COTTON HANDLING, GINNING, AND MARKETING FROM FARM TO MILL

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INTRODUCTION

Cotton marketing is an economic service. It includes the physical services which are required to effect changes in ownership as well as monetary transactions and physical distribution of the cotton. In recent years many technological changes have occurred at all stages in the marketing process for cotton, cotton textiles, and related cotton products. Coupled with these changes also have been new developments in market organization, affecting market structure, conduct, and performance.

Effective and efficient marketing of U.S. cotton involves numerous gins, warehouses, local merchants, and both foreign and domestic spinning mills. The marketing system consists of a multitude of services commencing when seed cotton is hauled from farm to gins and ends with the ultimate consumer.

However, the marketing of American cotton is complicated by the number and geographical distribution of producers, port facilities, and milling areas. Further complicating the system is the vast number of cotton qualities brought about by differences in soil and climatic conditions, harvesting and ginning systems employed, cultural practices, varieties and types of cotton, and other factors. Moreover, the ever-changing character of consumer demand for different products greatly influences cotton and cotton-related industries, and as a result, it has an enormous impact on the entire system.

FUNCTIONS IN MARKETING COTTON LINT

U.S. cotton is produced on nearly a half million farms located in 19 states from Virginia to California. 1/ In most years, over one-half of

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1/ Major cotton producing states are commonly divided into the following four areas: Midsouth--Arkansas, Louisiana, Mississippi, Missouri, Tennessee, Kentucky, and Illinois; Southwest--Oklahoma and Texas; West--California, Arizona, New Mexico, and Nevada; Southeast--Alabama, Georgia, North Carolina, South Carolina, Virginia, and Florida. For more detailed analysis, these regions were further subdivided into 32 additional subregions and descriptive reports developed on cotton ginning, handling, and marketing practices for each subregion. These reports are available to interested persons.

the crop is grown in the Southwest and West, and only about 15 percent in the Southeastern area where the textile mill industry is located. For many years, a large portion of the Western cotton was transported over long distances to Eastern mills. However, these cottons have become largely an export commodity principally to Far Eastern countries, and are usually exported through Western port facilities.

Even though cotton in all areas is harvested and ginned in late summer and fall, it is not all processed at this time. Year-round utilization of cotton by both domestic and foreign mills results in the need for adequate storage facilities to maintain cotton stocks for year-round mill use. Thus, storage and other services provided by the warehousing industry are major functions in the total cotton marketing system.

Seed Cotton Handling

Moving cotton from the farm and delivering it to consumers in the form of clothing and other textiles requires the services of many types of middlemen. These services begin when seed cotton is assembled and hauled from farms to gins.

Historically, cotton producers have assumed responsibility for the transporting of cotton to the gin. In some areas, particularly in the High Plains, other parts of Texas, and in the Imperial Valley, many gins have undertaken much of this function as a competitive device to assure themselves an adequate volume for gin operation. Many gins in these areas give rebates of from $1.00 to $2.50 per bale to growers who have their own trailers. Very few gins in the Southern and Eastern parts of the Belt furnish trailers to growers. Producers in these areas usually furnish and maintain their own trailers. Trailers are six to eight bale capacity, with some newer ten-bale trailers being used in the last few years. Trailer capacity in other areas varies from four to six bales, with a few in the San Joaquin having an eight to ten bale capacity. Trailers used on the High Plains have a capacity of from three to six bales of machine-stripped cotton.

With the widespread adoption of mechanical harvesting throughout the Cotton Belt, picking capacity greatly exceeds ginning capacity for a given time during harvest. Therefore, backlogs of trailers occur at gins during the peak harvest period. With available trailer space filled, the harvesting operation may be interrupted and the chance of damage to the crop because of adverse weather condition increases. However, intermittent interruptions of the harvest may exhaust the gin supply of seed cotton, forcing gins to cease operation until harvest can be resumed. Numerous methods of seed cotton storage, including trailers, enclosed buildings, wire baskets, and a slide form, have been tried. In 1965, cost for trailer storage averaged $25 per bale; wire basket storage, $6 per bale; and bulk storage in enclosed building, $5 per bale. These costs are based on 5,000 bales in storage. Although basket storage has been used extensively in some areas (Texas High Plains), the idea has not been popular in other areas.

Further bulk storage in enclosed buildings has never gained widespread acceptance due to high initial cost and the large amount of space needed to provide adequate storage facilities.

More recently, attention in all areas of the Belt has been focused on turn-row storage. This type storage involves either placing seed cotton directly on the ground or on a moveable pallet. The two most popular turn-row storage methods recently employed are free-form standing ricks and modules. 2/ Ricked cotton requires additional handling to place seed cotton in a trailer or other container for transportation to the gin, whereas module cotton is formed on a pallet, or directly on the ground, and picked up by a trailer-transporter or truck-mounted mover, that does not require a pallet. Early research has shown this system to have a $20 per bale advantage over conventional trailers.

Rick and module storage and handling of seed cotton has been adopted to some extent in all areas of the Belt. Producers in both the High Plains and San Joaquin Valley have been very receptive to these methods. Many growers in these areas have replaced their conventional trailers and module all of their cotton. Although module storage is practiced in other areas of the Belt, producers still tend to rely on trailers, using the module system for overflow only.

However, many in the industry feel that higher wages, difficulty in obtaining competent labor, over-time requirements, increasing cost of ginning, and stricter regulations will speed the adoption of more seed cotton storage. The USDA loan program for seed cotton may also aid in the adoption of this technique since it provides producers with partial payment of cotton value and provides interim financing until cotton can be ginned and transferred to the regular cotton loan program.

Cotton Ginning as a Marketing Function

When harvested, cotton usually contains dirt, hulls, leaf fragments, and other materials which must be removed if lint cotton is to have the highest market value. The term "ginning" embraces several important processes that promote faster processing and that are adapted to mechanically-harvested cotton. These processes include cleaning and other operations in preparing seed cotton, such as separating the fibers from the seed to baling the ginned lint and disposing of the seed at the cotton gin plant, or returning them to the producer.

Cotton spinner terms such as "tensile strength," "fiber length uniformity," and "neppiness" are familiar terms to cotton ginners because these elements may be affected by ginning methods and processes.

2/ Rick storage has been used to some extent in several areas of the Belt. However, California, with 25 percent of its 1974-75 crop ricked, uses this system more extensively than any other State. The Texas High Plains used this system extensively also, but has shifted more in the direction of module storage in the past year or two.

Neps are small knots of cotton fiber not found in seed cotton, but occurring in ginned lint, and in all products through which the raw cotton passes in being manufactured into yarn. The occurrence of neps in yarn affects the quality of cloth manufactured from it. Neps appearing in some types of dyed cloth appear as light spots and result in cloth that is considered inferior in quality to evenly-dyed fabrics. Seed coat fragments being chipped in the ginning process also cause yarn and fabric imperfections during the manufacturing process. When cotton is ginned wet, the seed tends to chip and produce seedcoat fragments and yield some immature fibers which accompany lint to the press. This detracts from the spinning value due to increased neps and manufacturing waste.

Certain processes in the ginning and packaging of cotton are common to all regions. However, other characteristics of the industry vary from section to section and give rise to strictly sectional practices in conditioning, ginning, and packaging of lint cotton.

Cotton Gin Cost

At the gin, cotton is conditioned, coarse trash removed, lint separated from the seed, subjected to one or more stages of lint cleaning, and packaged into bales weighing about 480 pounds.

In 1974-75, the 3,269 active gins in the United States processed approximately the same volume of cotton processed by 8,257 gins in 1946. The steady decline in the number of gin plants, and the resulting increase in volume handled per gin, has been accompanied by a rise in the general price level; hence a sharp rise in the cost of constructing a modern gin plant. A decade ago, an expenditure of $250,000 for construction of a single battery gin was common. Increases in the proportion of cotton harvested by machine has necessitated the use of supplementary ginning equipment. As a result, capital outlays for a new high-capacity gin plant are approaching 2 million dollars.

Number, Location, and Size of Ginning Facilities

Cotton gins are strategically located throughout the cotton-producing States; generally speaking, in the immediate production region. Of the 3,269 gins operating during the 1974-75 season, nearly 71 percent were in the South Central and Southwest region (table 1). 3/ Total production in these areas during this year accounted for nearly 56 percent of the total U.S. production. In contrast, the Southeastern region, which produced only about 12 percent of the crop, accounts for nearly 17 percent of all gins; and the Western region, which produces nearly one-third of the U.S. crop, has only 13 percent of the total gins.

3/ Number and size of firms for each of the 32 subdivisions of these areas are shown in the individual reports.

Table 1. Distribution of cotton gins in the United States, by regions, 1974-75

Gin size	Region									
	Southeast		South Central		Southwest		West		Total	
Bales per hour	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1-8	357	67	741	60	447	42	93	22	1,638	50
9-13	107	20	222	18	392	37	216	51	937	29
14-18	56	10	180	14	137	13	60	14	433	13
19+	15	3	104	8	89	8	53	13	261	8
Total	535	100	1,247	100	1,065	100	422	100	3,269	100

The ginning industry is characterized by a rather large number of small, older, low-capacity plants. As shown in table 1, one-half of the gins in the United States are rated at eight bales per hour or less; and only eight percent are the modern, high-capacity gins of 19 bales per hour or more. The Southeast, South Central, and Southwestern regions have the highest percentages of low-capacity gins, with 42 to 67 percent of the total gins in these areas having a capacity of eight or less bales per hour. Also, gin size tends to become smaller, on the average, as one moves from west to east across the Cotton Belt, or from the newer producing areas to the older.

During the 1974 season, the 3,269 active gins in the United States ginned a total of 11.3 million bales of cotton, for an average of 3,460 bales each (table 2). Gins in the Southeastern region had the lowest average volume (2,434 bales), and gins in the Western region the largest (8,860 bales). While gins in the Western region appear to obtain fairly high utilization of their facilities, gins in the other regions do not appear to have enough cotton produced for adequate utilization.

Total capabilities of gins in all areas greatly exceed production requirements. Utilization of the existing ginning capacity at 85 percent of rated capacity and 906 hours of annual operating time would result in an annual ginning capacity of 27.7 million bales, or a capacity 2.44 times larger than 1974 production (table 3). Only the Western region appears not to have any large amount of excess ginning capacity.

Roller gins are typically smaller than saw-type gins, with three to seven bales per hour capacity. During the 1974 ginning season, 20 roller gins were active in Arizona, New Mexico, and Texas. In a roller gin, a moving knife jerks the seed from the fiber while the latter is pulled away between a roller and a fixed knife. Gin stands are either 40 or 72 inches long. The number of stands in a roller gin varies from as few as two to as many as 24. Production of American Pima cotton was about 54,000 bales, or an average of about 2,700 bales per gin.

All varieties and staple lengths of cotton can be ginned on roller gins regardless of whether the cotton has smooth or fuzzy seed. However, saw gins are not universally adaptable to all cotton. Long staple cottons ginned on saw gins have met with objections from mills, but the small amount of upland cotton ginned on roller gins usually brings a premium price. Moveover, saw gins have about five to seven times greater capacity which reduces ginning time and cost.

Ginning Charges

Charges for ginning cotton and related services vary considerably from year to year, with changes in general business conditions, in prices of cotton, and in cost of bagging and ties. They vary from one state or region to another with differences in the condition of seed cotton, method of harvest, kind and amounts of services provided, and method used in computing charges. Ginners throughout the Belt use a number of methods

Table 2. Number of gins, cotton produced, and average bales ginned per gin by regions and United States, 1974

Region	Gins	Production	Average bales per gin
	Number	Bales	Bales
Southeast	535	1,302,284	2,434
South Central	1,247	3,481,766	2,792
Southwest	1,065	2,787,344	2,617
West	422	3,738,979	8,860
U.S. total and average	3,269	11,310,373	3,460

Table 3. Regional gin number, rated and adjusted capacity, and ginning capacity

Region	Number of gins	Rated Total capacity	Adjusted capacity 1/	Adjusted ginning capacity 2/
	Number	Bales/hr.	bales/hr.	Bales
Southeast	535	4,911	4,174	3,781,644
South Central	1,247	13,125	11,156	10,107,336
Southwest	1,065	12,449	10,582	9,587,292
West	422	5,438	4,622	4,187,532
U.S. total	3,269	35,923	30,534	27,663,804

1/ Adjusted by taking 85 percent of rated total capacity.

2/ Adjusted ginning capacity equals 906 hours operating time multiplied by the adjusted capacity.

to assess ginning charges. Within a particular area or region, however, most ginners adopt and use the same basic method, and many gins rebate to the producer a portion of these charges. The amount of rebate given varies from gin to gin, and usually depends upon the total profits realized at the end of the ginning season.

The most common methods used to assess ginning charges throughout each of the areas are:

1. A charge per hundredweight of seed cotton which includes the cost of bagging and ties.
2. A charge per hundredweight of seed cotton, plus a separate charge for bagging and ties.
3. A charge per hundredweight of lint cotton, which includes the cost of bagging and ties.
4. A charge per hundredweight of lint cotton, plus a separate charge for bagging and ties.
5. A flat charge per bale, which includes the cost of bagging and ties.
6. Ginned for seed.

Additionally, some ginners in an area may use a slight variation of the above methods. For example, a few ginners in Texas assess ginning charges on the hundredweight of lint cotton and seed, and may or may not include the cost of bagging and ties, depending on the rate used per hundredweight. Each method results in a different charge, but within an area these differences are not large. Fairly large differences in charges do occur, however, when ginning cotton harvested by different methods. For example, when using method 1, ginners in the High Plains area of Texas charged an average of $41.18 per bale for machine-picked cotton and $48.38 for machine-stripped cotton. Most, if not all, of this difference in cost is due to differences in the amount of seed cotton processed. For example, during the 1975-76 season, 2,734 pounds of machine-stripped cotton were required to produce a 480-pound net weight bale of lint cotton compared with an average of 1,502 pounds of machine-picked cotton. Cottonseed is usually purchased by the gin and sold to a cottonseed oilmill, except for that amount saved for planting seed.

Ginning Process

The following processes are common to all regions, although more elaborate systems are used in processing rough-harvested cottons such as machine-stripped and hand-snapped, or pulled cotton.

Drying

Drying of seed cotton is the first major process in improving cotton grades as well as increasing the ginning efficiency in rain-grown sections of the Belt. Driers condition the seed cotton for smoother and more continuous operation of the gin plant by removing the excess moisture and by fluffing the partly-opened locks. Dried cotton gives up more of its

foreign matter and the ginned lint is smoother. Thus, the possibility of grade reduction due to rough preparation is lessened and the spinner is provided with raw material of optimum quality. The weight loss that usually results from drying below the 5 to 7 percent moisture level costs the producer money, since grade improvement is seldom sufficient to offset the reduction in bale weight, the extra fuel required cost the ginner money and over-drying substantially reduces the use value of the cotton for the spinner. Thus, the cost of the total marketing system for cotton increases. The need for drying is evident, however, as virtually all gins in the United States are equipped with one or more stages of drying. For the Belt, 21 percent of the gins have one stage of drying, 71.3 percent two stages, and 8 percent have three or more.

Cleaning

The second major process in modern ginning is bulk cleaning. These machines remove burs, sticks, grass, stems, dirt, and sand. They are highly beneficial in increasing both the lint grade and bale value of cotton, and in reducing manufacturing waste to mills.

The types and amounts of cleaning equipment used vary widely throughout the Cotton Belt, and are closely related to the kinds of cotton grown and the harvesting method used. Early-day gins required very little cleaning equipment since seed cotton was hand-picked and was relatively clean. With the advent of machine harvesting, however, trashier cotton which requires more cleaning is delivered to the gin. In fact, seed cotton cleaning equipment now accounts for a substantial portion of the total investment in a modern gin.

Generally, gins in the Southeastern part of the Belt are older and have less elaborate overhead cleaning equipment than those in other parts. Gins in the stripper-harvest areas generally employ additional cleaning equipment not usually needed in the spindle-harvest areas. Thus, total investment in these areas for gin facilities are usually higher. Ginning charges also tend to be somewhat higher.

Extracting

The third step in seed cotton treatment common to modern gins is called extracting. This process removes large particles of foreign matter by means of carding principles, whereas the cleaning process removes fine trash, leaf particles, and small parts of stems. In this process, the locks of seed cotton are seized when they pass beneath a stripper or beater; and burs, sticks, and stems and other large pieces of foreign matter are knocked off.

Lint Cleaning

The use of lint cleaners is now common in nearly all gins in the United States, with more than 99 percent of the gins employing one or more

units. This development enables the ginner to remove foreign matter from lint cotton as a continuous process of ginning. Lint cleaners effectively remove small leaf particles, motes, green leaves, and grass left in the cotton by cleaners and extractors. Grade improvement results from the use of lint cleaners; but when grades are improved, bale weights are reduced from seven to 50 pounds or more. Quantity of foreign matter removed varies, depending on the harvesting method, number of cleaners used, and initial trash content of cotton being ginned. Thus, in some bales losses in bale weights may offset grade improvement.

Packaging

The final step in the ginning process is packaging the lint cotton. Presently, lint is packaged in five different bale forms at U.S. cotton gins — gin flat (12-13 pounds per cubic foot), modified flat (14-16 pounds per cubic foot), universal density (28 pounds per cubic foot), standard density (23 pounds per cubic foot) and high density (33 pounds per cubic foot). Progress, however, has been made at gins in recent years in regard to bale density and related technology. About 66 percent of the gins in the Belt have modified their flat bale presses to conform with bale size specifications necessary to press bales to universal density at the compresses. Additionally, slightly over four percent of the gins have installed the universal density press which eliminates the need for further compression. About four percent have standard density and less than one percent (ten gins) has high density gin presses.

However, ginners in the Southeast have made few changes in their packaging operations since cotton in this area generally moves to the mill without further compression. Moreover, gins in California also have been slow in modifying their flat bale presses, largely because of higher conversion cost due to older presses and the fact that no penalty is assessed for not modifying, nor any incentive given for modification. In contrast, about 88 percent of the gins in the South Central and Southwestern areas have modified their presses.

California, Arizona, Texas, Louisiana, Arkansas, and Mississippi have been leaders in adoption of gin standard density presses. California gins, however, operate all known high density presses. Ginners in the South Central states lead all others in installation of the newer gin universal density presses, with slightly over 57 percent of the total compared with about 25 percent by Texas-Oklahoma ginners, and 15 percent by California-Arizona ginners.

Sampling

Ginners do little sampling of cotton bales, except in a few areas of the Belt where traditionally bales have been hand-sampled on the gin

premises. 4/ Most bales of cotton are sampled by bonded samplers at the warehouse where cotton is stored.

Automatic bale samplers are available for use during the ginning process, but during the 1975-76 ginning season only 279 samplers were in use. Of this total, 112 (40.1 percent) were installed at gins in California; 20 (7.2 percent) in Arizona gins, and 71 (25.4 percent) in Texas gins. The remaining samplers were installed in gins located throughout the Southeastern States (9.7 percent), and gins in the South Central States (17.6 percent). Gins in the California-Arizona area mechanically sampled about 50 percent of total ginnings (1.134 million bales) during the 1975 season. Texas Plains gins, with about 185,000 bales sampled mechanically, was the only other group with a significant amount of cotton mechanically sampled. Most samplers in the latter two areas are recent installations incorporated in newly constructed high-capacity operations, whereas, those in other areas have been in use for a number of years. Although the automatic sampler produces an excellent sample of the bale, several factors have retarded its use. These include (1) the high cost per bale in gins with low annual volumes, (2) the long-standing domestic practice of obtaining fresh cut samples on many of the bales each time they are sold and sometimes when offered for sale but not sold, and (3) the general feeling of some segments that the properties of stored mechanical samples may not change in the same manner and to the same extent as cotton inside the bale.

Supplementary Services Rendered

Charges for services rendered in connection with ginning, which are included in ginning charges in many areas, may materially affect total ginning charges. These may include hauling from the gin to warehouse, cotton yard, or railroad platform, National Cotton Council fees, local cotton research programs, cooperative fees, insurance, storing lint cotton and cottonseed at the gin. In addition, ginners in a few areas buy a substantial portion of the crop, either for their own account or as agent for a merchant. Most of the cottonseed for crushing is purchased through or by ginners. A few ginners also sell feed, seed, fertilizers, and pesticides in an effort to attract and hold business.

New Technology

Historically, the ginning industry in the United States has been relatively slow in developing and accepting new and advanced methods of handling and ginning cotton. Until the middle 1950s, gin stands were only capable of processing one to two bales of cotton per hour. Since that time, development and acceptance of high-capacity gin stands have brought about several technological changes in the ginning industry.

New and faster automatic presses have been installed in many ginning operations; and as a result, total labor requirements in the pressing

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4/ For example, the Southwest irrigated region where about 8 percent is sampled at the gin.

operations have been reduced. Automatic strapping devices have also been developed which further reduced press labor requirements.

Increased efficiencies of from 20 to 40 percent in the ginning operation have been accomplished at a number of gins through the installation of automatic or semi-automatic unloading machinery which replaces the traditional pneumatic air suction system. Moreover, adoption of this system has reduced power requirements by 15 percent as well as eliminating labor requirements for unloading seed cotton.

Developmental work on a new system of packaging cotton is moving along well. This system will produce a 480-pound continuous lap of cotton wound around a cardboard core at a density of about 28 pounds per cubic foot. Reductions in gin labor rquirements promise to be significant. Moreover, a bale package of this design offers tremendous potential savings in labor, power, waste, and in better blending of cottons at the mill.

The acceptance of net weight trading by the cotton trade has effected substantial savings in transportation charges and ginning charges since lighter weight and cheaper materials may be used by the gin to cover bales. The practice of tying out bales "naked" at the gin has increased ginning efficiency and reduced press labor requirements at many gins throughout the Belt. Moreover, bales may be sampled at the warehouse or compress prior to placing in bagging, thus eliminating cutting of bale wrapping which improves the appearance of the bale and reduces contamination.

Universal density bale presses produce a bale at a density acceptable for both foreign and domestic shipment without further compression. Producing bales of uniform density (28 pounds per cubic foot) eliminates the need for pressing to high density for overseas shipments; thus, reducing the total marketing bill for American cotton.

Cotton Storage and Handling

The cotton warehouse and/or compress industry occupies an important position in the present system of marketing American cotton. Warehouse and compress-warehouses are located throughout cotton producing areas; generally, in the immediate area of cotton production. Compress-warehouses are for the most part strategically located with respect to the source of cotton production and transportation routes from gin points to export and domestic mill points.

The cotton merchant trade depends on the compress and warehouse industry for numerous services in relation to the physical handling of cotton that are incident to the processes of concentration, distribution, and merchandising. Moreover, the industry provides physical shelter for the cotton bale, affording protection from fire, theft, and damage by the elements. The services rendered permit the orderly flow of cotton into various marketing channels in amounts and at times when cotton is required for spinning purposes.

Additionally, compress warehouses provide and maintain the equipment necessary to compress or reduce the size of cotton bales in order to effect efficiencies in storage and transportation. Compression of cotton is necessitated by the form or package in which most cotton bales leave the gin. The present system of packaging cotton in "flat" bales of low density produces the most bulky package of all American crops. These bales usually average about 500 pounds, and represent a volume of about 40 cubic feet and have an average density of 12-13 pounds per cubic foot. The compression process reduces the cubical contents of the bale to about one-half or less of its original volume; thus, providing economies in both storage at the compress and in transportation.

Number, Location, and Size of Facilities

The total number of warehouses and/or compresses varies somewhat with fluctuations in production, but in recent years downswings in both production and carryover of government stocks have resulted in a rather sharp decline in the total number of active facilities. In 1975, only 563 facilities were active in the Cotton Belt. Of this total, 197 (about 35 percent) are equipped with one or more compression machines (table 4).[5/] More than 81 percent of all warehouses operating in 1975 were in the Southeastern area of the Belt. These 295 facilities accounted for 64 percent of the U.S. total warehouse capacity. The relative sparsity of compress facilities in the Southeastern area is due to the fact that a major portion of the area's production is consumed by local mills. Thus, the extra expense of compression is not justified.

The largest concentration of compress warehouses is in the South Central region which produces about one-third of the Nation's crop. Compress storage capacity is 6.3 million bales, or about 46 percent of the total.

The Southwest which also produces about one-third of the crop has the second largest concentration of compress facilities (57). Total capacity of these facilities is 3.8 million bales which accounts for about 28 percent of total compress capacity.

Compress facilities in the West are generally large and, in spite of the small number of plants (20), account for about 15 percent of total compress warehouse storage space. Moreover, unlike other areas in the Cotton Belt, very little excess capacity exists in the West during the harvest season.

5/ The compression machine is a massive and expensive machine which reduces the size of the bale, as produced at the cotton gin, for more economical transportation. It presses the typical bale, having a density of 13-14 pounds per cubic foot, to "universal density" of 28.7 pounds per cubic foot for economical storage and transportation. The finished bale measures 21 x 26 x 55 inches.

Table 4. Cotton warehouses and compresses: Number, capacity, and size group by area, 1975 1/

Area and bale capacity group	Number of plants	Capacity of plants
	Number	1,000 bales
Warehouses 2/		
Southeast: 3/		
5,000 or less	113	326.0
5,001-15,000	146	1,259.8
15,001-25,000	16	328.2
25,001-50,000	14	459.1
50,001 or greater	6	469.4
Total	295	2,842.5
South Central: 4/		
5,000 or less	1	3.8
5,001-15,000	20	231.7
15,001-25,000	5	105.0
25,001-50,000	1	29.7
50,001 or greater	1	208.6
Total	28	578.8
Southwest: 5/		
5,000 or less	2	6.0
5,001-15,000	13	138.3
15,001-25,000	10	204.2
24,001-50,000	8	276.1
50,001 or greater	2	180.0
Total	35	804.6
West: 6/		
5,000 or less	1	5.0
5,001-15,000	3	27.5
15,001-25,000	1	22.5
25,001-50,000	2	80.0
50,001 or greater	1	64.0
Total	8	199.0
Total warehouses	366	4,424.9

Table 4. Continued

Area and bale capacity group	Number of plants	Capacity of plants
	Number	1,000 bales
Compresses[7/]		
Southeast:[3/]		
50,000 or less	2	77.5
50,001-100,000	5	303.4
100,001 or greater	0	0.0
Total	7	380.9
South Central:[4/]		
50,000 or less	55	1,980.8
50,001-100,000	34	2,388.7
100,001 or greater	13	1,952.0
Total	102	6,321.5
Southwest:[5/]		
50,000 or less	25	776.3
50,001-100,000	21	1,468.7
100,001 or greater	11	1,568.2
Total	57	3,813.2
West:[6/]		
50,000 or less	10	336.7
50,001-100,000	4	246.5
100,001 or greater	6	1,468.1
Total	20	2,051.3
Ports:[8/]		
50,000 or less	2	77.5
50,001-100,000	4	265.3
100,001 or greater	5	799.9
Total	11	1,142.7
Total compresses	197	13,709.6
Total, all plants	563	18,134.5

1/ Firms approved by the Agricultural Stabilization and Conservation Service to handle and store government-owned or controlled cotton.

2/ Warehouses are storage facilities without compression equipment.

3/ Includes Alabama, Georgia, Florida, South Carolina, North Carolina, and Virginia.

4/ Includes Arkansas, Louisiana, Mississippi, Tennessee, and Missouri.

5/ Includes Oklahoma and Texas, excluding district 6.

6/ Includes Texas district 6, New Mexico, Arizona and California.

7/ Compresses are storage facilities with compression equipment.

8/ Includes port facilities in Texas, Louisiana, Mississippi, and Alabama.

Additional compress warehouse space is located along the Gulf Coast at such places as Galveston, Houston, New Orleans, Gulfport, and Mobile. 6/ These facilities, although rather large, do not compete to any appreciable degree with compress warehouses in other parts of the Belt. Port compress-warehouses function primarily as concentration points for cotton destined for export, and do not receive and store cotton bales for extended periods of time. Total space in port compress facilities was 1.1 million bales in 1975, and accounts for slightly over 8 percent of the total.

Utilization of Capacity

Storage capacity, average inventory, and capacity utilization by area are given in table 5. As indicated by the data in the table, with the exception of the West, excess capacity still exists in all areas of the Belt, even though total capacity has continually declined since 1970.

Warehouse and Compress Ownership

Ownership of warehouses and/or compresses throughout the Belt can be placed into three groupings: (1) cooperative; (2) multiple units or chain organizations; and (3) local independent or single unit operations. Of the total available warehouse and compress-warehouse space, about 16 percent is cooperatively-owned, 36 percent multiple units or chain organizations, and the remainder local independent or single unit operations.

Most of the cooperative type organizations are located in the High Plains area of Texas and in the far Western areas, whereas multiple and single unit operations prevail over most of the rest of the Belt. About 60 percent of the total available warehouse space, for example, in the Mid-Arizona, California, and irrigated areas, is cooperatively owned, 21 percent multiple unit, and 19 percent independently-owned. In contrast, 63.3 percent of total warehouse space in the South Central region is multiple unit ownership, with the remainder single unit, independently-owned. Generally speaking, warehouses in the Southeastern part of the Belt are independently-owned, single unit operations.

Warehousing Functions

Prior to being shipped to consuming mill or export points, most cotton ginned in the United States is transported to a warehouse or compress-warehouse, usually in the producing region, for further processing and

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6/ Large volumes of cotton are shipped from the facilities at Los Angeles and Long Beach, California. However, these are containerized shipments and cotton warehouse space per se does not exist.

Table 5. Commercial cotton storage capacity and utilization by area, 1970-75[1/]

Year beginning August 1	Southeast			Southcentral			Southwest[2/]			West		
	Capacity	Average inventory	Use	Capacity	Average inventory	Use	Capacity	Average inventory	Use	Capacity	Average inventory	Use
	1,000 bales	1,000 bales	Percent	1,000 bales	1,000 bales	Percent	1,000 bales	1,000 bales	Percent	1,000 bales	1,000 bales	Percent
1970	5,237	988	18.9	8,872	2,770	31.2	5,425	1,730	31.9	2,330	1,083	46.5
1971	4,315	834	19.3	8,567	2,346	27.4	5,130	1,379	26.9	2,345	847	36.2
1972	3,757	768	20.5	8,251	1,873	22.7	4,983	863	17.3	2,146	631	29.4
1973	3,524	797	22.6	8,123	2,452	30.2	4,974	1,548	31.1	2,182	717	32.9
1974	3,273	771	23.6	6,901	1,363	19.8	4,728	1,846	39.0	2,032	677	33.3
1975	3,223	1,005	31.2	6,900	1,569	22.7	4,618	1,463	31.7	2,250	1,389	61.7

1/ Does not include the capacity of port facilities; however, inventory and capacity utilization data include cotton stored in port facilities; Southeast area includes Alabama, Florida, Georgia, South Carolina, North Carolina, and Virginia; Southcentral area includes Mississippi, Tennessee, Missouri, Arkansas, and Louisiana; Southeast area includes Texas and Oklahoma; Western area includes New Mexico, Arizona, and California.

2/ Includes inventories in port facilities in this area. Data not available for yearly inclusion of port capacity by region. Data indicate the 1975 percentage utilization to be biased upward by four percent.

storage.[7/] The four major functions (receiving, compression, breakout, and storage) are discussed in the sections that follow.

Receiving

Upon arrival at the warehouse and/or compress, the bale is unloaded, a tab bearing the warehouse name and an identification number is affixed to the bale, and the bale examined for fire or other unusual conditions. The bale is then either trucked to a scale by hand or placed on a conveying system and moved to a scale where it is weighed by a weigher, usually licensed under the Federal or State Warehouse Act. From the scale, the bale is moved forward, where a sample is either cut by hand or mechanical sampler on both sides of the bale. One or two samples weighing about ten ounces each, one-half of which is removed from each side of the bale, are pulled from the bale and placed together to form the sample. A coupon, from the tag affixed to the bale, is placed in each sample for identification and each sample is wrapped in paper or placed in a plastic bag. A warehouse record is prepared at the same time showing for each bale the gin tag number, the warehouse tag number, and the weight of the bale.

A negotiable warehouse receipt is then issued for each individual bale. The warehouseman is required to include the following information on the receipt: gin identification number, gross weight of the bale, tare weight, net weight of the bale, tariff charge, bagging and band type, date received at the warehouse, producer's name, warehouse manager's name and signature.

The sample and receipt are then forwarded to the owner, or on request of the owner, the sample is forwarded to a government classing office, cotton broker, or some other agency designated by the owner. The warehouse receipt is universally accepted as representing the bale described thereon. Likewise, in selling transactions, the sample is usually accorded the same degree of validity.

Cotton merchants seldom see the actual bale of cotton which they merchandise. Therefore, the warehouse receipt is of paramount importance in all future transactions involving each individual bale of cotton produced in the United States. Each bale is bought and sold, and received as security for loans, based on the single bale negotiable warehouse receipt. In each case, the right of ownership and possession are transferred by delivery of the receipt. When the bale is shipped from the warehouse, the receipt is cancelled and returned to the warehouseman, where it is maintained for a number of years as proof that delivery has been made.

7/ Some cotton grown in the United States is shipped directly from gin to mill and does not enter a public storage facility. A fairly large amount of cotton grown in the Southeastern region, and to a lesser extent in other regions, is handled in this manner.

Compression

Once the receipt has been issued, "gin run" or "flat" bales are usually transported in major producing regions to the pressing area for compression to universal or standard density prior to being placed into storage. 8/ This operation requires that gin bands be removed prior to pressing and shorter bands placed around the bale. Also, because of the additional force exerted by cotton in the smaller bale, two additional bands are required. Pressing the bale to standard or universal density accomplishes two purposes: (1) It affects economies in storage by reducing the cubical content of the bale; (2) it affects economies in transportation charges over the "flat bale."

Breakout and Shipping

Services performed in the breakout operation include identifying the bales ordered for shipment in the warehouse compartment removing from stacks and setting out from storage, transporting to the shipping area, press room or loading platform. This process is time consuming and costly and requires a great amount of labor and machinery, because in removing each bale from the place where it is stored, many other bales may have to be removed. Moreover, each individual bale must either then be loaded on a trailer train for transport or transported by lift truck to some other designated area of the warehouse.

Once bales reach the designated shipping area, they are segregated into lots, bale tag number rechecked against the shipping order for accuracy, and if correct, loaded into rail cars or onto trucks according to instructions.

Maintenance by the warehouse of records of the individual bale numbers, location of the bales within the warehouse, locating bales according to numbers on shipping orders, assembling into lots and shipping bales by individual tag bale numbers is of paramount importance in insuring that the mill, exporter, and shipper will receive the actual bales which he has purchased.

Related Services

Warehousemen also provide other services from time to time when needed or requested by the owner of the cotton. Among those more frequently requested are reconditioning, reweighing, resampling, and ranging (arranging in rows for inspection).

8/ Because of low occupancy levels, some warehousemen store flat bales after they are received and press to standard or universal density at time of shipment. In either case, their compression process is the same.

Reconditioning is usually performed as a result of fire or weather damage. Damaged fibers are removed and the bale placed in as good a condition as possible. The weight of the bale after reconditioning is then recorded on the receipt. If reconditioning is not performed, the warehouseman is required to make a notation on the bale that the bale was received in fire- or weather-damaged condition.

Reweighing is done because of the susceptibility of cotton fibers to absorb and lose moisture. Successive buyers of cotton sometimes have cotton reweighed if it appears to their advantage. Weight gains may accrue in high humidity areas and weight losses taken when air is hot, dry, or windy.

Resampling is performed primarily in order to obtain a fresh sample for reclassification purposes. Changes, if any, in bale fiber properties can then be determined and prices negotiated on the basis of this classification.

Ranging is the process of removing bales from compartments, setting out, and arranging in rows in order that the owner or prospective buyer can visually inspect individual bales. Because of the large labor and machinery involved, these procedures are some of the most expensive handling services provided by warehousemen in preparing cotton bales for the market.

Cost of Services Provided

Cost to the warehouseman for services provided vary by year and area, cost of inputs required, methods employed in providing services, and volume in storage. Also, cost of performing various services incident to marketing vary somewhat between warehouses and compress-warehouses. Warehouses, for the most part, are smaller and less well equipped than compress-warehouses, which require more manual labor to perform necessary handling functions. The more mechanized compress-warehouses can perform these same functions at a faster pace with less manual labor, and thus, at lower cost. The average cost of the basic services required for the in- and out-handling of cotton bales at warehouses and compress-warehouses are shown in table 6 for major cotton producing areas. Increases or decreases in these costs have a marked effect on the total marketing bill for cotton.

Charges for Services Provided

Charges for warehousing services incident to marketing American cotton vary from year to year with changes in the cost of providing the service, from area to area, and the kind and amount of services included. Warehousemen in some areas may not charge for receiving cotton because of competition, tradition, or other reasons. On the other hand, some warehousemen may include a short period of storage while others may not make a charge if

Table 6. Storing and handling baled cotton: average cost per bale, by area and type of facility, 1974-75

Area and type of facility 1/	Receiving	Storage per month	Breakout	Shipping	Standard density Compression	Universal density Compression
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Southeast						
Warehouses	1.392	0.842	0.797	1.391	--	--
Compresses	1.398	.753	.681	.682	1.571	2/
All plants	1.393	.833	.768	1.215	1.571	2/
South Central						
Warehouses	1.224	.909	.831	1.447	--	--
Compresses	1.289	.798	.834	1.032	3.190	2.998
All plants	1.282	.809	.834	1.076	3.190	2.998
Southwest						
Warehouses	.902	.607	.302	.686	--	--
Compresses	1.171	.485	.262	.518	3/	1.913
All plants	1.120	.504	.268	.544	3/	1.913
West						
Compresses	.904	.560	.527	.979	3.131	3.421
United States						
Warehouses	1.188	.771	.594	1.103	--	--
Compresses	1.189	.601	.510	.757	3.106	2.328
All plants	1.189	.640	.525	.819	3.106	2.328

1/ See footnotes table 5 for delineation of areas.

2/ Bales not compressed to universal density in this area.

3/ Data unavailable.

compression is performed at their facility. Charges for warehousing services are about the same within a state or region, or vary insignificantly between facilities. Average charges per bale at warehouses and compress-warehouses in each major region of the Cotton Belt are shown in table 7. The total charge per bale, however, depends upon the length of time individual bales remain in storage, since storage charges are assessed on a monthly basis. The average months of storage for a typical bale of cotton in major cotton producing regions are shown below:

Southeast	-	3.1 months
South Central	-	4.5 months
Southwest	-	4.0 months
West	-	4.1 months

Typical charges accruing against a bale of cotton in the South Central area would be: receiving, $1.50; storage, $4.55 ($1.01 x 4.5 months); shipping, $2.60; and universal or standard density compression $3.67, for a total charge of $12.32. Additional services are provided as requested. Charges for these services vary across the Cotton Belt, but typical rates in the South Central region are: weighing or reweighing at time of shipment, $1.00 per bale; reconditioning damaged cotton, except for fire damage, actual cost plus $4.00 per bale; consolidating cotton, $1.25 per bale; and sampling or resampling at time of shipment, $0.75 per bale. Generally, all warehousing charges are based on a 500-pound net weight bale and a service fee is collected on all bales weighing more than 550 pounds.

Quality Evaluation and Marketing

Quality evaluations are made to determine the grade, staple length, and micornaire of each bale of cotton which indicates to a large extent the spinning quality and, thus, the value of each bale. Producers are interested in quality evaluations of each bale as a means of appraising production, harvesting, and ginning practices, and to more advantageously market their cotton. Merchants also buy and sell more efficiently through the use of these evaluations. Although supplementary measurements have worked their way into marketing transactions, quality evaluations are still the prime and essential means of orderly marketing.

Role of Classing Office in Cotton Marketing

The classification and market news service was established in 1937 under the Smith-Doxey Act. The Act provides classing and reclassing and market news service to farmers. 9/ It provides for taking a sample from each bale of cotton at the gin or warehouse. These samples are sent to one of 39 designated Agricultural Marketing Service, Cotton Division, offices

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9/ A fee of $0.45 per sample is charged for review classification. Producers are also charged for resampling and other costs incurred in providing the sample to the classing office.

Table 7. Warehousing charges: Average charges for major services by area, 1974

Area 1/	Receiving	Storage	Shipping	Standard density	Universal density
	Dollars	Dollars	Dollars	Dollars	Dollars
Southeast	1.71	0.93	2.25	3.22	3.45
South Central	1.50	1.01	2.60	3.67	3.67
Southwest	1.41	.89	1.75	3.70	3.71
West	2/	.96	2.00	3.43	3.47

1/ See table 5 for delineation of areas.

2/ Receiving charges not normally made in this area.

for classification. 10/ Cotton classification, or classing, is a means of describing the quality of cotton in terms of grade and staple length. The grade of cotton is defined in terms of three factors -- foreign matter, color, and preparation, and is determined chiefly through the sense of sight. Foreign matter is the amount of leaf, pieces of burs, dirt, and so forth, in the cotton; color is the hue, brilliance, and chroma of the cotton; and preparation describes the degree to which normal length of fibers relative to neppiness, roughness, and stringiness is altered in ginning. For staple, classification is based on sight and feel, and is the normal length of a typical portion of the fbers.

Staple Length

The various quality classifications are shown below:

Official Cotton Standards of the United States for the Grade of American Upland Cotton-Universal Standards

Grade description	Grade symbol	Code no.
White cotton		
*Strict Good Middling	SGM	01
Good Middling	GM	11
Strict Middling	SM	21
*Middling Plus	Mid Plus	30
Middling	Mid	31
*Strict Low Middling Plus	SLM Plus	40
Strict Low Middling	SLM	41
*Low Middling Plus	LM Plus	50
Low Middling	LM	51
*Strict Good Ordinary Plus	SGO Plus	60
Strict Good Ordinary	SGO	61
*Good Ordinary Plus	GO Plus	70
Good Ordinary	GO	71
Light Spotted Cotton		
*Good Middling Light Spotted	GM Lt. Sp.	12
*Strict Middling Light Spotted	SM Lt. Sp.	22
*Middling Light Spotted	Mid Lt. Sp.	32
*Strict Low Middling Lt. Spotted	SLM Lt. Sp.	42
*Low Middling Light Spotted	LM Lt. Sp.	52
Spotted Cotton		
*Good Middling Spotted	GM Sp	13
Strict Middling Spotted	SM Sp	23

10/ A few of these offices are temporary offices, open only during the harvest season.

Grade description	Grade symbol	Code no.
Middling Spotted	M Sp	33
Strict Low Middling Spotted	SLM Sp	43
Low Middling Spotted	LM Sp	52
Tinged Cotton		
*Good Middling Tinged	GM Tg	14
Strict Middling Tinged	SM Tg	24
Middling Tinged	M Tg	34
Low Middling Tinged	LM Tg	54
Yellow Stained Cotton		
*Good Middling Yellow Stained	GM YS	15
*Strict Middling Yellow Stained	SM YS	25
*Middling Yellow Stained	Mid YS	35
Light Gray Cotton		
*Good Middling Light Gray	GM Lt Gray	16
*Strict Middling Light Gray	SM Lt Gray	26
*Middling Light Gray	Mid Lt Gray	36
*Strict Low Middling Light Gray	SLM Lt Gray	46
Gray Cotton		
*Good Middling Gray	GM Gray	17
*Strict Middling Gray	SM Gray	27
*Middling Gray	Mid Gray	37
*Strict Low Middling Gray	SLM Gray	47
Below Grade		
*Below Good Ordinary	BG	81
*Below Low Middling Light Spotted	BG	82
*Below Low Middling Spotted	BG	83
*Below Low Middling Tinged	BG	84
*Below Middling Yellow Stained	BG	85
*Below Low Middling Light Gray	BG	86
*Below Strict Low Middling Gray	BG	87

*Descriptive Standards: The descriptive standards for grades are based upon the physical standards. Each of these standards provides a description for cotton in which the factors of grade -- color, leaf, and preparation -- are not contained in a single physical standard. For example, "Middling Gray" is American Upland cotton which in color is Strict Good Ordinary and which in leaf and preparation is "Middling or better;" "Middling Plus" is "Middling" in leaf and preparation with "Strict Middling" color.

Physical Standards: Grades are represented in physical form by samples put up in boxes. The range of each grade for which there is a physical standard is represented by 12 samples put up in the official box of the Cotton Division, AMS, USDA.

Official Cotton Standards of the United States for Length of Staple -- (All American Cottons)

Inches	Code	Inches	Code
*Below 13/16	24	1-3/16	38
12/16	26	1-7/32	39
7/8	28	1-1/4	40
29/32	29	*1-9/32	41
15/16	30	1-5/6	42
31/32	31	*1-11/32	43
1	32	1-3/8	44
1-1/32	33	*1-13/32	45
1-1/6	34	1-7/16	46
1-3/32	35	*1-15/32	47
1-1/8	36	1-1/2	48
1-5/32	37		

Staple standards continue upward beyond 1-1/2 inches in steps of 1/32 inches. Physical types for the length 1-5/16, 1-3/8, 1-7/16, and 1-1/2 inches are available for American Pima only.

*Descriptive Standards.

In addition to classifying each bale for grade and staple length, each bale is now "miked" -- measured for cotton fiber fineness and maturity by means of an air flow instrument. The reading is referred to as a "mike" or micronaire reading. Once a sample has been classified and "miked," values are stapled on the classification card, generally called a green card because of its color, which accompanied the sample to the classing office. The classing office returns the completed card to the gin who in turn gives them to the producer, or upon written authorization turns them over to a trucker, marketing association, or merchant. Producers are not required to have their cotton sampled or classified, but in recent years more than 95 percent of the crop has been classified under this program.

In addition to the classification service, the classing office provides producers with market news through radio, television, and newspapers, estimates of crop conditions, harvesting rates, supply, demand and price information, and a review of spot cotton quotations.

Information furnished by the classing offices has resulted in a considerable savings in marketing cost, encouraged quality improvement and provided farmers with information needed to make sound marketing decisions. Moreover, many cotton purchases and sales are based on the Smith-Doxey classification and micronaire reading. Instrument measurements

of cotton quality may provide producers with additional information needed to more advantageously market their cotton in the future. These tests, which will supplement the classer's art or skill, will provide for rapid measurement of fiber length, length uniformity, fiber strength, color, trash, and condition. This information on values for each will be entered on the "green card" along with regular class values for grade, staple, and micronaire. Development and use of instruments should have a considerable influence on the method of pricing cotton and in evaluating cotton for specific end uses.

Transportation of Cotton

Cotton is moved from producing areas by rail, motortruck, or some combination of rail and truck, and occasionally water transport directly to domestic mills, ports, compresses, or concentration points. From these points it goes to domestic mills or is exported. Transportation of cotton by either means is invariably the cotton merchant's largest item of cost, and often accounts for one-third or more of their total merchandising cost. Presumably, cotton merchants give added attention to alternative means of transporting their cotton.

Changes in Transportation Patterns

In the years prior to World War II, the Nation's railroads carried the bulk of the cotton shipped from producing areas in the United States. Better highway systems, a steady deterioration of rail lines, abandonment of some rail systems, more favorable rates, convenient and more timely service have brought about a dramatic shift in cotton transportation. Various reports and comments have indicated that the number of bales transported by motor truck lines has increased. Since 1961, for example, truck shipments have increased from 27 percent of the total to about 47 percent (table 8). Prior to this time, truck shipments accounted for less than 10 percent of the total.

On a regional basis, the Southwest had the least amount of cotton shipped by truck in 1975 (30.3 percent), and the Southeast the largest (63.2 percent) (table 9). The largest quantities of Southeastern cotton (63.2 percent of the total) shipped by truck results from much of this cotton being consumed locally and trucked direct from gin to mill.

Container shipments in increasing numbers are being made from California, Arizona, and the High Plains region of Texas. Most containers used for cotton are 40-foot van-type trailers with detachable under carriages. The Sealand Company has both 40-foot and 35-foot containers. The 40-foot containers hold 80 bales of compressed cotton and the 35-foot about 75 bales. Two containers are shipped per flat bed rail car, with a 70,000 pound minimum weight per car. Texas High Plains cotton is loaded into containers either at inland warehouses or at Texas Gulf ports and then rail "mini-bridged"

Table 8. Shipments of cotton from warehouses, United States, 1961, 1970, and 1975 seasons

Year	Percentage shipments by		
	Truck	Rail	Total
	Percent	Percent	Percent
1961	27	73	100
1970	36	64	100
1975	47	53	100

Table 9. Shipments of cotton from warehouses by major cotton-producing regions, 1975-76 season

Region	Total bales	Bales shipped by		Percentage shipped by	
		Rail	Truck	Rail	Truck
	Bales	Bales	Bales	Percent	Percent
Southeast	828,141	305,205	522,936	36.8	63.2
South Central	2,809,385	1,304,005	1,505,380	46.4	53.6
Southwest	3,416,130	2,382,681	1,033,449	69.7	30.3
West	2,652,257	1,109,528	1,542,729	41.8	58.2
Total	9.705,913	5,101,419	4,604,494	52.6	47.4

or land "mini-bridge" from Texas Gulf ports to West Coast ports for export.[11/] In contrast, approximately 65 percent of cotton exported from San Joaquin Valley of California, and 30 percent from Mid-Arizona and Imperial Valley of California, are container loaded at the warehouse and trucked to West Coast ports for export. Additionally, truck shipments are also made from Mid-Arizona and the Imperial Valley to port areas where cotton is placed in containers for export. Some experts estimate that 90 percent of European and 60 percent of Far Eastern shipments are now made in containers. Container shipments of cotton are not made to any large extent from other areas.

Container shipments, however, offer reductions in the total marketing bill for raw cotton through reduced export packaging cost, low ocean freight rates ($2.25 per metric ton to Europe), reduced damage and pilferage during transit, lower insurance, and a savings of from $0.50 to $1.00 per bale in pier warehousing and handling charges.

Inbound Freight Allowances and Transit Privileges

Rail transportation to and from the warehouse is greatly facilitated by the rail transit privilege. Under this proviso, cotton which is received at a warehouse by rail transportation is moved at a certain inbound freight rate from the gin to the warehouse location. In some areas, special transportation or freight allowance programs have been arranged whereby cotton bales are moved from gin to warehouse by truck. Under this program, however, railroad billing is taken out to cover transportation, as if the cotton had been moved in rail cars.

Inbound freight is paid at the time cotton bales are shipped from gins to storage. These charges are based, usually, on less than carload rates and are indicated on the warehouse receipt as a lien against the bale. The lien is satisfied by the person surrendering the warehouse receipt by shipping an equal amount of cotton by rail. If an equal amount of cotton is not shipped, the inbound freight charges are billed to the person surrendering the receipt.

Cotton ordered moved by a shipper or other owner prior to final destination shipment is subject to a transit privilege. Under this privilege, the ultimate destination charge is based on the most direct route from the origin to final destination, even though cotton bales normally do not follow the most direct route to their final destination on account of the need for consolidaition of grades and staples into even-running lots. While the shipper or owner pays the published rate for each intermittent shipment,

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11/ Cotton is a new-comer to "mini-bridge" operations. It is a term used to denote a combination truck, rail, and ocean-going-vessel shipments by container and is an arrangement between steamship lines and railroads, with the cotton shipper having little voice in the method selected. Rates for this type service are low and some are based on a monthly or annual volume rate.

a refund is made by the rail line. This refund is the difference between the charge for the most direct route and total charges for intermittent shipments. This privilege is offered only by rail lines, and the point of origin is where continuous rail transportation for each bale of cotton begins. It also provides rail lines a competitive edge not enjoyed by truck firms.

Some changes have taken place, or likely will take place in the near future, with regard to the inbound freight allowance. The inbound gin-to-compress freight or truck allowance has been, or is being, cancelled in the Southwest and Western regions of the Belt. Effective November 15, 1976, most rail lines in the Southwestern region cancelled the trucking allowance on cotton moving to the Gulf ports and reduced rail rates 10 percent, with maximum of 15 cents per hundred pounds. Although not passed at this time, a later proposal would cancel the inbound freight allowance to Southeastern and other mill areas. The Western Cotton Shippers Association is also sponsoring a proposal to eliminate the inbound transit privilege and to reduce current rail rates to Southeastern mills by about $0.45 per hundredweight, or $2.25 per bale.

Transportation Charges

As mentioned previously, the cost of transporting cotton to final destination points is invariably the cotton merchant's largest expense, and often accounts for one-third or more of his total merchandising cost. Basically, the cotton merchant has access to two modes of transportation, which are in direct competition with each other for the transportation of cotton to domestic mills and to export points. The nation's railroads and non-regulated trucking industry transport nearly 100 percent of the cotton grown in the various cotton producing regions.

Although the proportion shipped by each method varies from area to area, merchants in general utilize lower cost rail transportation for longer hauls, and trucks for shorter hauls of from 300 to 600 miles.

Basic charges paid by merchants for rail and truck shipments of cotton during 1975 are shown in table 10. Rates are shown from specific locations, except where rates apply to an entire area or state. Rates to a specific area may vary slightly from points within a state, but generally are not significant. However, recent decisions allowing additional increases in rail rates and provisions of the Railroad Revitalization and Regulatory Reform Act of 1976 allowing carriers to file for rate increases of as much as 7 percent before the Interstate Commerce Commission without suspension will have a marked effect on the rail rates in the future and will likely widen the gap between rail and truck rates. Increasing rates and the railway's inability to provide adequate cars for a timely loading and shipment of orders placed by domestic mills and merchants for both domestic and export cottons will likely contribute to a greater use of truck transportation even over the longer distances.

Table 10. Selected rail and truck transportation rates from primary origin to destination point, by states, 1975

Origin	Destination and transportation mode									
	Carolina 200A		Carolina 201B		New England		Macon, Georgia		New Orleans	
	Rail	Truck	Rail	Truck	Rail	Truck	Rail	Truck	Rail	Truck
	Dollars per acre									
Pine Bluff, ARK	7.63	6.90	6.81	5.80	10.80	3/	6.48	5.00	5.28	4.75
Sikeston, MO	7.63	6.75	6.81	6.25	10.80	3/	6.48	5.75	5.33	5.75
Rayville, LA	7.82	6.50	7.06	6.00	10.13	3/	6.43	5.25	2.30	3.50
Greenwood, MISS	6.86	6.00	6.43	6.00	9.40	3/	5.95	4.75	4.70	4.00
Memphis, TENN	6.68	6.00	6.00	6.00	9.12	3/	5.42	5.00	4.70	4.25
									Houston	
Lubbock, TEX	9.40	12.25	9.02	10.25	13.00	3/	8.69	8.50	6.58	5.34
El Paso, TEX	10.70		10.13		14.30	3/	9.40	--	9.60	6.80
Altus, OKLA	8.78	9.55	8.45	9.00	12.53	3/	7.73	8.50	6.76	4.50
Las Cruces, N MEX	10.70		10.13		--	3/	9.41		8.83	
Roswell, N MEX	10.61		10.08		--	3/	9.26		9.07	
California 1/	13.48	13.50	13.48	13.50	18.55	3/	13.48	13.50	13.68	
Arizona 2/	14.92	11.50	14.92	11.50	18.55	3/	14.92	11.50	9.12	4/ 7.50
Decatur, ALA 5/	5.50	6.80	4.10	5.50	--	--	3.50	4.55	--	--
Cordele, GA 5/	4.55	6.20	3.45	6.95	--	--	1.70	2.55	--	--
Gastonia, N.C. 5/	1.65	2.55	1.65	2.25	--	--	3.55	4.60	--	--

Note: Truck rates in South Carolina are charged at $1.25 per bale plus one cent per mile. The average haul is 150 miles.

1/ 62,500 pounds reduced rate. 2/ 50,000 pounds.

3/ Rates unavailable -- only limited number of bales shipped by truck.

4/ Bulk container shipments.

5/ Special rail rates in these areas. However, demurrage charge by many warehouses to rail service may offset lower rates.

Cotton Marketing

Although cotton is grown in many areas of the Cotton Belt where climatic conditions, topography, production costs and other factors make each area separate and distinct from the others, cotton marketing has for many years been performed on the basis of five general regions. These are the Southeast, Midsouth, Texas-Oklahoma, Southwest, and Far West. These differentiations are made principally on the types of cotton grown in each area, or on specific handling practices. Specifically, there is little difference in the quality characteristics of the types of cotton grown in the Southeast and the Midsouth. But the Southeastern area produces substantially less cotton and it moves either directly to the nearby mill area or through the warehouse system without compression. Also, practically all of this cotton moves by truck.

Texas-Oklahoma cotton is generally characterized as short-staple cotton and except for the manufacture of coarse yarns is an export commodity. The Southwest is characterized by long staple, fine fibered cottons that are used in manufacturing fine yarn count goods and threads. Far Western cottons are medium staple, high strength cottons, and are used principally in apparel fabrics in the domestic market. During the period 1964-1970, when polyester/cotton blends were accounting for a substantial share of the woven fabric market, Western cottons had a substantial share of this market. However, as textile firms gained more experience in manufacturing blends, it was found that Midsouth and Eastern cottons performed adequately in blends without the extra cost of transportation from the west to the east coast and the premiums which were associated with the high quality Western cottons. Subsequently, the Far Western growths became largely an export commodity, principally to the Far East.

Types of Buyers

Typically in any one of the five general areas there may be found the following five types of buyers:

1. Merchant-shippers. Firms in this category perform all of the functions involved in moving cotton from the producer to the mill. These firms actually take title to the cotton from the time it leaves the farmers' hands until it is purchased and/or delivered to a domestic or foreign mill or trading firm.

2. Cooperative marketing associations. These cooperatives act as shippers, except that they are acting for farmer-members who comprise the association. There is a strong cooperative marketing association located in four western areas and a smaller association located in the Southeast.

3. Broker, agent, or commission buyer. This type of firm or individual acts as a go-between in either the purchase of cotton in country markets from growers or gin points, and in the sale or cotton to domestic mills on behalf of merchants-shippers or large growers.

4. Gin buyer. Generally, this function is performed by the gin owner who is involved to supplement his income. This type of operation would classify him as a merchant-shipper in that he takes title to the cotton. While technically this may be correct, actual practice indicates that he has a pre-arranged outlet for this volume either to a bona fide shipper or direct to the cotton department of a textile firm.

5. Direct mill buyer. This type of operation developed in the 1950's and the 1960's, largely because of fiber quality problems encoutnered in the harvesting/ginning area. Usually it involved growers with unusually large acreages contracting direct with mill buyers to process their crop according to a pre-determined set of conditions for a pre-determined price to the grower. Although the situation changed over the years, there are still arrangements where the same firm purchases a particular grower's crop year after year, due mainly to the fact that confidence is built up on both sides of the bargaining agreement. However, this is not a general practice, for two reasons: (1) textile firm cotton departments do not have the personnel to deal with a volume of growers across the Belt, and (2) they prefer to have a third party between them and the grower who, under the present marketing system, would be the guarantor of performance under any contract. Furthermore, the cost of staff maintenance, as well as personnel availability, would be more than the cost of doing business through a third party.

More recently, foreign trading companies have opened offices in various locations across the Cotton Belt. These operations are primarily in the export business, although some sales are made domestically. Generally, these firms buy from growers and cooperatives, although one firm is now growing in excess of 10,000 acres in California on land which it owns. This idea was explored by domestic textile firms shortly after World War II, but the economics involved in land acquisition, capital investment, mechanization, ginning, and staff requirements as related to the volume of cotton needed, ruled against such an enterprise.

In summary, the merchant-shipper and the cooperative marketing association handle the greatest part of each year's cotton crop, both domestically and for export. Other types of handlers are involved mainly in accumulating cotton from small country markets into larger volumes or in facilitating sales in the textile manufacturing area through contacts which have been well established over the years.

Method of Operation

Merchant-shippers

Normally a merchant-shipper operates in several of the five areas of the Cotton Belt, except the relatively small shippers who confine their operations to one specific area. In these latter cases, the shippers' customers are usually domestic mills that purchase all or part of their requirements in

other areas from shippers located in the area involved. There are countless small shippers located in all areas of the Belt who have built a grower and buying clientele over the years. Moreover, there is always competition between these shippers for available cotton.

Large shippers maintain branch offices in several areas or territories, depending on the requirements of their domestic and foreign customers. This practice occurs because most of their customers require cottons of different areas of growth as well as different qualities.

Typically, 90 percent of the cotton is sold by growers to the first buyer on the basis of the Smith-Doxey "green card" class. If the shipper purchases from the growers in the absence of a corresponding sale to a buyer, he immediately hedges his purchase by selling a corresponding number of bales of futures on the New York Cotton Exchange. If a mill sells a large order of cloth for future delivery, a purchase of equivalent raw cotton will be made from a shipper. The latter will either buy futures as a hedge against the sale if raw cotton is not available, or he will make a contract with a grower to deliver cotton from the forthcoming crop. Such a practice is referred to as forward contracting and has come into wide-spread practice in recent years. In all cases, the practice of "hedging" as protection against wide-spread price fluctuations by buying or selling futures is employed by both buyers and sellers. Generally, the shipper is not in business to "sepculate" on raw cotton, and the textile firm is in business to manufacture fabrics and not to "play the futures market" by speculation.

It can readily be seen that large capital requirements are initially involved in the actual purchase of raw cotton. Furthermore, it extends over a long period of time. Growers usually harvest, gin and sell a crop in a relatively short period of two to three months, and expect to sell immediately for valid reasons. Thus, the shipper is faced with carrying his purchases until the sale is finally consumated. Generally, no payment is made until the final bales are delivered several months hence as is stated in the sale/purchase contract. In addition, if margin calls are made on the shipper by the Cotton Exchange as a result of his hedging operations, additional capital is involved in order to protect his position. This position is dependent on whether he is a buyer or seller of futures and the direction in which the futures market is moving.

Purchases of cotton are usually made several months ahead of actual needs by textile firms; the length of time involved depending on supply availability and the state of the cloth business. A firm may purchase 50,000 bales and have one-half of this amount delivered in February-May, while the second half will be delivered in September-November. Some textile firms perform their own shipping function from the compress to the mill and may either take title to the cotton at time of purchase or at time of actual shipment. Storage charges are thus adjusted accordingly. Other firms specify that the shipper will make all arrangements for moving the cotton within the time limit specified by a specific type of carrier (either truck or rail, depending on location). The textile firm thus pays

a "landed price" for the cotton which includes the usual compress and storage charges that will have accrued, plus the transportation charge from the particular area to the mill. Firms utilize this method of purchase when the staffs are relatively small and prefer to depend on shippers to perform these services where a large volume of cotton is involved.

Purchases made on a "landed" basis are made from bona fide merchants or shippers and the two terms are synonomous in this situation. In some areas, particularly West Texas, f.o.b. merchants are active. These particular firms operate exactly as merchants or shippers insofar as financing, purchase, hedging, or warehousing is concerned. However, as the name implies, their sales are made on the basis of the bales being located at a particular warehouse in the trade territory. Thus, it is the responsibility of the purchasing textile firm to arrange for take-up and transportation from a particular location (warehouse) to the textile firm's storage facilities.

In some areas there is frequent trading between f.o.b. merchants. This involves transfer of warehouse receipts between firms for a stated price. Warehouse receipts are negotiable instruments, signifying that a particular bale has been warehoused, is backed by the warehouse industry, and ownership of the bale resides in the firm actually holding the receipt.

Once a sale is made by a shipper, the necessary volume is accumulated or it is ear-marked from already existing stocks. Terms of the contract may specify that grade and staple length be based on "green card" classification with certain micronaire specifications. However, more than likely the quality specifications will most likely be based on a private type or types developed by the purchaser over the years and with which the shipper is familiar. Quite often the shipper can fill more than one order from different firms at the same time, as one firm may accept particular bales that another firm may not.

In some cases, textile firms, having purchased a lot of cotton from a shipper, will send personnel to the shipper's sales office to approve or "take up" cotton that is offered on the contract. A part of the contract specifies that the purchases must be satisfied either on the take-up, or when the shipment reaches the mill. If there is disagreement, the samples are sent to arbitration by a board maintained in Atlanta by the industry for arbitration purposes. This function is becoming less important in today's marketing picture. Generally, contracts call for a grade of Strict Low Middling or better, or a specified percentage of certain grades with a minimum staple length. This minimum is usually less than the average of the crop in the area or territory involved, so staple length presents no problem.

Cooperative Marketing Associations

Cooperatives operate essentially in the same way as the merchant-shipper, except that any profits are rebated to the grower. Other differences are that some of the Western cooperatives operate their own compresses and warehouses as part of the marketing process.

Most cooperatives have several sales options available for members' use. Forward contracting is one form in which the grower decides on what price he will accept and, if met by a purchaser, the cooperative will act as the third party between the grower and purchaser. The contract can be a "hog-round or gin-run" price. The second type of contract is one with a specified number of bales with a base quality and discounts for qualities below this base. The type of contract is dependent upon the degree of competition which exists in the forward contracting area.

The second type sales option is a seasonal pool, which is designed to even out wide fluctuations in prices throughout the year. This is accomplished through orderly sales and blocking cotton into selected categories, and by fitting different qualities within the pool into sales to firms with narrow quality requirements.

A third type sale is a call pool where the grower fixes a price on a part of his crop prior to harvest. Sales are made on a fixed number of bales with price based on a base quality. Final price is adjusted according to the contract for quality variations above or below the base quality specified.

An unusual system of marketing is being developed by a Southwest cooperative association. Through the use of computers and high speed data printers located in shippers' offices in Lubbock, Dallas, and Memphis, information on quality and lot size is flashed on the screen for bidding. Minimum prices that producers will accept are stored in the computer for each lot and when the asking price reaches the minimum, the computer automatically offers the lot or lots for sale. The cooperative also is involved in the bidding process, along with the merchants who participate in the cities involved.

Broker, Agent, Commission Buyer or Seller

As the names imply, brokers, agents or commission men only act as middlemen between a grower (seller) and a purchaser (usually shipper or textile firm) or between a seller (shipper) and buyer (textile firm). Minimum price is normally specified by the purchaser or seller and they act as intermediaries while receiving a basic amount per unit for the volume bought or sold. They neither take title to the cotton nor perform any of the corollary functions involved in shipping such as financing, hedging, arranging for transportation, and so forth. Their real function is in the assembling of individual bales or small lots into substantial volumes of cotton for others, or in acting as selling agents in the textile manufacturing area for shippers or possible large growers.

Ginner-Buyer

Ginner-buyers probably had their origin in the early part of the 20th Century when gin-owner-operators purchased from growers their production in the form of seed cotton. During this period, transportation and

marketing facilities were generally lacking. This method of first purchase was also used by merchants to assure an adequate volume and the ginner-owner acted as agent. In more modern times, gins purchase lint cotton from growers. This custom has varied considerably between areas. During the period when the Federal Government provided a price support program, prices did not fluctuate to any great extent and the risk involved was not great. In addition, the ginner had a certain outlet for his purchases or he was actually acting as a commission buyer for a merchant or a mill. The extent to which this practice is used was and still is dependent on the desire of local grower patrons to sell their cotton as it is ginned.

In recent years, gin buying has fluctuated widely. This has been caused by the wide swings in price levels. If gins actually bought cotton for their own account, the wide price fluctuations left him vulnerable, since few of them used the futures market to hedge purchases. Available data over the years indicate that gins purchased over 90 percent of the crop in Missouri. However, this figure dwindled to only 6 percent in 1974-75. In other areas, gins may have checkbooks from several firms with authority to write checks for cotton. These firms may be acting for their own acccount or, more likely, for merchants located in large metropolitan cities. Usually a small fee is paid to the gin for performing this "collection" service.

Direct Mill Buyer

As previously stated, direct mill buying originated in the late 1950s, largely because of fiber quality problems encountered in the harvesting/ginning area. More recently, it has been used in forward contracting where the acreage or volume of cotton has been large and where personal confidence has been established between buyer and seller. This practice is not general, since mill buying departments do not have the personnel to deal with any volume of growers, either across the Belt or in any particular area. In addition, mills usually prefer to have a third party as the guarantor of performance under any contract.

Forward Contracting as a Marketing Tool

The practice of forward contracting had its origins in the early 1970s, following a period when surplus government stocks had disappeared, a free market existed for cotton, and supply was erratic as related to demand. Originally, the concept involved the purchase of a specified volume of cotton from a grower prior to harvest and in some cases before cotton had even been planted.

As competition developed for expected production, terms of the contract changed from one based on volume to one based on acres. This meant that any quality specifications involved in the original were changed to "hog-round" basis. While this method was favorable to growers, buyers became reluctant to enter into such arrangements because of the difficulties involved in hedging, selling, or using all of the cotton delivered under

such terms. In addition, it meant that all of the educational programs relating to cotton quality maintenance/improvement had no importance under such arrangement. Subsequently, standard contracts have been developed which generally include quality specifications, cut-off dates, number of bales involved, and so forth.

In recent years, growers have adopted a policy of contracting to sell only part of their expected production. This is due primarily to wide upward swings in prices. In effect, growers are "hedging or locking in" a known price at which they can make a profit on at least a portion of their production. While it might be said that growers are speculating on their unsold production, this risk is not abnormal if the situation exists with reference to supply and demand which created the use of forward contracting for that particular year in the first place.

The mechanics of forward contracting generally begin in textile firms when they determine that supply will be short and that price will be abnormal. Having sold goods or anticipating that sales will be made, they will either contract with a shipper for a specified volume to be delivered at specified dates in the future, or the futures market will be used to protect their position. In the case of the shipper who anticipates the same situation as the textile firm, he may purchase a volume of cotton from growers and then sell a similar amount on the futures market. However, in most cases, neither the textile firm nor the shipper desire to be placed in a speculative position by "gambling" on the futures market. Their primary objective is to make a profit on the manufacture of cloth or the purchase and sale of raw cotton while protecting their position by using the futures market.

One of the difficulties of producing and marketing cotton in recent years has been the violent fluctuations in price, supply, and demand. As price increases, as was the case in 1973, with increased demand in both domestic and export markets, supply increases the following year. However, a world-wide recession including textiles soon followed, prices decreased substantially, and cotton gave way to competing crops. Generally, price must be at least attractive enough just prior to the time of cotton planting to generate the production required for anticipated domestic use and for export. Decisions made during this period in terms of planting competing crops are vital to cotton production. Once the planting period is passed, any price increase will not generate increased production for another year. Generally, this has been the case over the past several years which in turn has caused violent price fluctuations.

Forward contracting may be used as a tool to counter at least part of this fluctuation by purchasing a significant part of the domestic textile industry's raw cotton requirement. Also export expectations could be involved by shippers. Such contracting should be conducted prior to any planting season. Furthermore, the futures market should be utilized in a proper hedging operation, particularly if cloth has not been sold at the time of the transactions.

THE U S TEXTILE INDUSTRY

The manufacture of cloth begins with the spinning of fibers into yarn. The American textile industry began in 1789 with the introduction of advanced English yarn-spinning methods to the United States by a young man named Samuel Slater.

In the 18th Century, England held a textile industry monopoly, thanks to inventions like John Kay's flying shuttle, which more than doubled a weaver's capacity and James Hargreaves' spinning jenny, which increased production eightfold. Water power replaced hand power with Sir Richard Arkwright's invention of the water frame, a spinning machine. And Edmund Cartwright mechanized weaving with his power loom.

Severe English laws prohibited the export of any machines, plans or tools for them, and this included textile mechanics. Slater sharpened his mechanical skills by apprenticing and working in a leading textile mill. There he memorized details of the Arkwright water frame and other machinery. Slater slipped secretly into London, declared himself a "farmer" and sailed for New York in 1789. He traveled to Pawtucket, R.I., where he contracted to build and operate a mill for the Almy Brown textile firm. Slater's tiny spinning mill on the banks of the Blackstone River launched the textile industry and ignited the American Industrial Revolution. Slater, Almy Brown, and others soon built more cotton mills. Mechanics trained by their companies branched out for themselves or joined other firms.

These mills did the spinning, but contracted the weaving of yarn into cloth to individuals or small groups until 1813 when Francis Cabot Lowell introduced a practical power loom. Lowell's factory in Massachusetts was the first textile mill in America where all operations from cotton bale to finished cloth were not only mechanized, but also performed under one roof. It was the forerunner of today's vertically integrated textile plant.

The newly mechanized mills operated below their capacity because of short supplies of cotton fiber. There was no way to speed the removal of seeds from cotton until Eli Whitney invented the cotton gin in 1793. Whitney's machine could clean as much cotton in one day as could 50 men. The cotton industry picked up speed which in turn accelerated textile production.

As the textile mills multiplied, so did their need for employees. By 1847, more people worked in textiles than in any other industry. The textile industry also scored a first, and may have caused a minor social revolution, by employing large numbers of women long before "equal rights." Today, almost half of the industry's employees are women. It was a woman, Samuel Slater's wife, Hannah, who invented in 1873, a cotton sewing thread that was stronger and smoother than liner thread.

Steam engines replaced water power and permitted mills to locate away from waterways. With the turn of the 19th Century, the textile industry spread south from New England to be closer to the source of cotton. This

expansion caused population shifts from rural to urban concentrations. The textile industry was a major cause of the industrialization of the rural South.

The textile industry's continued growth gave birth to new inventions and spawned other industries. The sewing machines, invented by Walter Hunt and Elias Howe, were followed by Isaac Singer's more sophisticated model, which when mass produced -- a technique developed by Eli Whitney -- resulted in the textile industry's first big offspring, the vast apparel industry.

A growing industry, like a growing child, has a big appetite. Textile's needs for more efficient and durable machinery were met by innovations which improved iron and steel processing. Its fuel needs were first supplied by the coal industry, which provided power, heat, and light. However, it didn't take long for textiles and other industries to utilize the potential of petroleum for fuel and power. Today, petroleum is also the primary raw material for production of 80 percent of the manmade fibers used in textile, although only a small fraction of the nation's oil supplies are used for this purpose.

Electricity has replaced steam and coal by-products for powering and lighting textile mills. Natural gas has become an essential process fuel in fabric manufacturing.

As textiles gave birth to other industries, its own growth was nurtured and accelerated by other industrial pioneers like Henry Ford and Charles Goodyear. The auto maker, his competitors and their successors became the textile industry's largest single group of industrial customers. Goodyear discovered how to vulcanize rubber, but it was the textile industry that developed the tire cord which reinforces pneumatic tires. And even the glass fiber and steel belts in today's tires are woven on special textile looms.

When the Wright brothers realized man's dream of powered flight, they launched us into the jet and space age. Ironically, the wings of their tiny craft were covered with unbleached cotton muslin, a product of the industry that spawned the industrial revolution. Man since has bridged the great chasm of space from Kitty Hawk, N.C. to the moon, and the textile industry has fashioned fabrics ranging from flame-resistant carpet for jet planes to suits for the astronauts and heat shields for their re-entry craft.

The character of textiles changed drastically with the introduction of man-made fibers, the first of which was rayon. In the 1930s, the development of man-made fibers began, and resulted in fibers which today are known by their generic names: nylon, polyester, and acrylic. These fibers, used alone or in blends with each other or natural fibers, have changed dramatically the fashion, fit, and function of the fabrics which touch everyone's life.

The textile industry has entered the age of technology. It is using computers and electronics to develop better ways to make new and better textiles for uses today and tomorrow.

From Fibers to Fabrics

The textile industry produces about 23 billion square yards of fabric each year. Some 14 billion square yards are broadwoven cloth and about nine billion equivalent square yards go into knitted fabrics, carpets, pantyhose, and other products. These fabrics are made from natural fibers -- cotton, wool, and silk, and from manmade fibers -- rayon, nylon, polyester, acrylics, and several others. Cotton was the major fiber used by the American textile industry until the 1960s when man-made fibers surpassed it in use. The textile industry consumes about 11.8 billion pounds of fibers annually. More than 69 percent are man-made, and 29 percent are cotton. Wool and silk account for two percent. The average American consumer uses about 59 pounds of fibers each year with the same percentage breakdown.

Cloth making begins with the arrival of natural and man-made fibers at textile plants. Fibers go through several processes before entering a spinning frame which twists the fiber strands ten to 30 times per inch to form a strong yarn. During the yarn making process, two or more fibers, such as cotton and polyester, may be blended.

Yarn is transformed into fabric in many ways: by weaving single or double-knitting, tufting, and bonding. Weaving is the oldest and best known process. Yarn is woven on looms into fabric called gray cloth and can also be knitted in several different ways: warp, raschel, tricot, and double-knit. Knit fabrics are widely used in T-shirts, sweaters, and socks. Due to new fibers and processes,knits have also won acceptance in outerwear. Tufting is used primarily to make carpets, which have virtually replaced woven carpets in the U.S. market.

Nonwoven textiles, a recent development, are formed by chemically or mechanically bonding yarns together. Disposable diapers are nonwoven products.

Finishing is the final step in the textile process, although some fabrics, such as that used for bagging, is ready for use when it leaves the loom. Most fabrics must be finished in various ways. These include bleaching, dyeing, and Sanforizing to prevent further shrinking.

Color is added to fabric by dyeing the yarn before it becomes cloth, or the gray cloth is passed through a continuous dyeing range to add solid colors. Jet-dyeing techniques have substantially speeded this process. There are also other forms of dyeing.

When the fabric's end use -- sheets or blouses -- calls for a design, the cloth is printed on one side only. This is done by roller printing or screen printing. Improved technology permits printing up to 12 colors on fabric at speeds of 150 yards a minute. Designs are also added to fabric through heat transfer printing, a sophisticated version of using an electric hand iron to print a decalcomania. In the finishing process, some of the special qualities of fabric are added. These include durable press, water-repellency, and resistance to flame and soil.

End Uses and Developments

After finishing, the cloth is shipped to manufacturers for an amazing variety of end uses -- apparel, home furnishings, industrial fabrics, and other consumer products. A small proportion is exported (4.5 percent). The largest portion is made into clothing, and it is this fraction that the average American usually associates with textile manufacturing (36.8 percent). Home furnishing products, like sheets, draperies, towels, carpets, and upholstery, rank second in consumption (29.7 percent).

The less familiar industrial fabrics are used in things like automobile tire cord, reservoir liners, fuel tanks, space suits and heat shields, fire hoses and cables, and wire insulation (17.8 percent). Other consumer uses comprise 11.2 percent.

Fiber quality requirements for the myriad of fabrics produced vary widely. However, the basic aim of the textile industry is to use fibers with those quality characteristics that will satisfy quality specifications of the converter, cutter, or retailer, insure efficient operations in manufacturing cloth, and maintain minimum cost for the mix from which cloth is manufactured.

Textile technology has developed fabrics so strong, durable or resilient that they are being put to new and dramatic uses not dreamed of a few years ago. A textile company has patented a fabric which responds automatically to temperature changes. It gets thinner and cooler in heat and thicker and warmer in cold. A gigantic nylon "whale" can gulp millions of gallons of spilled oil from the ocean. Floating textile booms are being used to contain oil spills. Even cotton wastes are being used to sop up oil. Nonwoven fabrics in disposable operating gowns and hospital bed linens have cut drastically the risk of infection and costs involved in laundering. Surgeons are saving lives by using tubes of knitted fabrics to replace defective or damaged human arteries. A portable collapsible bridge designed for the U.S. Army can span a 60-foot wide river in 30 minutes. Strong enough to support a 20-ton tank, it is made of woven polyester. A huge conveyor belt for moving people from perimeter parking lots into central sections of cities is woven of cotton and nylon. The world's largest covered football stadium is an air-supported fabric dome covering ten acres and seating 80,400 people. The fire-resistant roof consists of 50 tons of woven glass fiber coated with teflon.

This then, in brief, is a synopsis of the textile manufacturing business and its varied fields of endeavor. Its importance to our peace time economy is exemplified by its very nature and by man's dependence on its products. During World War II, the Quartermaster General of the U.S. Army declared that textiles ranked second only to steel in importance to national defense. This dependence on textiles would still be needed by the military in the event of any large scale conflict.

Textile manufacturing and marketing have undergone an internal revolution to better satisfy the American consumers' needs and desires for new, different, and better products, particularly since World War II. For years the industry was geared to turning out miles and miles of basic gray cloth, which was sold

to independent converters for finishing and ultimate cutting into garments. This philosophy was very close to that of Henry Ford in pre-depression days when he supposedly made the remark relative to marketing, "I'll give you any color Ford you like, so long as it is black." The trend today is more market oriented toward "producing what the public wants and will buy," instead of the old idea of "selling what the industry produces." One result of this modern management philosophy is that the primary textile industry has assumed most of the converting and finishing operations. Textile manufacturers research, design, and sell their fabric directly to apparel manufacturers. There is a growing list of consumer products which are completely finished by the fabric maker and ready for retail sales. These range from panythose and carpets to household textiles like sheets, towels, and curtains.

Manufacturing research has focused on increasing the efficiency and speed of machinery as well as developing new and different ways of forming fabrics, some of which may be used in applications never envisioned for textile products.

A new generation of machinery is now being put into place. The open-end spinning machine eliminates some of the operations required in older yarn-spinning methods, particularly for coarser yarns. Furthermore, production rates are greatly increased. The water-jet loom is three times faster, smaller, and quieter than conventional looms, although its use is limited to synthetic fibers. Rotary screen printing has increased six-fold the speed of adding new designs to fabric. New textiles for new uses may be just around the corner from the familiar durable press fabric finish. Fiber producers are talking about a new generation of fibers with built-in crease and wrinkle resistance. New developments in dyes, chemical and finishing techniques have put brilliant, new long-lasting colors in clothing and the home.

Organization

The textile manufacturing industry employs about one million people. Combined with those working in closely related industries, such as those producing apparel, natural or man-made fibers and textile machinery, the employment figure is over three million. The industry offers careers requiring special training and skills such as chemistry, data processing, engineering and management. It also serves as a gateway to industrial employment for persons with little or no experience in manufacturing. To them it offers opportunities to learn and advance. Actually, textile manufacturing is one of the more labor intensive industries in the United States. The industry's one million employees play an important role in the American economy. Each year they earn more than $7 billion in wages, pay over $700 million in personal taxes, and spend $2.4 billion for food, $1.4 billion for housing, and $781 million for transportation. In recent history, the textile manufacturing industry is normally the first to feel the effect of recession and is also among the first to move forward when economic conditions return to normal.

There are about 5,000 companies in the U.S. textile manufacturing business. These companies operate some 7,000 plants. However, 4,300 of these companies are small (less than 100 employees). Therefore, there are about 700 companies which would be classified as medium or large and which operate some 2,700 plants, or almost four plants per company. Thus, the textile industry is very fragmented in its organization and very highly competitive. Although the largest company in the industry is big by any standard, it accounts for only about 7 percent of total sales. The nature of the competition is more readily seen by the average consumer when she visits her favorite department store and sees various brand name sheets or towels on sale. This competition is enhanced even more if one visits a textile concern several times and sees the different packaging materials of various sales organizations like the major department stores, or perhaps the textile firm's own private label. The same intense competition for the consumer's dollar extends to finishing apparel fabrics as well as denims on the part of cutters and converters. The price of the fabric in its finished form bears little or no resemblance to the price of the garment in the retail store.

Presently, over three-fourths of the textile plants are located in the Southeast; that is, the Carolinas, Virginia, Georgia, Alabama, and the Midsouth. About 11.5 percent are in the Northeast, with a similar proportion in the combined Midwest and West.

Industry sales are expected to approach $39 billion in 1976. Spending for new plants and equipment averaged about $700 million in the 1970s. However, it faces the prospect of making staggering capital outlays for non-productive equipment which may be required to comply with stringent government standards on noise and dust abatement as well as water and air preservation. Presently, most of this equipment is beyond the technology of manufacturers and the financial capability of textile manufacturers.

The U.S. textile industry growth has been hampered in recent years by the rapid increase in imports from foreign countries, principally far eastern countries. Trade agreements with several nations helped establish reasonable growth rates for cotton textile products. However, there are no controls on wool or man-made fiber textiles. Finally in 1973, representatives of 50 nations signed textile trade agreements. However, one of the largest exporters of cheaply produced cotton textile products, People's Republic of China, has no agreement and is presently increasing substantially its exports to the United States. It is expected that the value of textile and apparel imports to the United States from all sources will be about $5 billion by the end of 1976, or a 40 percent increase in one year.

As previously noted, profits to the textile manufacturers are not in keeping with ideas of consumers in general and cotton producers in particular. The latter, upon finding an all-cotton shirt (if he is lucky) wonders how a shirt priced at $22 can command such a price when the actual cotton content only amounts to about 35 cents at today's raw cotton prices. Actually, the profit margin of textile manufacturers bears no relation to retail prices of the fabric they produce. For instance, many manufacturers

are competing in the sale of apparel fabrics to shirt manufacturers. Moreover, there is intense competition in the procurement of raw cotton by these manufacturers as they know that raw cotton costs are a major part of their fabric cost. An axiom long identified with textile manufacturers in the sales area has been "a textile manufacturer would cut his grandmother's throat for 1/8 cent a yard." To understand the validity of a statement like this, one has only to observe the degree of competition that exists among several textile manufacturers as they compete for the future sheet business of large department stores at a time when they have no idea what the supply and price of next year's cotton crop will be.

SUMMARY

The marketing of American cotton is complicated by the number and geographical distribution of producers, port facilities and milling areas. Further complicating the system are the vast number of cotton qualities brought about by differences in soil and climatic conditions, harvesting and ginning systems employed, cultural practices, varieties and types of cotton, and other factors. Moreover, the ever-changing character of consumer demand for different products greatly influences cotton and cotton-related industries, and as a result, have an enormous impact on the entire system.

Cotton in the United States is produced on nearly a half million farms located in 19 States from Virginia to California. In most years, over one-half of the crop is grown in the Southwest and West, and only about 15 percent in the Southeastern area where the textile mill industry is located. For many years, a large portion of the Western cotton was transported over long distances to Eastern mills. However, these cottons have become largely an export commodity principally to Far Eastern countries, and are usually exported through Western port facilities.

When harvested, cotton usually contains dirt, hulls, leaf fragments, and other materials which must be removed if lint cotton is to have the highest market value. The term "ginning" embraces several important processes that promote faster processing and that are adapted to mechanically-harvested cotton. Cotton gins are strategically located throughout the cotton-producing states; generally speaking, in the immediate production area. Of the 3,269 gins operating during the 1974-75 season, nearly 71 percent were in the South Central and Southwest region. Total production in these areas during this year accounted for nearly 56 percent of the total U.S. production. In contrast, the Southeastern region, which produced only about 12 percent of the crop, accounts for nearly 17 percent of all gins; and the Western region, which produces nearly one-third of the U.S. crop, has only 13 percent of the total gins.

Until the middle 1950s, gin stands were only capable of processing one to two bales of cotton per hour. Since that time, development and acceptance of high-capacity gin stands has brought about several technological changes in the ginning industry. Increased efficiencies of from 20 to 40 percent in the ginning operation have been accomplished at a number of gins through the

installation of automatic or semi-automatic unloading machinery, which replaces the traditional pneumatic air suction system. Moreover, adoption of this system has reduced power requirements.

The cotton warehouse and/or compress industry also occupies an important position in the present system of marketing American cotton. Warehouses and compress-warehouses are located throughout cotton producing areas, generally in the immediate area of cotton production. Total number of warehouses and/or compresses varies somewhat with fluctuations in production, but in recent years downswings in both production and carryover of government stocks have resulted in a rather sharp decline in the total number of active facilities. In 1975, only 563 facilities were active in the Cotton Belt. Of this total, 197 (about 35 percent) are equipped with one or more compression machines.

Upon arrival at the warehouse and/or compress, the bale is unloaded, a tag bearing the warehouse name and identification number is affixed to the bale. A negotiable warehouse receipt is then issued for each individual bale. The warehouse receipt is of paramount importance in all future transactions involving each individual bale of cotton produced in the United States. Each bale is bought and sold, and received as security for loans, based on the single bale negotiable warehouse receipt. In each case, the right of ownership and possession are transferred by delivery of the receipt. When the bale is shipped from the warehouse the receipt is cancelled and returned to the warehouseman, where it is maintained for a number of years as proof that delivery has been made.

Quality evaluations are made to determine the grade, staple length, and micronaire of each bale of cotton, which indicates to a large extent the spinning quality and, thus, the value of each bale. The grade of cotton is defined in terms of three factors--foreign matter, color, and preparation--which are determined chiefly through the sense of sight. Foreign matter is the amount of leaf, pieces of burs, dirt, and so forth in the cotton; color is the hue, brilliance, and chroma of the cotton; and preparation describes the degree to which normal length of fibers relative to neppiness, roughness, and stringiness is altered in ginning. For staple, classification is based on sight and feel, and is the normal length of a typical portion of the fibers.

Information furnished by the classing offices has resulted in a considerable savings in marketing costs, encouraged quality improvement and provided farmers with information needed to make sound marketing decisions. Moreover, many cotton purchases and sales are made on the basis of the Smith-Doxey classification and micronaire reading.

Cotton is moved from producing areas by rail, motortruck, or some combination of rail and truck, and occasionally water transport directly to domestic mills, ports, compresses, or concentration points. From these points it goes to domestic mills or is exported. Transportation of cotton by either means is invariably the cotton merchant's largest item of cost, and often accounts for one-third or more of their total merchandising cost.

Although cotton is grown in many areas of the Cotton Belt, cotton marketing has for many years been performed on the basis of five general regions. These are the Southeast, Midsouth, Texas-Oklahoma, Southwest, and Far West. These differentiations are made principally on the types of cotton grown in each area, or on specific handling practices. Typically in any one of the five general areas, there may be found the following five types of buyers: merchant-shippers, cooperative marketing associations, broker, agent or commission buyer, gin buyer, and direct mill buyers. Merchant-shippers and the cooperative marketing associations handle the greatest part of each year's cotton crop, both domestically and for export.

The manufacture of cloth begins with the spinning of fibers into yarn, which is transformed into fabric in many ways: by weaving, single or double knitting, tufting and bonding. The textile industry produces about 23 billion square yards of fabric each year. Some 14 billion square yards are broad-woven cloth and about 9 billion equivalent square yards go into knitted fabrics, carpets, pantyhose, and other products. The largest portion is made into clothing (36.8 percent), followed by home furnishings (29.7 percent), industrial fabrics (17.8 percent), and other consumer uses (11.2 percent).

Presently, over three-fourths of the textile plants are located in the Southeast--the Carolinas, Virginia, Georgia, Alabama, and the Midsouth. About 11.5 percent are in the Northeast, with a similar proportion in the combined Midwest and West.

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