse and opening-room waste or sweeps.

Loose cotton, hanging from sample holes, torn places in bagging, and other unprotected areas of the bale, creates significant fire hazards because it burns freely and can be readily ignited by sparks from power equipment, electrical wiring, cigarettes, or slipping bands. No attempt was made in this study to determine the losses from such fires at mills or the effects on insurance rates. The hazard, however, is such that considerable precautions are generally taken, including picking the loose cotton from the sample holes. Also, small amounts of such cotton are accidentally dislodged during the weighing and handling operations and while the bales are in storage. Most of this cotton goes into some form of waste, much of it being of low quality, and is disposed of at a low price or used as a low-value product. Although the amount of this waste per bale is small, it is significant in the aggregate.

Excessive Adherence of Cotton Fibers to Bagging

When a bale is stripped of its covering, a fairly large amount of cotton remains on the bagging, particularly on open-weave jute. At most mills some of this cotton is picked or brushed from the bagging. A part of the cotton removed is often put back with the cotton in the bale and processed along with it. However, when cotton removed from covers is contaminated with bagging fibers and other foreign materials, it is either sold at a greatly reduced price or utilized by the mill in producing low-grade yarns. Even where the bale covers are picked, some cotton is usually left on the bagging and sold with the covers at a price lower than that received for most other cotton waste.

Since almost all American cotton bales are wrapped in either open-weave jute or sugar-cloth bagging to which cotton fibers readily adhere, this is an aspect of the conventional bale package affecting all domestic mills.

Extra Labor Requirements Due to Loose, Ragged Bagging

Usually cotton bales are unloaded, weighed, and moved into mill storage by means of hand trucks or power equipment. Later the bales are taken from storage and moved to the opening room, where the cotton is prepared for processing. Most mill operators interviewed reported that loose bagging frequently became entangled in the wheels of the handling equipment and slowed down the operation. A single interference of this nature may stop or slow down an entire operating crew of up to 6 or 8 men. A few bales were reported as being in such condition that the bagging and ties were removed at the unloading docks and the loose cotton carried directly to the opening room.

Bale Cleaning Practices

Bales Cleaned

The information developed through the industrywide mail survey indicated that about one-half of all American bales consumed domestically in 1955 were cleaned at least to some extent by the mills prior to processing (table 1). Practices by individual mills varied widely, with about 15 percent of the mills doing no cleaning and approximately 50 percent of them cleaning all bales they consumed. About one-fourth of the mills cleaned less than 10 percent of their consumption and the remaining 10 percent of the mills cleaned between 10 and 99 percent of the bales consumed.

A larger proportion of the Western-grown cotton was cleaned than cotton from the other three areas (table 1). Approximately three-fifths of the cotton obtained from the West was cleaned, compared to one-half of that from the Central area and a little less than one-half of that from each of the other two producing areas. 7/ Apparently the most important factor contributing to the high proportion of Western cotton cleaned is the large amount of open storage in the West.

A rough classification indicated that mills producing fine goods cleaned more than three-fifths of the bales they consumed, compared with less than one-half of the bales consumed by mills producing coarse goods. This is in keeping with the higher proportion of Western and Central area cotton cleaned, since the cotton from these areas is longer in staple and therefore is used to a greater extent by producers of fine goods than cotton from the other areas.

7/ Production areas referred to in this report generally encompass the following: Southeast--North and South Carolina, Georgia, Alabama, central and eastern Tennessee; Central States--Mississippi, Louisiana, Arkansas, Missouri, western Tennessee; West--El Paso area of Texas, New Mexico, Arizona, California; and Texas and Oklahoma.

Table 1.--Estimated distribution of bales of cotton consumed and cleaned, by area of origin, United States, 1955

Area of origin	Bales consumed <u>1/</u>	Bales cleaned <u>1/</u>	Proportion of bales cleaned
	<u>Number</u>	<u>Number</u>	<u>Percent</u>
Southeast.....	1,719,050	801,861	47
Central States.....	3,087,555	1,556,377	50
Texas and Oklahoma.....	1,156,517	562,927	49
Western.....	1,304,760	801,720	61
All areas.....	7,267,882	3,722,885	51

^{1/} Estimates for all domestic mills based on answers to questionnaires by 424 mills and on Bureau of Census estimates of total consumption by mills.

Some mill operators stated that their bale-cleaning operations were varied from time to time, depending upon complaints received from their customers or upon defects noted in the finished yarns and fabrics. Others reported cleaning all bales without attempting to determine degree of contamination. This was believed no more costly and much safer than bale-by-bale visual inspection and selective cleaning.

Methods of Cleaning

Mill responses to the mail survey indicated that three methods of cleaning bale surfaces were used primarily: (1) Picking contaminated cotton from the surface of the bale by hand, (2) currying or brushing the surfaces of the bale with brushes, usually made at the mill from card clothing or other mill stock, and (3) blowing the bale surfaces with compressed air, usually supplied by the mill compressor system. Many mills used a combination of these methods and one mill reported the use of a vacuum system.

Brushing and blowing are rather explicit terms and probably were interpreted uniformly by all of the mills surveyed. Picking is less exact, however, and may have been interpreted to cover everything involving the removal by hand of an occasional bit of trash from the surface of a bale to removing a substantial amount of cotton from irregular or badly damaged bales.

Picking bales was the most prevalent method used, both in terms of number of mills using the method and in number of bales cleaned, while brushing was a close second (table 2). About 26 percent of all mills reported picking as the only method used. These mills accounted for approximately 33 percent of all bales that were cleaned prior to processing and an estimated 17 percent

Table 2.--Number and distribution of mills reporting and bales cleaned and not cleaned, by cleaning methods, 1955

Methods of cleaning: and other treatment	Mills reporting 1/ Percentage of--			Bales cleaned and not cleaned Percentage of--		
	Num- ber	Mills cleaning	All mills reporting	Number 2/	Bales cleaned	Bales consumed
Cleaning methods:						
Picked only.....	108	30	26	1,223,265	33	17
Brushed only.....	76	21	18	1,160,244	31	16
Blown only.....	13	4	3	199,903	5	3
Other 3/.....	162	45	38	1,139,473	31	15
Total all methods:	359	100	85	3,722,885	100	51
Other treatment:						
No cleaning.....	65	0	15	4/3,544,997	0	49
Totals.....	424	--	100	7,267,882	--	100

1/ Mills returning usable mail questionnaires.

2/ Estimated totals for all mills based on reports from mills reporting and on Bureau of Census estimate of total mill consumption.

3/ Includes combinations of picking, brushing, and blowing reported by 161 mills and the vacuum system reported by one mill.

4/ Includes an estimate for all mills that did no cleaning (not just those reporting), plus an estimate of the bales not cleaned that were consumed in mills which cleaned only a part of their bales.

of the total bales consumed by all domestic mills. Brushing was the only method used by about 18 percent of the mills; they cleaned 31 percent of all bales that were cleaned, an amount equivalent to 16 percent of all the bales domestically consumed. Only 3 percent of the mills reported blowing as the sole method used, and the bales cleaned by those mills represented 3 percent of the total domestic consumption.

About 38 percent of the mills reported the use of combinations of methods, especially picking and brushing. Collectively the mills, using a combination of methods, reportedly cleaned approximately 31 percent of all the bales cleaned and about 15 percent of the total consumption by United States mills.

Parts of Bales Cleaned

In 1955 nearly one-half of the bales that received any cleaning before processing were reportedly cleaned at least to some extent on all six surfaces (table 3). About one-third of the bales cleaned were reported as having been cleaned both on the heads and on one or two sides, and more than one-sixth of them on the heads only. This indicates that the heads of nearly all the bales that were cleaned received at least some cleaning.

The more frequent cleaning of the heads of the bales than other surfaces apparently results from the fact that cotton is generally both stored and transported with the bales resting on the head or end. This means that during a considerable proportion of the time, one end of the average bale of American cotton is in direct contact with either the ground, a warehouse or compress floor, a truck bed, or a rail car bed. All of these are often sources of various types of contaminants, particularly where there is no bagging over parts of the ends of the bale. Furthermore, when the bales are in an upright position, even the upper ends are often subject to more contamination and weather damage than the sides, especially when bales are stored in the open or in buildings with faulty roofs.

In terms of method of cleaning and parts of the bale cleaned, the picking of all surfaces and the brushing of heads and one or two sides were the most extensively used combination of practices.

COSTS TO MILLS

A number of costs incurred at domestic cotton spinning mills are related to the bale package. As previously indicated, however, the ones covered in this report are (1) those directly associated with bale cleaning, and (2) certain others occurring before the cotton is processed.

Costs Associated With Cleaning

Costs incurred by domestic mills in the cleaning of cotton bales include (1) the labor required both in cleaning the outer surface of the bales and in extra handling associated with cleaning, (2) the loss in the cotton removed from the bales in the cleaning operations, and (3) the power and hand equipment used in cleaning the bales.

The average of all cleaning costs as reported by 114 representative mills was about 25 cents per bale cleaned (table 4). Of this, the loss in the value of the cotton accounted for nearly two-thirds and labor costs about one-third. Equipment costs averaged less than 1 cent per bale.

Total cleaning costs per bale varied greatly among mills, ranging from about 4 cents to approximately \$3.24. However, nearly three-fourths of the bales cleaned were in mills with average cleaning costs of under 30 cents per

Table 3.--Estimated number and distribution of bales cleaned, by method of cleaning and parts of bale cleaned, 1955

Method of cleaning	Bales cleaned	Part of bale cleaned					Total
		Heads only	Head and one or two sides	All surfaces	Other ^{1/}		
	Number	Percent	Percent	Percent	Percent	Percent	
Picked only...	1,223,265	9	24	67	^{2/}	100	
Brushed only..	1,160,244	27	56	15	2	100	
Blown only....	199,903	17	50	33	0	100	
Other ^{3/}	1,139,473	12	20	60	8	100	
Total.....	3,722,885	16	34	47	3	100	

^{1/} The part of the bale cleaned was not reported or the different parts of the bales were cleaned by different methods.

^{2/} Less than 0.5 percent.

^{3/} Includes combinations of picking, brushing, and blowing, and a vacuum system used by one mill.

Table 4.--Estimated cost to domestic mills of cleaning cotton bales before processing, 1956

Cost item	Average cost per bale cleaned	
	Actual	As percent of total
	Cents	Percent
Labor for cleaning bale surfaces.....	7.2	28.4
Labor for extra bale handling.....	1.6	6.3
Total labor.....	8.8	34.7
Loss in value of cotton ^{1/}	15.7	61.8
Equipment.....	0.9	3.5
Grand total.....	25.4	100.0

^{1/} Original cost, minus salvage value of contaminated cotton removed from bales and adjusted for claims paid by shippers.

bale cleaned (table 5). The remainder of the bales cleaned were distributed as follows: 10 percent in mills with estimated average costs of 30 to 40 cents per bale, 6 percent where costs averaged 40 to 50 cents, and 10 percent where costs averaged 50 cents and above. These wide variations in costs per bale between individual mills were, of course, almost entirely the result of differences in the average loss in value of cotton and the average cost of the labor involved. These costs may be influenced by (1) efficiency and organization of the cleaning operations, (2) proportion of the bales consumed which are cleaned, (3) surface condition of the cotton received and the extent to which the mill either rejects bales with excessive contamination or obtains claim settlements from shippers of such contaminated cotton, (4) condition of the bales consumed by the mill for which no reimbursements were made by the shippers, (5) differences in the cleaning of bales with equal amounts of surface contamination, (6) quality and purchase price of the cotton consumed, (7) use made of, or the price obtained for, the contaminated cotton removed in cleaning the bales compared with the original purchase price of the cotton, and (8) method of cleaning.

Labor Costs

The estimated average labor requirement for all bales cleaned by domestic mills in 1956 was slightly less than 4 man-minutes per bale. The mill average ranged from less than 1 to about 30 man-minutes per bale cleaned.

The hourly wages paid the cleaning crew ranged from \$1 to \$1.46 and averaged about \$1.11. About half of the mills paid less than \$1.10 and one-tenth paid more than \$1.20. At existing wages, the average cost of the labor involved in cleaning the bale surfaces was about 7.2 cents per bale cleaned. The average at individual mills ranged from less than 1 cent up to about 58 cents per bale. Mills which accounted for 65 percent of the total bales cleaned had estimated average labor costs of less than 10 cents per bale cleaned.

In addition to the actual cleaning, a number of mills reported other labor costs incurred in moving bales to special areas for cleaning and from there to the opening room. The estimated extra handling costs at these mills, when calculated on the basis of the number of bales cleaned by all mills, was equivalent to 1.6 cents per bale.

Loss in Value of Cotton

The loss in value of cotton in bale cleaning represents the difference between the price originally paid for the cotton delivered to the mill and the salvage value of the cotton removed in cleaning. This loss or cost was estimated at nearly 16 cents per bale cleaned. At individual mills, the average cost ranged from less than 1 cent to about \$2.67 per bale cleaned.

The average amount of cotton removed by all mills in the cleaning process is estimated at 0.65 pound per bale cleaned. The average ranged up to approximately 10 pounds for some mills that cleaned only very badly contaminated bales. The average salvage value per pound of the cotton removed in

Table 5.--Estimated number and proportion of cotton bales cleaned by mills having specified bale cleaning costs, 1956

Range of average cost per bale cleaned to individual mills	Bales cleaned	
	Number ^{1/}	Percent of total
	<u>Thousands</u>	<u>Percent</u>
Cents:		
0 to 10.....	906	20
10 to 20.....	1,359	30
20 to 30.....	1,087	24
30 to 40.....	453	10
40 to 50.....	272	6
50 and above.....	453	10
Total.....	4,529	100

^{1/} Number cleaned at mills with average costs per bale cleaned falling within the range indicated.

the surface cleaning also varied somewhat from mill to mill, but at most mills it was based on the price received for cotton waste, which was about the same at all mills. The average for all mills was about 11 cents per pound, whereas the average price the mills originally paid for this and other cotton in the bales cleaned was estimated at 35.65 cents per pound.

Equipment Costs

Since large proportions of the bales cleaned were picked by hand or brushed with inexpensive and rather durable brushes, the equipment costs per bale incurred in the preprocessing cleaning of cotton were small. Some mills could provide no specific estimates relating to such costs, often reporting them as very small or practically nil. However, from data obtained, it is estimated that the average cost was equivalent to less than 1 cent per bale for all bales cleaned. The average for bales cleaned with brushes was estimated at about one-tenth cent per bale, and that for the bales which were blown at approximately 3 cents. The latter is based on limited reports from mills which had separate air-compressor units used largely for cleaning bales. Most mills using compressed air in cleaning bales had central compressor units which furnished air for a number of operations throughout the mill.

Costs Not Associated with Cleaning

Preprocessing mill costs resulting from the condition of American cotton bales and the type of bagging used, but not associated with the cleaning operations, include (1) the labor required in picking cotton adhering to the bale covers after they are removed, (2) extra labor required to move and stack distorted bales and those with loose and ragged bagging, and (3) loss in value of

cotton which is picked or blown from the bale covers, left in and sold with the bale covers, or picked from the sample holes while the bales are in the mill warehouse.

Collectively these costs are estimated to have averaged about 20 cents per bale consumed by all mills, with labor accounting for about one-fourth and loss in value of cotton about three-fourths (table 6). The average of these costs for individual mills ranged from about 4 cents to approximately 68 cents per bale consumed.

A large part of these costs represents the labor used in picking the bale covers. In many of the mills, the cost of removing the cotton from the bale covers was larger than the salvage value of the cotton removed. Some mills reported that this salvage cotton was sold as waste at prices below the prices dealers were regularly paying for either picked or unpicked used bagging. At some mills only large batches of cotton which adhered to the covers were removed from the bagging.

A considerable proportion of the mills supplied estimates of the extra labor required in handling and storing bales which (1) had loose, stringy bagging which became tangled in or caught under both the hand and power trucks used in moving the cotton, and (2) required special handling because they were abnormal in size and shape. The proportion of such bales reported was comparatively small, so that the estimated average cost of the extra labor involved was a little over one-half cent per bale consumed.

The estimated average loss in value of cotton which adhered to and was sold with the bagging was nearly 7 cents per bale consumed. This plus the estimated loss on the cotton removed from the bagging gives a combined average loss of approximately 12 cents per bale. The estimated loss on cotton going into warehouse sweeps was somewhat more than 3 cents per bale. About three-fifths of the bales consumed by domestic mills in 1956 were consumed in mills where the preprocessing costs not directly associated with bale cleaning averaged less than 20 cents per bale consumed (table 7). Nearly one-third of the bales consumed were in mills where such costs were from 20 to 30 cents and about one-tenth of the bales in mills where average costs were 30 cents or more per bale.

Total of All Preprocessing Costs

The cost per bale presented in the preceding pages, when multiplied by the number of bales involved, indicates that the total of such costs to all domestic mills in the calendar year 1956 was almost \$3 million (table 8). About two-fifths of the total cost was associated with bale cleaning operations and three-fifths with other operations. The total was equivalent to approximately 33-1/4 cents per bale for each of the 8,880,000 bales consumed. Of the overall average cost per bale consumed, 23.2 cents represented losses in value of cotton and 9.6 cents, the labor costs involved. Equipment costs were equal to one-half cent per bale consumed.

Table 6.--Estimated preprocessing costs to domestic mills resulting from the cotton bale package other than those associated with bale cleaning

Cost item	Average cost per bale consumed	
	Actual	Percent of total
	Cents	Percent
Labor for picking bale covers.....	4.5	22.2
Extra labor required in moving and stacking bales.....	0.6	2.9
Total labor.....	5.1	25.1
Loss in cotton removed from bale covers <u>1</u> /.....	5.1	25.1
Loss in cotton sold with bale covers <u>1</u> /.....	6.9	34.0
Loss in cotton sold as warehouse sweeps <u>1</u> /.....	3.2	15.8
Total loss in value of cotton <u>1</u> /.....	15.2	74.9
Total of all items.....	20.3	100.0

1/ Original cost minus salvage value.

Table 7.--Estimated number and proportion of cotton bales consumed by mills having specified preprocessing cost not associated with bale cleaning, 1956

Range of average cost per bale consumed to individual mills	Bales consumed	
	Number <u>1</u> / bales	Percent of total
Cents:		
0 to 10.....	444	5
10 to 20.....	4,884	55
20 to 30.....	2,753	31
30 to 40.....	444	5
40 to 50.....	89	1
50 and up.....	266	3
Total.....	8,880	100

1/ Number consumed at mills with average costs per bale cleaned falling within the range indicated.

Table 8.--Estimated preprocessing costs to mills associated with existing methods of packaging and handling American cotton, 1956

Cost item	Cost per bale	Bales involved	Total costs	
			Actual	Percent of total
	Cents	bales	dollars	Percent
Labor:				
In cleaning bales <u>1/</u>	8.7	4,529	395	14
In non-cleaning activities <u>2/</u>	5.1	8,880	454	15
Total labor	9.6	8,880	849	29
Loss in value of cotton:				
From cleaning bales.....	15.7	4,529	712	24
From non-cleaning causes <u>2/</u>	15.2	8,880	1,351	46
Total cotton	23.2	8,880	2,063	70
Equipment:				
In cleaning bales.....	.9	4,529	40	1
In non-cleaning activities.....	--	8,880	--	--
Total equipment5	8,880	40	1
Total costs:				
In and from cleaning bales <u>1/</u>	25.3	4,529	1,147	39
In and from non-cleaning activities or causes <u>2/</u>	20.3	8,880	1,805	61
Total	33.2	8,880	2,952	100

1/ Includes extra labor used in moving some of the bales to and from special areas for cleaning.

2/ These activities and causes include (a) labor for picking bale covers and for extra time in moving and stacking bales due to loose bagging and distorted and oversize bales, and (b) loss in value of cotton removed from bale covers, remaining with the bale covers, or going into warehouse sweeps.

The estimated 1956 costs to mills attributable to the bale package and sampling practices averaged about 45.6 cents per bale for those bales which were cleaned prior to processing. This includes estimates of average per bale costs of 20.3 cents due to "non-cleaning" expenses and 25.3 cents due to preprocessing cleaning. Here, too, roughly one-third of the 45.6 cents represented labor costs and approximately two-thirds was for loss in value of cotton.

Other Costs and Considerations

In considering the results given in this report as they relate to efforts to improve the American cotton bale package, the following should be kept in mind:

1. The cost estimates reported do not include any increase in processing costs or any reduced value of yarns and fabrics resulting from surface contamination including the mixture of jute fiber with the cotton, in bales which were either not cleaned at all before processing or were not adequately cleaned. It seems likely that such costs may well be important, particularly to the mills that do no regular bale surface cleaning.

2. No allowances have been included for differences in costs of transportation, handling, and fire loss, due to extra weight of standard bagging compared with improved bagging that has been used experimentally, the greater fire hazards of bales with exposed surfaces, and to misshapen bales. The effects of these are at least partially borne by the manufacturers, but are of more direct concern to other segments of the industry.

3. No estimates have been made of the costs to foreign mills resulting from the shortcomings in American cotton bale packaging and sampling practices. It may well be, however, that the costs to foreign mills are more important to the domestic cotton industry than comparable costs to domestic mills. This is because (1) American cotton is said to reach foreign mills in poor condition, and (2) in foreign markets American cotton meets strong competition not only from manmade staple fiber but from foreign-grown cotton, which generally reaches the spinners in a package which provides better protection to the cotton.

4. Even estimates of the total increase in direct marketing costs for American cotton due to the undesirable aspects of the existing package as it reaches the mills do not show the whole picture. These costs have indirect effects on prices, farm value, production, competitive position, consumption, and exports of American cotton.

It is contemplated that in subsequent phases of the project, efforts will be made to determine at least some of the other costs attributable to the American cotton bale package. In addition, it has been proposed that costs and other data be obtained for foreign countries similar to those given for the United States in this report.

A number of factors help to account for the shortcomings of the average American bale package and for the condition of the outer surface of the bales upon reaching the mills. One factor which has received a great deal of attention during the last few years is the bale cover itself. A summary of the industry's efforts to find an improved cover and some of the main difficulties involved is given in a report of May 1957 by the National Cotton Council. 8/

8/ National Cotton Council. The Search for a Better Bale Package for Cotton. May 1957.

In this report the Council recognized that the solution to this problem is greatly complicated by two traditional marketing practices. These are (1) the cutting of from 2 to 12 or more sampling holes in the bale covers, each of which is generally 18 to 20 inches long and 4 to 6 inches wide, and (2) gross-weight trading with the accompanying standard tare allowances.

In the industry's rather extensive experimental bale cover program "many efforts have been made to develop practical ways of opening and closing sampling holes," but up to now no satisfactory solution to the problem has been found (see footnote 8). However, mechanical sampling devices, which during 1957-58 sampled between 200,000 and 300,000 bales during the ginning process, show promise of providing a partial solution to this phase of the packaging problem. In addition to providing a sample more representative of the overall contents of the bale, the automatic samplers make it possible for the bales to reach the mills in better condition than would otherwise have been the case. Many of these bales have been delivered to mills with no sample holes having been cut in the bagging.

The domestic system of gross-weight trading, together with the weight and the comparatively low price per pound of the conventional jute bagging, represent a combination which greatly reduces the ability of other materials, including cotton fabrics, to compete for the bale cover market. Under the existing system the prices paid for cotton include an allowance of 21 pounds per bale for bagging and ties, about 12 pounds of which is bagging. This means, for example, that in order for a light-weight material (as most of the experimental covers tested have been) to compete with jute, there would need to be a downward adjustment in the tare allowance and an upward adjustment in the price per pound for cotton wrapped with the lighter bagging. Otherwise farmers' returns for a given amount of lint cotton would be reduced.

Bale tare is considered to be a partial waste to the mills and as such, naturally is reflected in the prices paid. However, under gross-weight trading, adjustments in prices for bales with appreciably more or less tare than that now allowed cannot be expected unless the marketing system provides adequate means of recognizing and trading in such bales. Even with the adoption of a single new cover differing in weight from the present cover, two sets of pricing and trading practices would be necessary until the previously produced bales were largely disposed of. Adoption of two or more new covers of different weights would further complicate the marketing of American cotton. Net-weight trading, on the other hand, would avoid such difficulties and permit the ready adoption and use of any types or weights of material which could measure up to certain minimum industry specifications.

