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The Cotton Industry in the United States. Edward H. Glade, Jr., Leslie A. Meyer, and Harold Stults, editors. Commercial Agriculture Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 739.

Abstract

U.S. cotton acreage increased by over 20 percent in the past decade, averaging 13.3 million acres since 1990. This rise in total planted acreage reverses a 60-year decline. Primary factors in this acreage rebound have been technical improvements in how growers produce cotton, government program changes and a resurgence in cotton demand. Forty percent of total cotton production comes from the Delta States. The share of production originating in the Southeast has nearly tripled in the 1990's, increasing from 5 percent in the late 1970's to nearly 13 percent in 1992. Improvements in cotton quality and increases in cotton marketing efforts have spurred a rise in the purchase of cotton products. Recent provisions in international trade agreements and agricultural acts have continued the trend toward market-oriented cotton programs. These national and international agreements have fostered improved cotton industry prospects. This report describes the U.S. cotton industry from producers to consumers and details the numerous changes in cotton programs since 1986.

Keywords: Cotton, cotton industry, production, supply, demand, government programs, trade agreements, prices, marketing, exports

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Highlights

The United States produces nearly 20 percent of the world's cotton and ranks second to China as the largest producing country. While over 80 countries produce cotton, the United States, China, India, Pakistan, and Uzbekistan (former Soviet republic) produce about 74 percent of the total world cotton supply. Total harvested acreage in the United States has dropped by more than 25 percent since 1960, but growers have maintained and even increased production levels because of sharply higher yields. U.S. cotton producers have experienced excess production capacity, high stocks, and low product prices over the years. Since 1986, however, strong consumer demand and export sales, combined with an effective government cotton program, have boosted cotton industry prospects. Currently, both cotton production and use are at near-record levels, with supply and demand in closer balance than in many years.

This report describes all components of the U.S. cotton industry—from producers to consumers—and provides a single source of economic and statistical information on cotton. It identifies and describes the structure and performance of the cotton industry, emphasizing the production, marketing, and consumption of raw cotton and cotton products. It also includes a historical overview of Federal farm programs affecting cotton supply and demand.

Seventeen States produce cotton, with major concentrations in the Delta area of Mississippi, Arkansas, and Louisiana; the Texas High and Rolling Plains; central Arizona; and California's San Joaquin Valley. Upland cotton accounts for 98 percent of the U.S. crop and is the most commonly grown cotton in other countries. Extra-long staple (ELS) cotton, also known as American Pima cotton, is grown in California, Arizona, New Mexico, and limited areas of west Texas.

Fewer but bigger farms dominate cotton production. In 1949, 1.1 million farms harvested an average of 24 acres of cotton each. In 1992, 34,800 farms harvested an average of 315 acres of cotton each. Despite this more than tenfold growth in average size, individuals or family businesses control about 75 percent of the cotton farms.

U.S. cotton production has shifted westward. From 1970 to 1985, production in California and Arizona as a share of total U.S. production almost doubled from 16 percent to 31 percent. Lower unit costs of production, higher net returns in relation to other crops, flat terrain, good soils, and the availability of irrigation water in the Southwest and West were the primary reasons for the shift. However, this movement has stabilized recently, and an increasing share of U.S. cotton acreage is moving back into the Southeast and Delta States. Improved insect control programs and higher relative net returns for cotton fiber versus other crops have encouraged this movement.

Cotton has been a major cash crop and an important source of foreign exchange in the United States for almost 200 years. Although the United States has usually been a competitive exporter of raw cotton, other countries, many of them also cotton producers, are more competitive as exporters of finished products. Since 1960, developing countries in Asia have become major importers of raw cotton for their increasing domestic demand and for their growing textile industries producing cotton fabrics and apparel for export. As a result, the United States has experienced a significant textile and apparel trade deficit.

Cotton lint is used in apparel, household, and industrial products. Cotton accounts for about 64 percent of all fibers used in apparel, 25 percent in home furnishings, and about 11 percent of the fibers in industrial products. Americans used 76 pounds of fiber per capita in 1993, which includes products produced by U.S. mills and the raw fiber content of imported textiles. Consumption of manmade fibers in all uses totaled about 43 pounds per capita in 1993, compared with cotton at 29 pounds. The remaining 4 pounds were divided among wool, linen, and silk.

Foreword

Keith J. Collins*

Cotton is the single most important textile fiber in the world, accounting for nearly 50 percent of total world fiber production. Although some 80 countries produce cotton, the United States, China, India, Pakistan, and Uzbekistan account for about 75 percent of world production. The United States produces about 20 percent of the world's cotton and uses 12 percent.

Cotton production, marketing, and manufacturing affect the lives of many people, from producers to consumers. The 34,000 cotton producers scattered across the Cotton Belt from Virginia to California received about $4.1 billion during 1992/93 from the sale of cotton lint and an additional $600 million from the sale of cottonseed. Ginning, warehousing, and marketing also provide significant sources of revenue and employment in local areas. Moreover, many producers and merchandisers of pesticides, fertilizers, and machinery and equipment are involved. Because cotton is a major raw material for the textile and apparel industries, spinners, weavers, finishers, and manufacturers of apparel and household and industrial products depend heavily on the cotton industry. The estimated retail value of domestically produced cotton apparel products alone totals $18-$20 billion a year.

This report identifies and describes the U.S. cotton industry's economic structure and operating practices. It emphasizes the production, marketing, and demand for raw cotton, and explores the underlying economic and political forces causing change in various segments of the industry. An extensive review of past and present cotton farm programs is also provided, along with a discussion of the current environmental issues facing the industry. The report updates and revises an earlier U.S. Department of Agriculture (USDA) study on the cotton industry published in 1987 (USDA-ERS, 1987).

Individual chapters are written by subject-matter experts and represent USDA's most comprehensive compilation of information on this important agricultural industry. In addition, appendix tables provide time-series data for many industry variables and a glossary of terms helps explain industry terminology. A directory of the primary cotton industry associations and organizations is also included, which describes their functions and includes their addresses and telephone numbers.

The Economic Research Service (ERS), USDA, has published similar industry studies for corn, barley, oats, rice, sorghum, soybeans, sunflowers, and wheat. A number of these reports are also currently being updated and revised.

*Keith J. Collins is Chief Economist for the U.S. Department of Agriculture.

Chapter 1

Supply, Demand, and Prices

James A. Larson
Leslie A. Meyer*

Cotton is a heat-loving plant that requires a long growing season with abundant sunshine and water resources. Soil type, topography, elevation, temperature, sunshine, and rainfall are all important determinants of where and how well cotton is grown.

U.S. cotton is primarily grown in three areas that have distinctly different production systems: the primarily rainfall-dependent production in the Delta States (Mississippi, Arkansas, Louisiana, Tennessee, and Missouri); the mixture of dryland and supplemental irrigation production in the Texas High and Rolling Plains and Oklahoma; and the strictly irrigation-dependent production areas of central Arizona and the San Joaquin Valley of California. However, cotton production has regained prominence in the Southeast (Georgia, Alabama, North and South Carolina, Florida, and Virginia), where acreage and production have rebounded since the first half of the 1980's.

Economic fundamentals, such as resource availability, productivity, and relative net returns, interact with the cotton crop and physical environment for each growing region. These fundamentals determine production levels and the comparative production advantage among these different growing areas.

Cotton Supply

The dominant species of cotton grown in the United States is upland cotton (*Gossypium hirsutum L.*). The staple length of the upland fiber ranges from about 3/4 inch to 1-1/4 inches with an average of 1-3/32 inches. Upland typically accounts for 98 percent of U.S. production and is grown from Virginia to California in the southern-tier States that comprise the U.S. Cotton Belt (fig. 1).

The balance of U.S. cotton production is from the extra-long staple (ELS) or American Pima type (*Gossypium barbadense L.*), grown primarily in California, Arizona, New Mexico, and west Texas, where it is particularly well adapted to environmental conditions. The International Cotton Advisory Committee defines ELS cotton as having a staple length of 1-3/8 inches or more. Production of ELS cotton is small relative to that of upland cotton because its production costs per pound are higher and its markets are chiefly high-value products such as sewing thread and expensive apparel items.

Cotton Acreage, Production, and Yield

Cotton acreage has declined over the years, partly because fewer people are involved in production agriculture. However, research and technology to improve yields and production practices have provided adequate supplies of cotton in most years.

Cotton Acreage Trends

U.S. cotton acreage rose steadily from 7.7 million acres at the end of the Civil War, before reaching a pinnacle of 46.0 million acres in 1925. Planted area then de-

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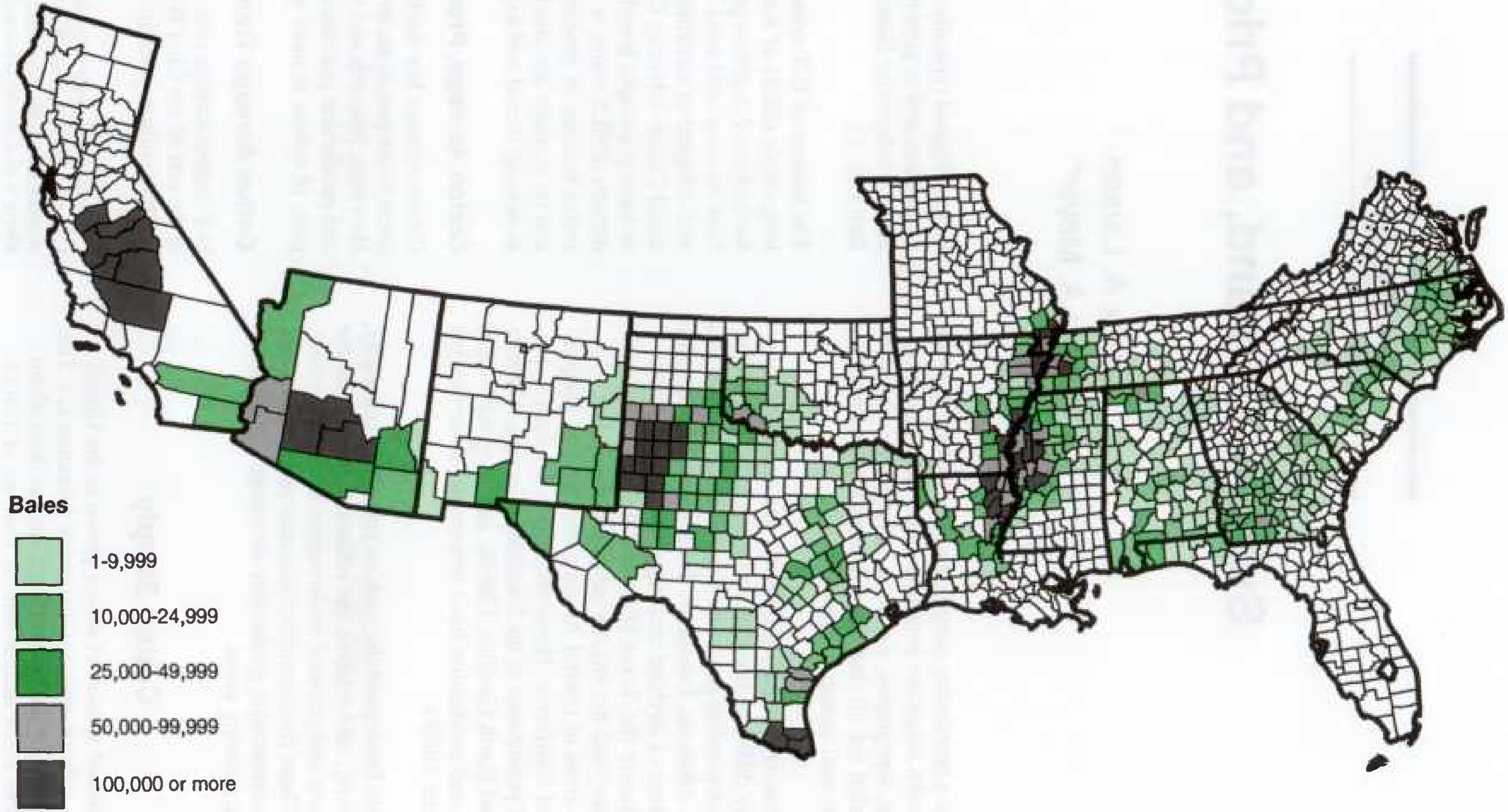
Figure 1
U.S. cotton production by county, 1993/94



Source: USDA, NASS.

clined from an average of 43.9 million acres during 1925-29 to 10.8 million acres during 1985-89 (table 1). U.S. cotton acreage has since rebounded, averaging 13.3 million acres since 1990. A large portion of the recent rise in area occurred in the Southeast, where acreage has more than doubled since the mid-1980's.

Widespread drought and insect problems in the 1930's sparked the beginning of the downward trend in acreage. These problems were particularly evident in the Southwest, where planted area plummeted from an average of 22.1 million acres during 1925-29 to 13.0 million acres during 1935-39. Planted acreage in Oklahoma, for example, reached a high of 5.4 million acres in 1925, when cotton was grown throughout the southern three-fourths of the State. By the end of the 1930's, area had plunged to 1.9 million acres in response to a prolonged drought, severe boll weevil infestation, and difficulties with soils unsuited for production in the eastern and central areas of the State (Verhalen, Bayles, and Thomas, 1984). By 1992, less than 400,000 acres were planted to cotton in Oklahoma.

Planted acreage in the Southeast declined even more dramatically between the 1930's and 1980's, as production moved out of areas less suited to cotton production (fig. 2). Area in the Southeast shrank from an average of 10.9 million acres during 1925-29 to 657,000 acres during 1980-84. By contrast, acreage in the West, particularly California and Arizona, rose steadily from the 1920's until the early 1980's. The cotton plant thrives in a hot and dry growing environment when supplemental irrigation water is available, resulting in higher yields and lower per unit production costs. These conditions, which existed in the West, encouraged the acreage expansion there.

Two of the important long-term forces influencing the decline in cotton area and the location of acreage in the United States include changes in how cotton is produced and government efforts to control production. The adoption of new technology, especially since the 1950's, such as labor-saving equipment, pesticides, and improved plant varieties, resulted in rising yields and lower per unit production costs. The rising yields and production pressured prices and income. As a consequence, acreage allotment and production control programs were prominent features of U.S. Government policy designed to control excess production from the 1930's until the 1970's. These programs further reduced area devoted to cotton and slowed shifts in acreage between production regions.

Extra-long staple (ELS) cotton acreage, following its introduction in Arizona and California in 1912, expanded rapidly to about 240,000 acres in 1920. ELS area plum-

Mature cotton bolls ready for picking.

Table 1—All cotton planted acreage, harvested acreage, yield per harvested acre, production, and production share, regional averages, 1920-93[1]

Period	Southeast[2]	Delta[3]	Southwest[4]	West[5]	United States[6]
Planted acreage:			*1,000 acres*		
1920-24	9,748	8,003	17,046	294	35,091
1925-29	10,911	10,380	22,098	504	43,893
1930-34	9,054	10,036	17,829	489	37,408
1935-39	7,007	7,814	12,968	706	28,496
1940-44	5,513	6,661	9,838	673	22,685
1945-49	4,781	6,767	9,503	1,024	22,075
1950-54	4,549	6,614	11,558	1,921	24,642
1955-59	2,545	4,232	7,385	1,356	15,518
1960-64	2,584	4,398	7,304	1,442	15,728
1965-69	1,680	3,328	5,216	1,125	11,349
1970-74	1,544	4,080	5,886	1,381	12,892
1975-79	758	3,140	6,603	1,928	12,429
1980-84	657	2,583	6,631	1,985	11,856
1985-89	863	2,900	5,402	1,681	10,846
1990	1,133	3,583	5,942	1,689	12,348
1991	1,579	4,073	6,802	1,599	14,052
1992	1,524	4,200	5,910	1,606	13,240
1993	1,727	4,180	5,953	1,579	13,438
Harvested acreage:					
1920-24	9,487	7,775	16,356	282	33,900
1925-29	10,694	10,185	21,233	488	42,600
1930-34	8,540	9,385	16,264	468	34,658
1935-39	6,910	7,685	12,496	697	27,788
1940-44	5,414	6,467	9,442	662	21,985
1945-49	4,715	6,453	9,083	1,007	21,259
1950-54	4,459	6,253	10,266	1,884	22,861
1955-59	2,479	4,054	6,766	1,314	14,613
1960-64	2,511	4,249	6,792	1,404	14,956
1965-69	1,491	3,083	4,802	1,100	10,475
1970-74	1,430	3,882	5,352	1,361	12,025
1975-79	717	2,978	6,056	1,893	11,643
1980-84	645	2,496	5,806	1,954	10,903
1985-89	836	2,824	4,724	1,659	10,043
1990	1,123	3,511	5,428	1,669	11,732
1991	1,566	3,968	5,839	1,587	12,960
1992	1,504	4,138	3,901	1,580	11,123
1993	1,689	4,095	5,431	1,568	12,783
Yield/acre:			*Pounds/harvested acre*		
1920-24	173	164	137	242	154
1925-29	196	212	136	352	172
1930-34	222	202	151	421	186
1935-39	252	296	152	529	226
1940-44	283	342	179	497	262
1945-49	288	331	180	573	270
1950-54	278	355	199	706	297
1955-59	381	481	310	941	428
1960-64	404	556	341	1,004	475
1965-69	381	540	366	942	481
1970-74	446	523	333	868	469
1975-79	424	497	346	937	481
1980-84	557	595	317	1,044	529
1985-89	585	681	417	1,134	624
1990	531	672	480	1,126	634
1991	724	774	411	1,167	652
1992	689	752	435	1,228	700
1993	552	547	478	1,261	606

Table 1—All cotton planted acreage, harvested acreage, yield per harvested acre, production, and production share, regional averages, 1920-93[1]—cont'd

Period	Southeast[2]	Delta3	Southwest[4]	West[5]	United States[6]
			1,000 480-pound bales		
Production:					
1920-24	3,447	2,655	4,733	145	10,980
1925-29	4,386	4,515	6,008	360	15,268
1930-34	3,933	3,904	5,095	411	13,343
1935-39	3,656	4,780	3,939	774	13,149
1940-44	3,157	4,588	3,528	685	11,957
1945-49	2,804	4,482	3,591	1,228	12,104
1950-54	2,600	4,636	4,157	2,689	14,083
1955-59	1,961	4,114	4,337	2,580	12,992
1960-64	2,105	4,901	4,823	2,928	14,757
1965-69	1,214	3,522	3,661	2,174	10,571
1970-74	1,329	4,198	3,745	2,505	11,777
1975-79	622	3,038	4,445	3,646	11,751
1980-84	758	3,069	3,813	4,257	11,897
1985-89	1,016	4,019	4,162	3,910	13,106
1990	1,242	4,919	5,429	3,916	15,505
1991	2,361	6,396	4,999	3,859	17,614
1992	2,160	6,486	3,532	4,041	16,218
1993	1,943	4,670	5,415	4,106	16,134
			Percent		
Production share:					
1920-24	13	24	43	1	100
1925-29	29	30	39	2	100
1930-34	29	29	38	3	100
1935-39	28	36	30	6	100
1940-44	26	38	30	6	100
1945-49	23	37	30	10	100
1950-54	18	33	30	19	100
1955-59	15	32	33	20	100
1960-64	14	33	33	20	100
1965-69	11	33	35	21	100
1970-74	11	36	32	21	100
1975-79	5	26	38	31	100
1980-84	6	26	32	36	100
1985-89	8	31	32	30	100
1990	8	32	35	25	100
1991	13	36	28	22	100
1992	13	40	22	25	100
1993	12	29	34	25	100

[1]Five-year averages for 1920-89. [2]Alabama, Florida, Georgia, North Carolina, South Carolina, and Virginia. [3]Arkansas, Kentucky, Illinois, Louisiana, Mississippi, Missouri, and Tennessee. [4]Kansas, Oklahoma, and Texas. [5]Arizona, California, New Mexico, and Nevada. [6]Regional totals may not add due to rounding.

Source: Economic Research Service, USDA, compiled from National Agricultural Statistics Service data.

meted to about 40,000 acres in 1923 and stayed relatively low during the 1930's. Acreage again ballooned during World War II because of wartime purchase programs, reaching about 193,000 acres in 1942. After the war ended, area again plunged to an average of less than 10,000 acres annually during 1944-49. Wartime incentives had ended, imports were higher, stocks were rising, and the Government had ended acreage allotments on upland cotton.

Between 1950 and the mid-1980's, ELS planted area averaged approximately 80,000 acres per year. The ELS purchase programs of 1951 and 1952 and relatively high support prices thereafter maintained acreage in this range. However, area devoted to ELS cotton expanded rapidly in the second half of the 1980's, reaching a high of 376,900 acres in 1989. Planted area since 1990 has averaged about 235,000 acres. High prices for ELS cotton relative to upland cotton have encouraged the rapid expansion of acreage. However, large carryover stocks, lower prices, and stagnant export markets have dampened further ELS acreage expansion.

Historically, Arizona has had the largest ELS acreage; however, planted area rapidly expanded in California during the 1990's. In fact, California ELS acreage exceeded Arizona's for the first time in 1992. Insect and weather problems in Arizona, coupled with minimal trade-offs for California producers and favorable price differentials between ELS and upland, have fostered this trend. Smaller amounts of ELS acreage are also located in west Texas and New Mexico.

Cotton Production Trends

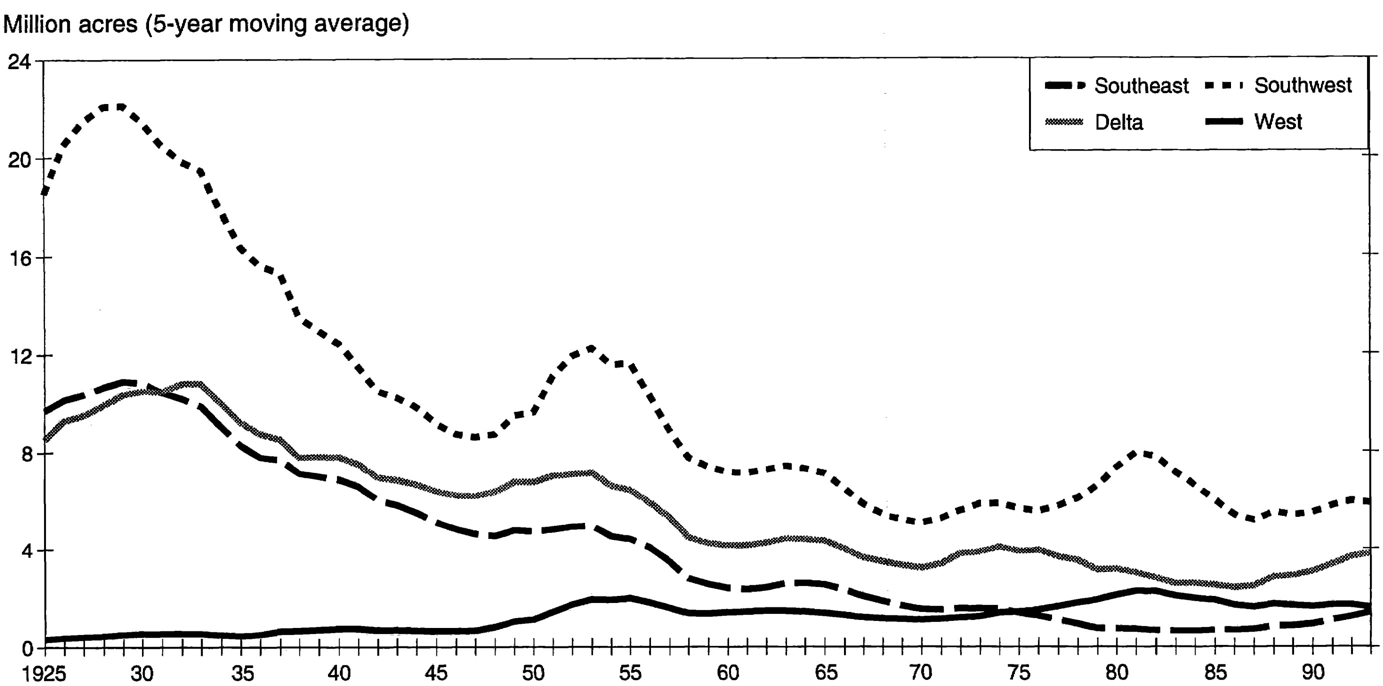
U.S. cotton production in the post-Civil War period grew from 2.1 million bales in 1866 to 18.0 million in 1926. Most production was located east of the Mississippi River. However, between 1920 and about 1980, cotton production gradually shifted westward from the Old South to the Southwest and West, especially to the Texas High Plains and California (fig. 3). Of particular significance was the growing share of U.S. production originating from the West, which rose from an average of 1 percent during 1920-24 to an average of 36 percent during 1980-84.

All the acreage in California and Arizona is irrigated, as well as significant acreage in the Texas High Plains. Thus, a larger share of total U.S. production is now being grown on irrigated land, which produces significantly higher yields. For example, the average yield in the West was 1,228 pounds per acre in 1992, compared with 700 pounds for the entire United States. The profitability of cotton production on irrigated land in the West and the cessation of acreage allotment controls that allowed acreage to move among States helped foster this shift in production. By contrast, the share of production originating from the Southeast declined from 31 percent in the early 1920's to 5 percent by the late 1970's.

The westward movement of cotton production had ceased by the early 1980's. Production began shifting back toward the Delta and the Southeast from the Southwest and the West. In 1992, approximately 40 percent of U.S. production came from the Delta region, up from an average of 26 percent during the late 1970's and early 1980's. The share of production originating from the Southeast has more than doubled, jumping from a low of 5 percent in the late 1970's to 13 percent in 1992. By contrast, the share of production originating in the Southwest and West dropped from an average of 69 percent in 1975-79 to 47 percent in 1992.

Several factors have contributed to this reversal of a longstanding trend in location of cotton production. First, the success of the boll weevil eradication program in several Southeastern States made cotton production

Figure 2
Cotton planted acreage, by region, crop years 1925-93



more profitable there (Carlson, Sappie, and Hammig, 1989). Also, many Delta farmers adopted short-season production systems which improved their yields and net income by reducing insect damage (Cooke and Sundquist, 1991). Furthermore, a long period of drought in the 1980's and early 1990's in California severely limited water supplies available for cotton and other crops. Finally, the 1980's and early 1990's were also a period of several large acreage abandonment years in the Texas High and Rolling Plains due to adverse weather conditions, which drastically reduced Texas' proportion of total U.S. production in those years.

Cotton Lint Yield Trends

Cotton yields typically averaged about 180 pounds per harvested acre from 1866-1919, and occasionally exceeded 200 pounds. In contrast to declining acreage, harvested lint yield per acre has trended upward since the 1920's, except for a period of stagnant growth in the late 1960's and 1970's (fig. 4). Between 1920 and 1965, the average U.S. cotton yield grew from 187 pounds to the then record of 527 pounds per acre, or an average growth rate of about 2.9 percent annually (table 2). Yield growth was particularly strong between 1950 and 1965, rising an average of 4.7 percent per year. The Southwest exhibited the highest average growth rate (5.4 percent), followed by the Delta (4.4 percent), the Southeast (3.8 percent), and the West (3.4 percent).

The strong yield growth of the 1920-65 period contrasts with languishing yields between 1966 and 1980. Yields during the latter period showed little growth in the Southeast and the West, and they actually declined in the Delta and the Southwest. The stagnation of cotton lint yield growth for this period has been the subject of much debate. However, it is thought that cotton yields declined in part due to growing losses from pests across the Cotton Belt during this period. Of particular importance were yield losses from bollworms (*Helicoverpa zea*) in Mississippi and the Texas High Plains (Meredith, 1987; McKinion, Reddy, and Baker, 1988; and Masud and others, 1985). Other possible contributing factors include higher ozone levels across the Cotton Belt and a

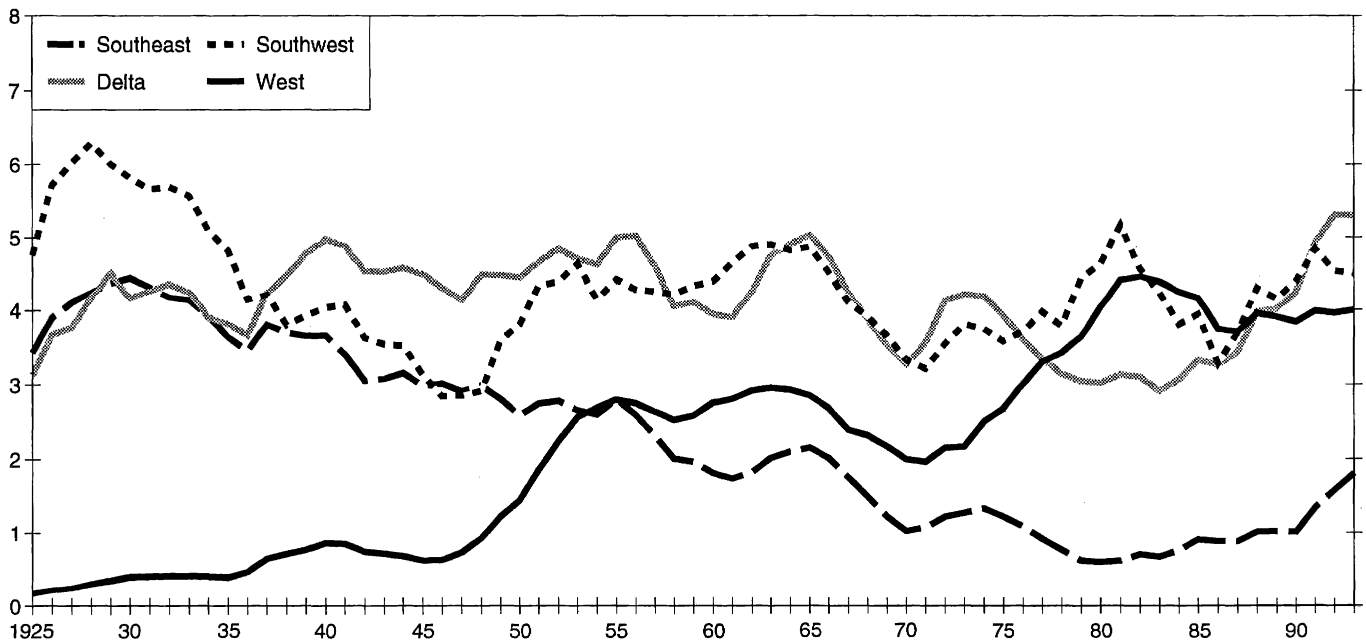
Table 2—All cotton yield per harvested acre average, annual percent change, by region and selected 1920-92 periods

Period	Southeast	Delta	Southwest	West	United States
			Percent		
1920-92	1.8	2.0	1.9	2.1	2.2
1920-65	2.0	2.9	2.4	3.3	2.9
1950-65	3.8	4.4	5.4	3.4	4.7
1966-80	0.4	(1.2)	(1.3)	0.1	(0.3)
1981-92	2.3	3.0	4.2	1.0	2.9

Source: Economic Research Service, USDA.

Figure 3
Cotton production, by region, crop years 1925-93

Million 480-lb bales (5-year moving average)



reduction in fertilizer and irrigation use in the Texas High Plains (McKinion, Reddy, and Baker, 1988).

Since 1980, yields have resumed a growth rate identical to that of the 1920-65 period, rising by an average of 2.9 percent per year. The Southwest again has had the largest yield growth, rising an average of 4.2 percent per year, followed by Delta yields, which have grown 3 percent annually. Improved management practices, particularly with pest management, and the suspension of production on marginal acreage have helped improve yields (Cooke and Sundquist, 1991). By contrast, the West has had the lowest growth rate (1 percent per year). A new record U.S. average yield of 706 pounds per harvested acre was established in 1987, closely followed by a yield of 700 pounds per acre in 1992.

Factors Affecting Supply and Location of Production

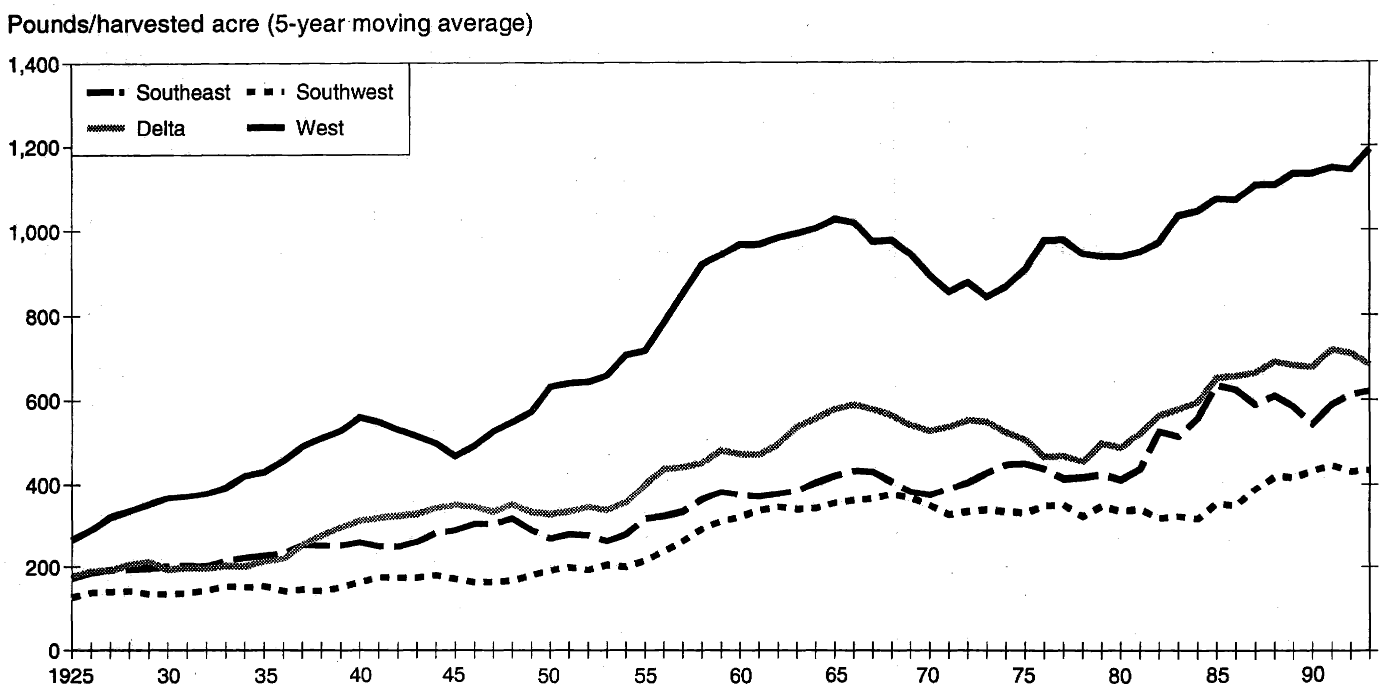
The amount of cotton supplied in the United States and the location of its production are influenced by many forces, including the physical growing environment, economic factors, and government programs. The relative strengths and complex interactions between these forces are never static. Consequently, the proportion of cotton acreage and production allocated among the major producing regions is always subject to change. In the long run, the location of production is dominated by economic forces as influenced by the physical growing environment and government program factors. This section examines the three primary forces that influence cotton supply in the United States and the location of its production.

Physical Environment

The attributes of the physical growing environment, including soil type, topography, temperature, rainfall, and other components, establish the range of production possibilities for a given region. The individual and combined effects of these physical attributes largely determine what commodities can be produced as well as the relative production efficiencies for that region.

Soils and topography. Soil characteristics and topography were important factors in the historical development of U.S. cotton production. Acreage and production have gradually shifted to areas having advantages in soil type and topography (regions with more productive and flatter terrain soils where production is more easily managed). For example, the Delta and the western areas contain primarily alluvial soils. The Delta retained its relatively large share of U.S. cotton production from the 1950's to the 1970's, while irrigated areas in the West and Southwest gained an increasingly larger share of production. By contrast, the relative share of production declined in the Southeast and the Texas Blacklands, where much of the land had become less productive because of soil erosion and other factors.

Figure 4
Cotton lint yields, by region, crop years 1925-93



Cotton planting usually begins in February in the Rio Grande Valley of Texas and extends into June in Oklahoma and the Texas High Plains.

Historically, cotton production was maintained in areas with less productive soils because of government acreage controls. The removal of these restraints on production facilitated shifts in the location of production. However, cotton is still planted in some areas not well suited to it. Other factors, such as technology, relative prices among competing enterprises, and government programs, have influenced acreage and production in those areas. (For an overview of soils acceptable for cotton, see Waddle, 1984, pp. 236-48.)

Topography may have exerted more influence on shifts in the location of production than any other single factor (McArthur, 1980). While there is no satisfactory quantitative measure of the effects of topography, the movement of cotton production from hilly land to relatively flat terrain suggests a significant relationship between topography and changes in the location of production. The relatively level terrain of these areas permits large-scale operations and the adoption of large-scale multirow machinery and equipment.

For example, most of the cotton acreage remaining in the Southeast by the end of the 1960's had moved from the Piedmont to the relatively flat Coastal Plains. Furthermore, cotton has virtually moved out of the hilly areas of eastern Oklahoma and southern Texas. The Texas Blacklands area, while only moderately rolling, has exhibited a sharp reduction in acreage since the 1940's, largely due to cotton disease problems, off-farm employment opportunities, and increased livestock farming in the area. By contrast, the Delta has generally maintained its one-third share of U.S. production. Most of the Delta's cotton production is located in the alluvial valley or stream-bottom lands that traverse the area. The West, which has a relatively flat topography, saw its share of U.S. production rise from 1 percent in the early 1920's to more than 30 percent by the late 1970's. Roughly three-fourths of Texas' cotton acreage and production are in the High and Rolling Plains regions (areas in the north-central part of the State that have a flat to gently undulating terrain). The share of U.S. cotton production originating from the High Plains rose from 8 percent in the early 1950's to more than 20 percent by the early

1970's. Since then, the High Plains' share of production has remained relatively stable, with the exception of 1991 and 1992, when higher acreage abandonment reduced the share to 15 percent.

Climate. The cotton plant, which requires a long growing season and at least 50 percent sunshine, thrives in a hot climate (Waddle, 1984). Temperature controls plant development, affects yield potential, and influences the pests that can reduce yield. Cotton plant development and crop yield potential are also affected by the total amount and distribution of rainfall during the growing season. The cotton plant consumes 562 pounds of water for each pound of plant material produced. This moisture consumption rate is 34 percent more than the water demand for corn (Tharp, 1960). A minimum of 19.7 inches of water is needed during the growing season to obtain an acceptable yield (Waddle, 1984).

Temperature. The boundaries of the Cotton Belt are determined by national borders on the east, south, and west and by frost-free periods and average temperatures on the north. Commercial cotton production generally requires about 200 days between killing frosts and a minimum summer average temperature of 77°F (Waddle, 1984). The northern limits marking these two phenomena coincide across most of the United States. The mean length of the frost-free period across the United States is illustrated in figure 5. Even though a 200-day line is not shown, its general outline is roughly suggested by an interpolation using the 180-day and 210-day lines.

Although cotton is a heat-loving plant that is well-adapted to tropical latitudes, more than 50 percent of the world crop is grown in temperate zones above latitude 37° North (Waddle, 1984). Cotton varieties grown in the former Soviet Union require somewhat fewer frost-free days and are grown between latitudes 37° and 42° North. The only other area in the world producing cotton north of 40° North is in northeast China.

The yield of cotton in pounds per harvested acre tends to be lower in northern than in southern production areas of the Cotton Belt (table 3). Cotton yield potential is generally determined by the length of the growing season (the total average seasonal temperature accumulation occurring within daily lower-and-upper growth thresholds (degree-days)). This yield potential is influenced by frost, rainfall, pests, and other events that occur during the growing season. Thus, the lower yields in the northern areas are associated with higher risks of yield loss from the more variable and shorter growing season (smaller temperature unit accumulations, more probable adverse spring and fall weather conditions, and late or early killing frosts). By contrast, the yields of the strongest competitor crops, mostly grains, tend to increase from south to north in most of these border areas.

Rainfall. Most cotton grown in the Southeast and Delta (east of the 40-inch annual rainfall line depicted in figure 6) is not supplemented with irrigation water. Cotton farmers in this high-rainfall zone generally aim for a high yield. Total rainfall in the eastern half of the United States is more than adequate for cotton production at high-yield levels. However, the distribution of precipitation is much less favorable and less predictable than total rainfall. At any location and in almost every year, yield is adversely affected by either too little or too much rainfall at some time during the growing season. Excessive precipitation is more common than insufficient rainfall; however, droughts do occur. Nevertheless, yield expectations are relatively high for the eastern zone, but yields vary by areas because of soil resources and other factors.

The 16- to 40-inch annual rainfall zone includes most of the cotton-producing areas in the Southwest. Precipitation is highly variable and follows a bimodal pattern, with peak rainfall periods occurring in the spring and fall and sparse precipitation in the winter and summer. Acreage abandonment after planting is significantly higher in the Southwest than in the other three major producing regions. Variable precipitation, especially winter and springtime rainfall, has a substantial impact on a region's harvested acreage (Larson and Meyer, 1992). For example, the average rate of planted acreage abandonment in Texas is 11 percent, compared with an average of 5 percent for the rest of the Cotton

Table 3—Cotton yield comparisons between selected northern and southern Cotton Belt areas

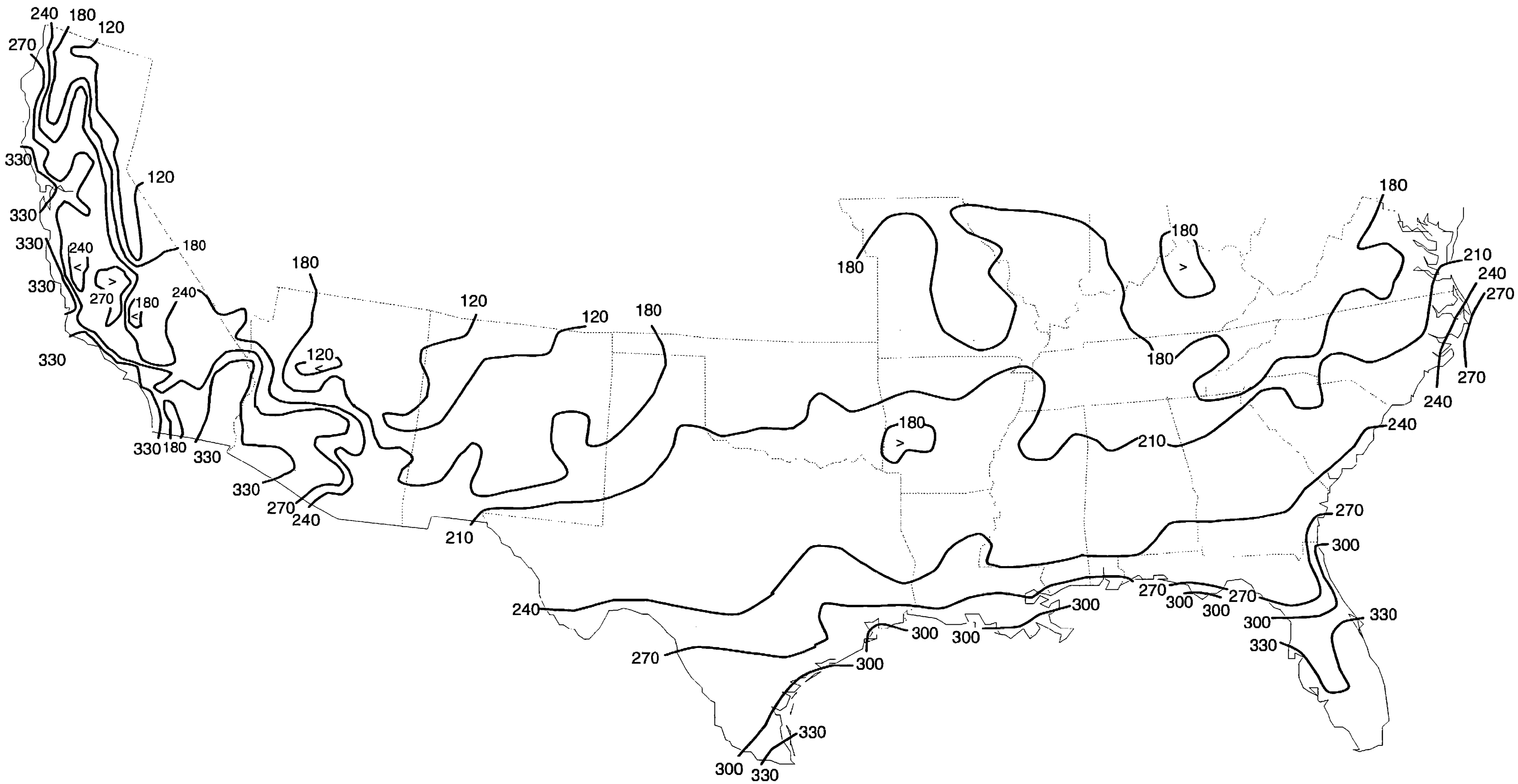
	Lint yield/acre	
Subregion	Northern area	Southern area
	Pounds	
Coastal Plains[1]	344	428
Brown Loam[2]	513	550
Delta[3]	523	575
Rolling Plains[4]	269	293
High Plains[5]	444	533

[1]Coastal Plains area of North Carolina, South Carolina, and Alabama. [2]Tennessee Brown Loam compared with Mississippi Brown Loam. [3]Northern area includes Missouri boot heel, and southern area includes the Arkansas Delta area. [4]Northern Rolling Plains area in Oklahoma compared with southern Rolling Plains area in Texas. [5]Northern High Plains of Texas compared with central High Plains of Texas.

Source: Economic Research Service, USDA, compiled using data from McArthur, 1980.

Figure 5

Mean length of freeze-free period in days, 1951-80



Sources: Data provided by National Climatic Data Center (NCDC). Analysis performed by the Joint Agricultural Weather Facility (USDA/NOAA).

Figure 6
Mean annual total precipitation in inches, 1961-90

Sources: Data provided by National Climatic Data Center (NCDC). Analysis performed by the Joint Agricultural Weather Facility (USDA/NOAA).

Belt. The rate of planted area abandonment in Texas has ranged from a low of 3 percent in 1977 to an all-time high of 37 percent in 1992 (2.0 million of the 5.55 million planted acres). As a result, the proportion of total U.S. production that originates from the Southwest in any given year is highly variable.

Roughly three-quarters of the Southwest's acreage and production are in the Rolling Plains and High Plains. Almost all of the approximately 1.6 million planted acres within the Rolling Plains, which extends from north-central Texas into southwest Oklahoma (20- to 32-inch annual rainfall zone), is not irrigated. Yield expectations and production-input use are low compared with other production regions. Farmer-input use depends on available soil moisture conditions going into the growing season and the precipitation that occurs during the growing season. The most significant factor explaining acreage abandonment in the region is winter rainfall, which determines soil moisture conditions entering the growing season (Larson and Meyer, 1992).

By contrast, a much larger proportion of the planted acres in the High Plains and lower Rio Grande regions (approximately the 16- to 20-inch annual rainfall zone) are supplemented with irrigation water. For example, acreage supplemented by irrigation in the northern High Plains (Crop Reporting District 1-N) constitutes about 80 percent of the 610,000 acres normally planted to cotton. This compares with 40 percent of the 2.63 million planted acres in the southern High Plains (Crop Reporting District 1-S) that receive supplemental irrigation.

Production-input use and yield expectations on irrigated production in the High Plains are considerably higher than with dryland production. Input use on dryland acreage is much more dependent on available moisture going into and during the growing season. However, production-input use and yields are much lower than in the irrigated cotton areas of the West. Limited irrigation water is one explanation of lower yields. However, the incidence of risk from other factors, chiefly related to the length of the growing season, discourages higher input use in the High Plains. The High Plains has a high average acreage abandonment rate (14 percent) because of its uncertain production environment. The most significant factor explaining the higher abandonment rate in the region is springtime weather conditions (Larson and Meyer, 1992). For example, 86 percent (570,000 acres) of the planted area in the northern High Plains was abandoned in 1992 when cool, wet weather conditions struck the region in May and June. In the southern High Plains, 45 percent (1.05 million acres) of the planted cotton acreage was abandoned in 1992 (Texas Crop and Livestock Reporting Service, various issues).

The mixture of irrigated and dryland production systems in the Plains contrasts with the strictly irrigated production systems of the West. All cotton production in the West is irrigated, with the region receiving less than 16 inches of annual precipitation. As a result, yield expectations and production-input use are very high.

The amount and variability of available rainfall has affected the nature and methods of cotton production in the various production regions. Precipitation patterns have also influenced the competitiveness of cotton with other crops. For example, since the removal of acreage allotments, cotton has appeared to be more sensitive to competition from other crops in some of the dryland production areas of the 16- to 32-inch annual rainfall zone than in most higher precipitation and irrigated areas.

Economic Factors

Certain economic factors, such as technological changes, prices, crop alternatives, and government policy, are an important part of the cotton production process. These economic forces interact with the resource base for cotton production and influence the supply and location of cotton in the United States.

Technology. Strong technological pressures have influenced the way cotton is produced and where it is grown since the 1940's. The estimated average annual productivity gain (the rise in output from the same given level of production inputs) for U.S. cotton production between 1939 and 1978 was 5.2 percent (Thirtle, 1985). Most of that productivity gain (4.7 percent) came from the adoption of mechanical technology with the balance (0.5 percent) primarily due to improvements in yield.

In 1949, more than 1.1 million farms averaged 24 acres of cotton harvested. Almost two-thirds of these farms had less than 15 acres of cotton. Family provided almost all of the labor on a majority of these farms, restricting the size of the operation.

Mechanization of cotton farming was still in its early development stages in 1949. Animals were still the only source of power on a majority of farms producing cotton as less than one-third of the farms growing cotton had tractors. Although tractors were used on many farms for land preparation and cultivation, critical and peak labor requirements required hand hoeing and hand harvesting. The mechanical harvester had been developed but had not been widely adopted, partly because the existing farm size structure could not support it. The use of mechanical harvesting rose significantly during the 1950's, involving nearly half of the U.S. crop by 1960. Virtually all of the U.S. crop was mechanically harvested by 1970. Mechanization of other field operations progressed rapidly in response to increased labor costs, labor shortages, and the need to perform more timely operations on larger acreages. Chemical weed control, which became common in the 1950's, has largely replaced hand hoeing, reducing labor requirements for this operation.

However, by the early 1970's, the marked improvements in productivity witnessed since the 1940's had come to an end. The adoption of mechanical technology on cotton farms was largely complete. Furthermore, farmers during this period experienced deteriorating yields and increased costs from widespread pest problems, particularly in the Texas High Plains and the Mississippi Delta (Meredith, 1987, and McKinion, Reddy, and Baker, 1988). U.S. cotton productivity actually dropped in the mid-1970's, falling by an average of 4.8 percent per year between 1974 and 1978. Productivity again improved by the early 1980's as farmers adopted shorter-season production systems, improved their pest management practices, and suspended production on marginal acreage. Cotton production-input productivity rose by an average of 5.6 percent per year between 1978 and 1982 (Cooke and Sundquist, 1991).

As productivity improved, the total number of farms growing cotton plummeted while the average acreage per farm devoted to cotton rose dramatically. About 35,000 farms produced cotton in 1992, down from 43,000 in 1987, and well below the 200,000 in 1969. Harvested area per farm rose from an average of 58 acres in 1969 to 256 acres in 1982; however, the average fell slightly to 228 acres in 1987 before jumping to 315 acres in 1992 (U.S. Department of Commerce, various issues). The rise in the number of farms growing cotton in 1987 and slight decrease in average acres per farm likely reflects the increase in production in the Southeast and Delta, which have smaller farm sizes than those in the Southwest and West.

Cotton enterprise productivity growth has also varied by region, thus influencing the competitive advantage of that region in cotton production. One study examined regional cotton enterprise productivity and the sources of competitive advantage for four cotton production areas: California (proxy for the West), Alabama (proxy for the Southeast), Mississippi (proxy for the Delta), and the Texas High Plains (proxy for the Southwest) (Cooke and Sundquist, 1991). California was found to be the most productive cotton-producing area in the study, maintaining this top ranking for the 1974, 1978, and 1982 periods examined in the study. Mississippi was ranked second in overall cotton enterprise productivity in 1982, followed by Alabama and the Texas High Plains. The relative competitive positions of Mississippi and Alabama improved, while the competitive position of the Texas High Plains deteriorated between 1974 and 1982.

Cotton yields in Mississippi and Alabama rose more rapidly than production-input use between 1974 and 1982. By contrast, total production-input use in the Texas High Plains escalated as yields declined during this period. If these changes in regional productivity continued after 1982, the results of this study may help to explain the resurgence of U.S. cotton production share in the Southeast and Delta in the 1980's and early 1990's.

Prices and income. The United States experienced a period of sustained inflation and rising economic expectations between the 1950's and the 1980's. Inflation accelerated during the 1970's in response to strong demand, oil and food supply shocks, a liberal money supply policy by the Federal Reserve, and other macroeconomic events before receding in the 1980's. The Consumer Price Index more than tripled between the early 1950's and the early 1980's. Per capita disposable income swelled nearly eightfold in nominal dollars and twofold in real dollars during this period.

During the 1950-80 period, prices farmers paid rose at a more rapid rate than did prices farmers received. Prices paid by farmers more than tripled, while prices received for cotton doubled between 1950 and 1980. Thus, the cost-price squeeze, particularly since 1970, has forced farmers to cut costs to stay in business. Many cotton producers have increased the size of their operations and adopted new technology in an attempt to lower per unit production costs and increase income. At the same time, marginal producers were forced to discontinue production because of the cost-price squeeze and the inability to adopt new technology. The removal of acreage allotments and the loss of certain government program benefits to small producers also influenced this trend.

Farmers also use market- and government-induced cotton prices, their costs of production, and returns from alternative crops in deciding how much of their acreage should be devoted to cotton production. U.S. cotton acreage in general does not proportionally respond to a change in price. For example, a 10-percent price change results in less than a 10-percent move in the same direction of cotton acreage and an even smaller change in production. One study found that a 10-percent change in cotton prices induced about a 3.5-percent change in the same direction of U.S. cotton area in the short run (Duffy, Richardson, and Wohlgenant, 1987). Cotton acreage in the Southwest and West was found to be the most responsive to price changes, with the Southeast and Delta being the least responsive.

Relative returns to cotton and other crops, capital intensity, and high investment in specialized equipment for cotton may explain the low response of acreage to price changes. Over the longer term, acreage is somewhat more responsive, changing about 5.2 percent in the same direction as a 10-percent price change.

Alternative crops. The location of cotton production depends not only on absolute advantages, such as lower production costs or higher net returns, but also on comparative advantage, or how net returns from cotton compare with those of alternative crops or other uses of resources. Net returns from cotton have generally exceeded returns from competitive crops in each of the major cotton-producing regions (table 4).

The major alternatives to planting cotton in the Southeast are soybeans and corn. Soybean area in the Southeast ballooned between 1960 and the early 1980's, rising from 1.6 million acres in 1960 to a peak of 8.3 million in 1982. Area planted to soybeans accounted for as much as 40 percent of the total acreage planted to principal crops in the Southeast. On the other hand, corn acreage fell from 7.7 million acres in 1960 to 2.6 million in 1992. Cotton area also plummeted from 2.6 million acres in 1960 to 634,000 in 1983, before rebounding in the late 1980's.

Since 1984, soybean acreage in the Southeast has steadily declined, falling to 2.9 million acres in both 1991 and 1992. Conversely, cotton area rose to 1.5 million acres by 1992. The net returns, after variable cash costs, per acre for cotton was $61 in the Southeast between 1981 and 1990, almost twice the average net returns to soybeans ($39) or corn ($31). Peanuts and tobacco have historically yielded higher net returns than cotton in the Southeast. However, their acreages have been controlled by allotments; thus, their effect on changes in planted cotton area has been small.

Average yields have improved substantially in the Southeast, rising from 356 pounds per acre in 1981 to 689 pounds in 1992. The boll weevil eradication program was partly responsible for yield recovery in this region (Carlson, Sappie, and Hammig, 1991). Thus, cotton production in the Southeast appears to have become more competitive with other enterprises in terms of net returns above variable cash costs, which may explain

Table 4—Returns above cash costs per acre for cotton and selected competing crops in cotton-producing regions[1]

	Southeast			Delta			Southwest			West
Year	Cotton	Soybeans	Corn	Cotton	Soybeans	Rice	Cotton	Sorghum	Wheat	Cotton
					Dollars					
1975	34	42	41	90	52	99	45	48	35	267
1976	98	80	49	98	86	78	120	35	13	476
1977	(6)	53	(21)	131	69	162	102	22	14	263
1978	63	66	28	112	87	105	60	68	25	145
1979	94	75	68	187	100	167	104	48	74	340
1980	21	21	7	97	42	94	33	40	28	405
1981	19	32	12	49	33	139	23	35	21	147
1982	95	25	3	118	35	16	3	16	21	100
1983	(20)	32	24	124	74	78	54	37	42	197
1984	106	36	58	85	63	53	34	34	20	98
1985	72	36	35	77	44	85	48	34	1	102
1986	(24)	28	(19)	19	23	(79)	5	(28)	(20)	70
1987	149	34	8	253	46	(37)	137	12	(16)	391
1988	21	91	59	108	109	44	60	61	6	189
1989	118	41	88	165	34	77	39	11	36	316
1990	73	33	39	171	52	(33)	115	13	20	338
Avg.	57	45	30	118	59	66	59	32	20	240
C.V.[2]	88	46	99	46	42	103	74	55	108	51

[1]Returns exclude Government program payments. Costs exclude hired labor. [2]Coefficient of variation.

the rise in acreage and production in the region since the early 1980's. However, in terms of net returns above variable cash costs per pound of lint produced, the Southeast still lags behind the other regions. The Southeast averages $0.09 per pound, compared with $0.12 in the Southwest, $0.17 in the West, and $0.18 in the Delta (1975-90 average). Furthermore, new technologies or equipment that require larger scale operations may continue to favor other regions.

Soybeans are the primary alternative to cotton in the Delta. Its acreage has increased sharply since 1960, rising from about 3.5 million acres in 1960 to a peak of 12.8 million in 1979. Soybean planted area in the region subsequently declined, falling to 6.1 million acres in 1992. By contrast, cotton area in the Delta steadily rose to 4.2 million acres after reaching a low of 1.8 million in 1983.

In the alluvial valley areas of the Delta, where most cotton production occurs, cotton and soybeans are the major competitors on the well-drained mixed and sandy soils, while rice has been the most profitable crop on clay soils. Much of the most productive rice land is the least productive cotton land in the Delta. For the average Delta producer, net returns per acre from cotton are much higher than from soybeans or rice. Between 1981 and 1990, average net returns to cotton in the region were $117 per acre, more than twice the average returns to soybeans ($51) and rice ($34). Cotton production in the Delta continues to compete favorably with other crop alternatives in the region and with other production regions.

Grain sorghum and winter wheat are the major crop alternatives to cotton in the Southwest (Texas and Oklahoma). In 1992, the Southwest accounted for 45 percent of U.S. cotton acreage, 38 percent of U.S. grain sorghum area, and 26 percent of U.S. winter wheat acreage. Texas accounted for as much as 60 percent of U.S. sorghum production in the early 1950's, but its share of production diminished to about 35 percent by 1992. Oklahoma and Texas are major producers of wheat, while Texas produces more than 90 percent of the region's cotton.

Net returns above variable cash costs in the Southwest are generally below those of other regions. However, net returns to sorghum and wheat production in the region have lagged behind net returns to cotton. Between 1981 and 1990, average net returns per acre to cotton in the Southwest were $48 compared with $26 for sorghum and $13 for wheat. Thus, cotton production has tended to be maintained in this region because of profitability compared with other alternatives and the established markets for cotton.

Cotton in the West accounted for an increasing share of U.S. cotton acreage and production in response to high yields, consistent high quality, and high net returns. Wheat and barley are distant competitors in the West in terms of returns above cash costs per acre. Cotton producers in the West received the highest average returns above cash costs per acre between 1975 and 1990.

Government Programs

Government programs also influence cotton acreage and supply. Between 1933 and 1965, cotton programs frequently included acreage allotments, marketing quotas, and parity price supports. These program provisions froze resource use patterns despite the fact that geographic production patterns tend to follow changes in such factors as relative costs and returns, productivity, resource availability, and numerous other factors. Elimination of historical allotments in the 1970's facilitated the further shift of cotton production to lower cost regions because benefits were based on recent plantings. Thus, this policy change encouraged the movement of acreage to efficient producers and to regions where cotton had a comparative advantage.

Since the 1970's, government cotton programs have followed a more market-oriented approach, using voluntary acreage reduction and deficiency payment programs rather than production controls. Cotton producers, in exchange for eligibility for government loans and direct payments, are required to comply with Acreage Reduction Program (ARP) requirements (idle 0-25 percent of their acreage base) (Lynch, 1991). Other program mechanisms such as Paid Land Diversion can also influence acreage planted to cotton. For example, a 1-percent increase in the ARP removed about 0.85 percent of U.S. planted acreage from production on average between 1986 and 1992 (fig. 7). One study found that cotton area in the Southwest is the most responsive to direct government payments, with about 2 percent of area being removed for each dollar per acre of weighted payment (Duffy, Richardson, and Wohlgenant, 1987). In the Delta, about 1 percent of area is removed for each dollar of payment per acre. By contrast, less than 1 percent of acreage in the Southeast and West is removed for each dollar of payment per acre. The low returns above cash costs per acre in the Southwest, compared with other regions, may explain the higher responsiveness of acreage to government payments in this area.

The influence of the ARP on cotton production since 1986 has been more variable (fig. 8). In general, pro-

Figure 7
Upland planted acreage under the Acreage Reduction Program, crop years 1986-93

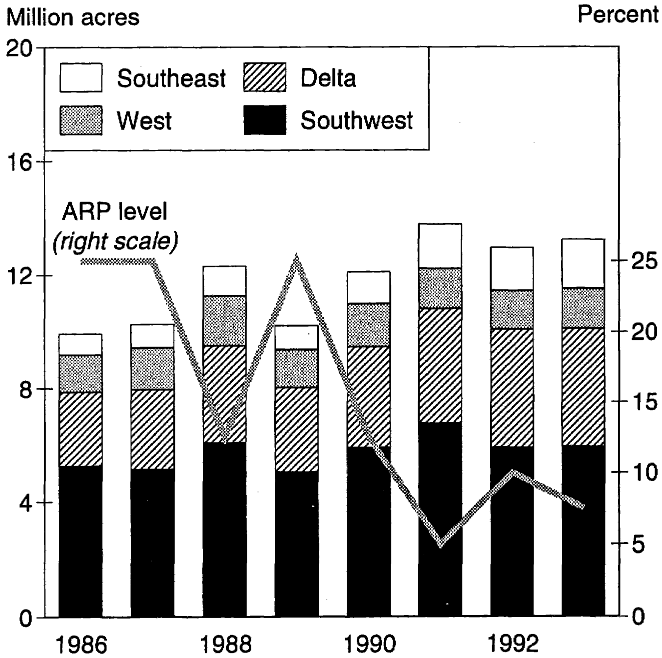
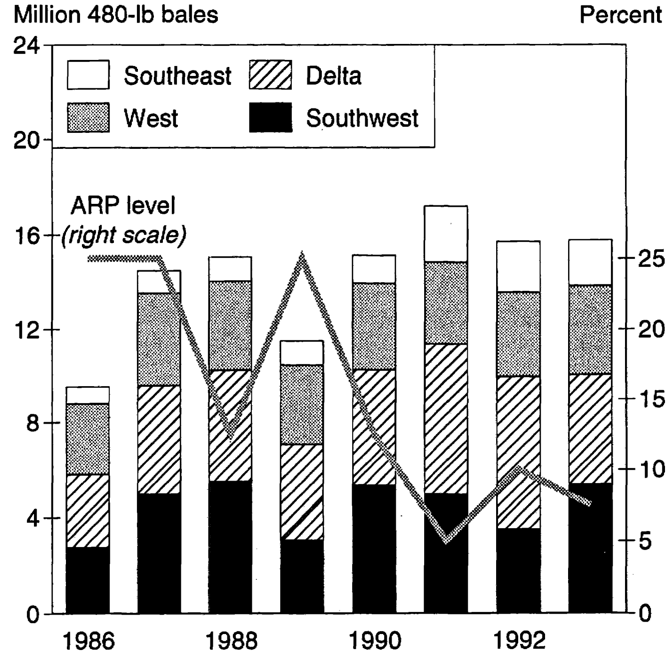


Figure 8
Upland production under the Acreage Reduction Program, crop years 1986-93



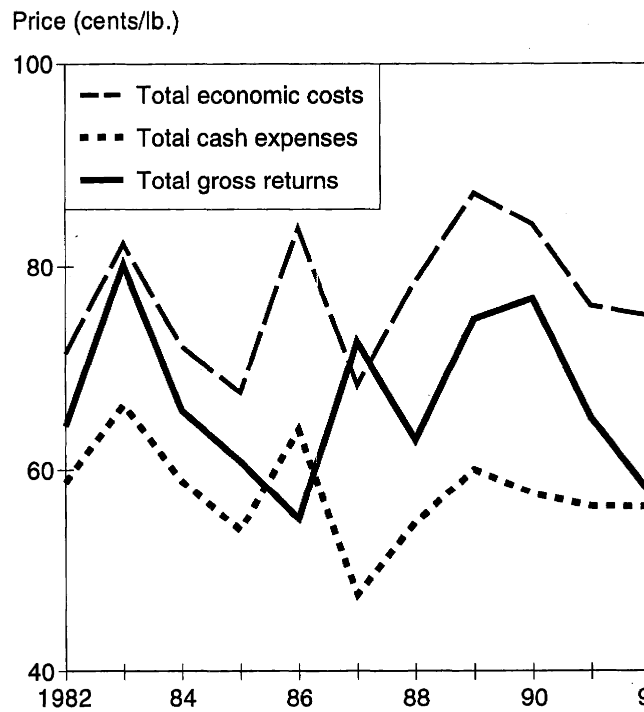
duction in percentage terms is usually reduced by less than the actual ARP percentage, partially because farmers tend to remove marginal land from production first (Gardner, 1987). For example, a 1-percent increase in the ARP decreased U.S. cotton production by about 0.27 percent on average between 1986 and 1992. However, because the ARP directly targets planted acreage and not production, the impact of the ARP on production is more variable. For example, in 1986 and 1989 (25-percent ARP years), production potential in the Southwest was lost from large acreage abandonment and production was lower even though planted acreage in those 2 years was approximately the same as in 1987, another 25-percent ARP year.

Costs of Production

Costs of producing U.S. cotton have increased since the mid-1970's. After increasing sharply during 1975-85, cost increases have moderated in recent years. However, cash receipts for cotton and cottonseed have not kept pace with rising costs, resulting in low or negative net returns (fig. 9). This situation has been a major concern of the U.S. cotton industry, as U.S. raw cotton competes with foreign growths in the world market and with synthetic fibers in domestic textile mills.

Cotton production costs per planted acre and per pound of lint vary considerably within and among regions (table 5). Cash expenses averaged $315.28 per planted

Figure 9
U.S. cotton production costs and returns, crop years 1982-92



acre in the United States during 1992, but ranged from a low of $216.14 in the Southwest region to a high of $628.07 in the West. Differences in yields, however, impact per unit costs (cents per pound). In the Southwest, where total cash costs are the lowest, per unit costs were the highest in 1992 when yields averaged only 251 pounds per planted acre. In the West, where total cash costs are nearly double the U.S. average, a yield of 1,083 pounds per acre kept the average cost per pound at 58 cents—just slightly above the average for all regions.

Cash receipts from the sale of lint and seed averaged 57.7 cents per pound for all regions, about 1.4 cents above total cash costs of 56.3 cents. Receipts do not include government payments, and cash costs only reflect variable and fixed cash expenses with no allocation for capital replacement, land charges, or unpaid labor. Cash receipts were above cash costs in all regions except the Southwest for the 1992 season (table 5). The largest margin was in the Southeast where receipts exceeded expenses by over 14 cents per pound.

In the Southwest, low yields and low prices combined to keep total cash expenses above cash receipts by more than $83 per planted acre in 1992. Returns above cash costs in the Southwest were very low or negative for most other years since 1982, increasing the importance of government programs to producers in this region.

Cotton producers have experienced negative returns above total or full economic costs virtually every year since 1980 (table 6). Government direct payments have been relatively small in some years, but are an important proportion of total producer income from cotton. Returns above total economic costs during 1986-92, show total net income (both nominal and real) ranging from 16.5 cents per pound in 1987 to -3.5 cents (nominal) and -3.2 cents (real) in 1989.

Cotton Demand

The demand for raw cotton fiber is derived from consumer demands for textile products. Textiles are found in apparel, home furnishings, and industrial products. Items as diverse as tire cord, conveyor belts, air filters, carpeting, towels, shoe linings, T-shirts, and upholstery are made from fibers.

Cotton is only one of many fibers used in textile products. Manmade fibers now account for about two-thirds of U.S. mill use, although cotton still accounts for about half of total fiber consumption worldwide. The major noncellulosic manmade fibers include polyester (about 40 percent of manmade fiber production), nylon (about 30 percent), and olefin (about 20 percent). Acrylic is a less important noncellulosic manmade fiber. Rayon and acetate are cellulosic manmade fibers that together account for about 6 percent of total manmade fiber production. Wool is the other major natural fiber, but it accounts for only 1 percent of U.S. mill use. Similarly, flax and silk together account for about 1 percent of U.S. mill consumption.

Demand Relationships

Major factors affecting U.S. cotton mill use include cotton and competing fiber prices, fiber characteristics, consumer income, changing lifestyles, cycles in U.S. textile activity related to the U.S. business cycle, and trade in textile products.

Even in the long run, total fiber demand is price inelastic, meaning that a 1-percent change in the price of raw fiber causes less than a 1-percent change in the quantity of fiber demanded. In apparel products, where fiber is the primary material, the costs of spinning, weaving, finishing, cutting, sewing, packaging, storing, transporting, and retailing dwarf the cost of the raw fiber. Consequently, a considerable change in the cost

Table 5—U.S. and regional cotton production costs and receipts, 1992

Costs and receipts	Southeast		Delta		Southwest		West		United States	
	$/planted acre	*Cents/lb*	*$/planted acre*	*Cents/lb*	*$/planted acre*	*Cents/lb*	*$/planted acre*	*Cents/lb*	*$/planted acre*	*Cents/lb*
Cash expenses	323.82	47.8	382.73	56.6	216.14	86.1	628.07	58.0	315.28	56.3
Cash expenses with capital replacement	372.82	55.0	440.59	65.1	241.89	96.4	689.46	63.6	356.74	63.7
Total economic costs	423.85	62.5	522.14	77.2	295.23	117.7	794.14	73.3	420.46	75.1
Cash receipts, lint	379.52	56.0	331.47	49.9	112.92	45.0	617.53	57.0	280.04	50.0
Cash receipts, seed	41.97	6.2	50.70	7.5	20.13	8.0	116.48	10.8	43.10	7.7

Source: USDA Cost of Production survey, 1992.

of the raw fiber may have only a negligible effect on consumer prices and no discernible change in the total quantity of fiber demanded.

The demand for individual fibers may be less inelastic than the demand for all fibers combined, but the elasticity of demand, even for individual fibers, is still less than 1. For example, shortrun elasticity of cotton mill demand has been estimated between -0.2 and -0.35, meaning that a 10-percent increase in raw cotton prices will generate a 2- to 3.5-percent drop in mill consumption of cotton.

Since World War II, cotton's share of U.S. mill use has fallen from about 80 percent to a low of 24 percent in 1981, before rebounding to its current level above 30 percent. During the decline in cotton's share, manmade fibers became the major fibers in a large number of end uses previously dominated by cotton, but the cotton industry has regained some of these markets (fig. 10). Although manmade fibers are well suited for many products invented since World War II, particularly industrial and household products, cotton can substitute in some of these end uses. The resulting interfiber competition magnifies the quantity response from a particular fiber price change. Some textile machinery and machine settings are specific to the types of fiber being used, so textile mills may need some lead time to convert from one fiber blend to another. Nevertheless, a perceived longrun change in relative fiber prices encourages mills to adjust their production accordingly.

Changes in fiber consumption are positively correlated with changes in consumer income. Estimates vary, but a 1-percent increase in income is generally expected to cause total fiber consumption to rise by more than 1 percent. As incomes rise, consumers can afford additional clothing and home furnishings. Also, as consumers can afford more manufactured products, the demand for industrial textiles rises.

Most textile products are considered semidurable or durable goods, meaning that they have a useful life of more than 1 year. Therefore, consumers often treat the purchase of textile products as an investment. When incomes rise and consumer confidence is high, consumers are willing to purchase products ranging from new suits to carpeting. Conversely, during economic downturns, consumers are apt to defer purchases of new clothes, home furnishings, and manufactured products.

Uses for cottonseed provide a secondary source of income for cotton producers. Cottonseed usually provides about 12-15 percent of the total farm value of cotton production, with lint accounting for the rest of the value. Cottonseed can be fed directly to dairy cattle or crushed to produce meal and oil. Cottonseed oil accounts for about 5 percent of the fats and oils used in edible oil

Table 6—Cotton sector costs and returns, 1980-85 average, annual 1986-92[1]

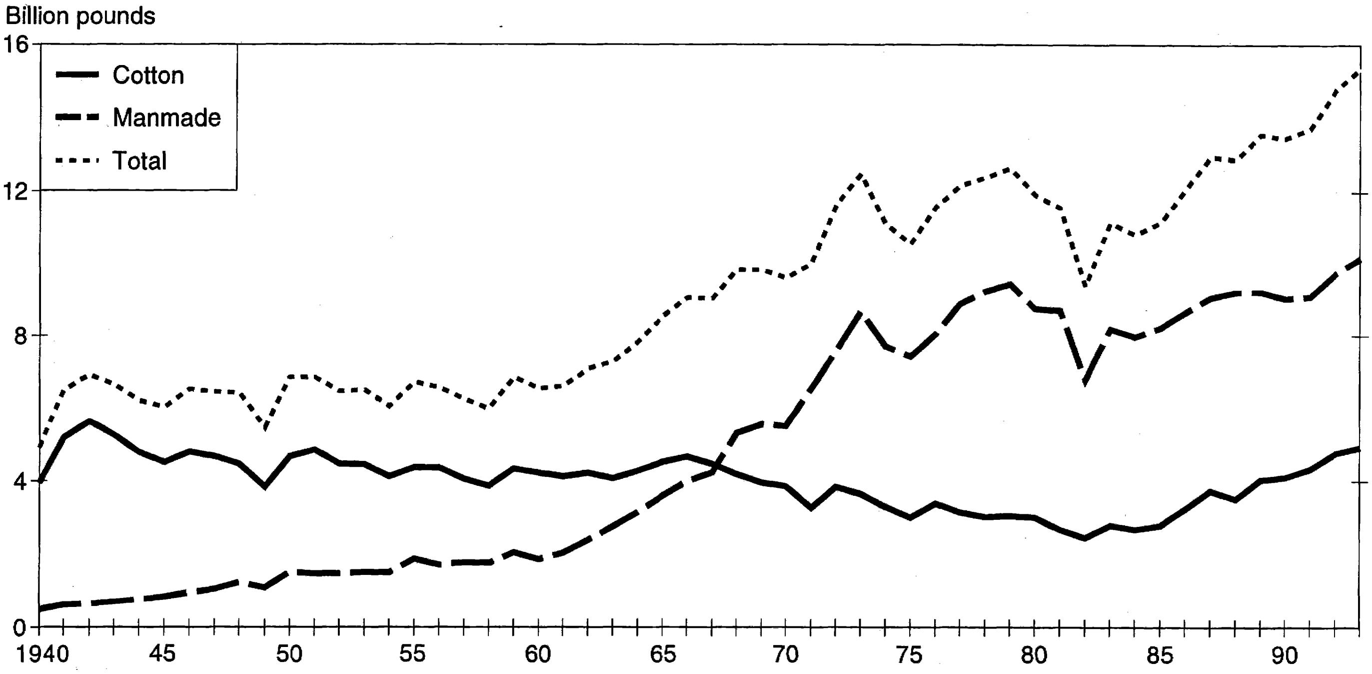
						Returns above total economic costs			
								Total income	
Crop year	Farm value[2]	Direct payments[3]	Total income	Total cash expenses[4]	Total economic costs[5]	Farm value	Total	Nominal	Real[6]
	Million dollars							Cents/pound	
1980-85 average	3,955	608	4,563	3,326	4,370	(415)	193	3.3	3.9
1986	2,664	1,566	4,230	2,938	3,855	(1,191)	375	8.2	8.5
1987	4,888	1,074	5,962	3,345	4,799	89	1,163	16.5	16.5
1988	4,719	1,291	6,010	4,008	5,737	(1,018)	273	3.7	3.6
1989	4,048	655	4,703	3,321	4,901	(853)	(198)	(3.5)	(3.2)
1990	5,618	408	6,026	4,214	6,161	(543)	(135)	(1.8)	(1.6)
1991	5,222	926	6,148	4,465	6,027	(805)	121	1.5	1.3
1992	4,661	1,692	6,353	4,190	5,588	(927)	765	10.3	8.5

Note: Negative numbers are in parentheses.

[1]Costs are from ERS Cost of Production series. Acreage and payments from *Commodity Fact Sheets*, published by the Agricultural Stabilization and Conservation Service, USDA. [2]Total gross value (including cotton seed) per planted acre times planted acres. [3]The sum of deficiency, diversion, and disaster payments to producers. Includes any marketing loan gains beginning with 1986 crop. [4]Includes variable cash expenses, general farm overhead, taxes and insurance, interest on operating loan, and interest on real estate. [5]Includes variable cash expenses, general farm overhead, taxes and insurance, capital replacement, and located returns to operating capital, nonland capital, land, and unpaid labor. [6]Based on GNP implicit price deflator (1987=100).

Figure 10

U.S. mill use of fibers, calendar years 1940-93



products in the United States, with soybean oil, corn oil, and edible tallow being the major competing oils. Recent dietary trends away from animal fats and oils in fast foods have led to increases in vegetable oil consumption, including cottonseed oil. Seeds also yield linters (fuzzy short fibers) and hulls. Linters are used in paper, upholstery stuffing, dynamite, and other products where fiber strength is not important. Linters are also sometimes used as the cellulosic material in the production of rayon and acetate. Cotton hulls, meal, and whole seeds can be used as cattle feed supplements.

Domestic Fiber Consumption

Total U.S. fiber consumption (U.S. mill use plus the raw fiber equivalent of textile imports minus textile exports) rose dramatically over the past 35 years. Population growth, changing lifestyles, new textile products, rising real incomes, and decreases in real fiber prices have significantly contributed to this increase. Domestic consumption rose from 5.8 billion pounds in 1958 to a record 18.9 billion pounds in 1993, while per capita fiber consumption increased from 33 pounds in 1958 to 73 pounds in 1993 (table 7).

Although population has expanded incrementally over the past three and a half decades, fiber consumption has varied significantly. From 1958-78, domestic fiber consumption increased at an average annual rate of 370 million pounds. However, both total and per capita consumption declined during 1979-82, falling 2.7 billion pounds and 14 pounds, respectively. Consumption recovered following the recession, reaching a 1987 record of 16.5 billion pounds. For the next 4 years, however, fiber consumption weakened and averaged less than 16.0 billion pounds until new records were set in 1992 and 1993.

Despite the increase in total fiber consumption, domestic consumption of cotton declined from a postwar peak of 5.0 billion pounds in 1966 to 3.1 billion in 1982. Since 1982, however, domestic cotton consumption has rebounded and achieved a new record of nearly 7.6 billion pounds in 1993. Per capita cotton consumption rose from a 1982 low of 13.5 pounds to 29.3 pounds in 1993, the highest level since 1950. Recent gains in market share over polyester and rayon account for cotton's comeback. Cotton accounted for only 26 percent of total U.S. fiber consumption in 1979, but regained a market share of nearly 40 percent by 1993.

Domestic consumption of wool has also declined from the late 1940's. In 1948, nearly 715 million pounds of wool were used in the United States, accounting for 12 percent of total fiber consumption, or about 5 pounds per capita. During the 1950's and 1960's, wool consumption averaged only 500 million pounds, but fell further to 142 million by 1974, or 1 percent of fiber use. In the late 1970's, demand for wool improved and peaked again in 1986 at 396 million pounds. After

Table 7—Domestic consumption of fibers: Total and per capita, 1980-93

		Cotton			Wool			Manmade			All fibers	
Year	Population	Total	Share of fibers	Per capita	Total	Share of fibers	Per capita	Total	Share of fibers	Per capita	Total	Per capita
	Million	*Million pounds*	*Percent*	*Pounds*	*Million pounds*	*Percent*	*Pounds*	*Million pounds*	*Percent*	*Pounds*	*Million pounds*	*Pounds*
1980	227.7	3,324.2	26.6	14.6	202.4	1.6	0.9	8,991.0	71.8	39.5	12,517.6	55.0
1981	230.0	3,310.1	27.0	14.4	239.9	2.0	1.0	8,702.2	71.0	37.8	12,252.2	53.3
1982	232.2	3,138.3	29.9	13.5	216.0	2.1	0.9	7,143.7	68.0	30.8	10,498.0	45.2
1983	234.3	3,723.8	29.1	15.9	278.8	2.2	1.2	8,792.9	68.7	37.5	12,795.5	54.6
1984	236.3	3,973.9	30.3	16.8	340.2	2.6	1.4	8,820.8	67.2	37.3	13,134.9	55.6
1985	238.5	4,226.4	30.5	17.7	363.7	2.6	1.5	9,267.4	66.9	38.9	13,857.5	58.1
1986	240.7	4,894.6	32.4	20.3	396.3	2.6	1.6	9,836.4	65.0	40.9	15,127.3	62.8
1987	242.8	5,790.9	35.2	23.9	395.4	2.4	1.6	10,279.3	62.4	42.3	16,465.6	67.8
1988	245.0	5,308.8	33.4	21.7	344.5	2.2	1.4	10,258.8	64.5	41.9	15,912.1	64.9
1989	247.3	5,892.5	36.7	23.8	290.8	1.8	1.2	9,872.8	61.5	39.9	16,056.1	64.9
1990	249.9	5,866.9	37.6	23.5	278.9	1.8	1.1	9,458.1	60.6	37.8	15,603.9	62.4
1991	252.7	6,217.5	38.9	24.6	299.1	1.9	1.2	9,471.2	59.2	37.5	15,987.8	63.3
1992	255.5	7,109.9	39.8	27.8	316.0	1.8	1.2	10,450.4	58.5	40.9	17,876.3	70.0
1993	258.2	7,553.8	40.0	29.3	342.9	1.8	1.3	11,012.1	58.2	42.6	18,909.9	73.2

consumption weakened in the late 1980's, the new decade once again brought renewed interest in wool. In 1993, wool consumption totaled 340 million pounds, but only accounted for about 2 percent of total U.S. fiber consumption.

After World War II, domestic consumption of manmade fibers began to accelerate. By the end of the 1940's, manmade consumption reached 1 billion pounds annually, which represented 20 percent of the total fiber market. Over the next 25 years, fiber share had doubled while actual consumption had nearly quadrupled. Manmade fiber gains continued through 1979, when share reached its peak at 72.5 percent. Since cotton's comeback in the 1980's, manmade fiber's share has moved lower. Although total domestic manmade consumption rose to 11.0 billion pounds in 1993, share has remained below 60 percent, the lowest in over 20 years.

U.S. Cotton Mill Consumption

Mill consumption of cotton has changed dramatically in the United States over the past several decades. During crop years 1955-69, U.S. mills used approximately 9 million bales annually. In the 1970's, however, cotton mill use weakened and fell to a low of 5.3 million bales by 1981/82. Lower manmade fiber prices, as well as consumer preference for manmade fiber products, contributed to cotton's decline during this period.

In addition to being cheaper between 1970 and 1987, manmade fiber prices were more stable than cotton prices (table 8). Uncertainty exists each year with cotton production, and the output cannot be adjusted from month to month. Cotton is also produced on approximately 35,000 farms, whereas manmade fiber production is more concentrated among large chemical companies. Although price risk can be reduced with the use of fu-

Table 8—Annual average fiber prices at Group B mills and cotton's share of U.S. mill use[1]

Calendar years	Cotton[2] (1)	Polyester (2)	Difference (1) - (2)	Cotton's share of mill use
	Cents/pound			*Percent*
5-year averages:				
1960-64	32.0	114.3	(82.3)	59.6
1965-69	23.5	65.6	(42.1)	47.4
1970-74	42.4	39.0	3.4	33.0
1975-79	64.1	54.3	9.8	26.6
1980-84	78.0	77.5	.5	25.2
1985-89	67.3	70.8	(3.5)	27.7
1990	79.3	82.6	(3.3)	30.6
1991	79.1	73.5	5.6	31.7
1992	61.9	73.5	(11.6)	32.3
1993	61.8	72.7	(10.9)	32.1
1994	78.7	74.9	3.8	32.2

Note: Negative numbers are in parentheses.

[1]Group B mills are textile mills in the Western half of North and South Carolina. [2]Middling 15/16 inch, 1960-69, and Strict Low Middling 1-1/16 inch, 1970-94.

Sources: Compiled from Agricultural Marketing Service (USDA) and trade reports.

tures contracts, the inherent instability of cotton prices, along with the easy care and durability of polyester and rayon, contributed to the loss of market share for cotton.

Since the early 1980's, consumer preferences have shifted back to natural fiber products, with cotton leading the way. Cotton's major advantages over manmade fibers are breathability and absorbency—characteristics that have kept cotton dominant in products like denim and toweling. These "comfort" advantages, combined with research to make easy-care cotton products and competitive prices in the 1980's led to the rebound in cotton use, particularly in apparel. Since the 5.3 million bales used in 1981/82, U.S. mill consumption has risen dramatically, as has cotton's share of fiber use on the cotton system (fig. 11). In just 5 years, cotton use climbed to 7.5 million bales and share to 67 percent. Cotton consumption and share continued to rise and, by 1993/94, consumption had jumped to 10.4 million bales, while share of fiber use had risen above 75 percent. A continuation of the robust demand for denim and apparel products, an anticipated increase in cotton textile exports, and additional mill capacity expansion is expected to push cotton mill consumption during the mid-1990's to levels not experienced since 1950.

U.S. Cotton Exports

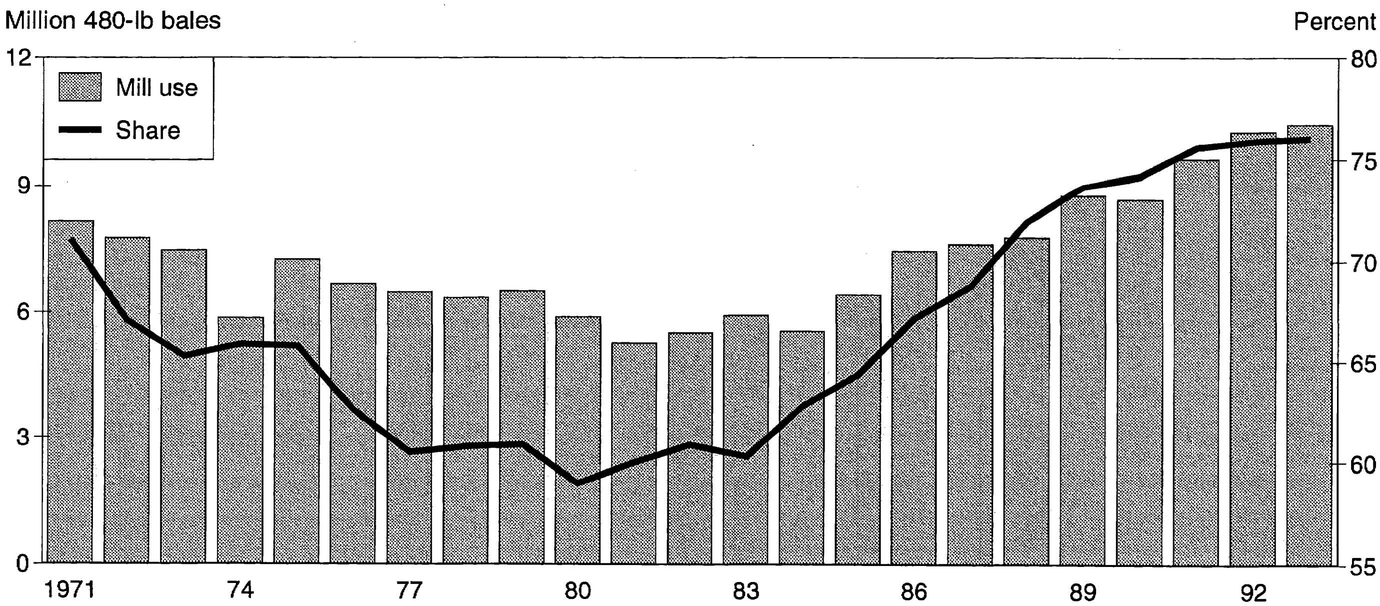
Cotton export levels have also changed significantly over the past several decades. During crop years 1945-75, U.S. raw cotton exports accounted for nearly a third of total cotton disappearance, but they accounted for more than half of disappearance in 1978-84 (table 9). During the latter period, U.S. exports exceeded domestic mill use in 5 out of 7 years. In 1985/86, however, U.S. prices were supported above those charged by

Table 9—Annual average U.S. mill use and exports of raw cotton

Crop years	Mill use	Exports	Disappearance	Exports as a share of disappearance
	------ 1,000 bales[1] ------			*Percent*
5-year averages:				
1960-64	8,762	5,062	13,825	36.6
1965-69	8,939	3,586	12,525	28.6
1970-74	7,496	4,528	12,025	37.7
1975-79	6,653	5,798	12,451	46.6
1980-84	5,625	6,140	11,766	52.2
1985-89	7,605	5,814	13,418	43.3
1990	8,657	7,793	16,450	47.4
1991	9,613	6,646	16,259	40.9
1992	10,250	5,201	15,451	33.7
1993	10,418	6,862	17,280	39.7

[1]480-pound net-weight bales.

Figure 11
U.S. cotton mill use and share



Note: Cotton's share based on consumption on the cotton system.

competing exporters and U.S. exports subsequently fell below 2 million bales. Between 1986 and 1991, exports averaged 6.9 million bales or 45 percent of total use. Competitively priced foreign cotton limited U.S. exports once again in 1992, but exports in 1993 rebounded to capture about 40 percent of total use.

The primary export markets for U.S. cotton remain South Korea, Japan, and Taiwan, though export destinations to countries with lower labor costs, such as Indonesia, Thailand, Brazil, and Mexico, have provided an increasingly important home for U.S. cotton. During crop years 1978-81 and 1988-91, China was also a major customer of the United States. As these textile industry trends continue, U.S. cotton export destinations will likely become even more diverse.

Foreign mills purchase both the highest and lowest quality U.S. cotton. Up to 80 percent of the high-quality lint produced in California, Arizona, and New Mexico is exported to mills in Japan, Korea, and Europe for use in production of high-quality textile products. Low-grade, short-staple length cotton, particularly from Texas and Oklahoma, is often shipped to mills in Taiwan, Hong Kong, and other Far East countries for production of coarse-yarn textile products like denim and corduroy.

Export demand generally shows a greater sensitivity to price changes than domestic mill use. Cotton is produced in about 80 countries around the world. An increasing number of these countries are seeking to expand their foreign exchange earnings by exporting cotton. Consequently, a small change in U.S. prices can produce a shift in world trade patterns. Some estimates indicate that a 1-percent increase in U.S. cotton prices will cause a 0.5-percent decrease in U.S. exports during an ensuing year, other factors held constant. U.S. mills, on the other hand, have only U.S. cotton to choose from as import quotas on raw cotton limit shipments from other countries. Consequently, larger price changes are required to significantly shift U.S. mill use.

Competition among cotton exporters is likely to remain strong during the late 1990's, as limited growth is expected to occur in traditional importing countries. Although world consumption is projected to expand as the global economy improves, much of the growth will likely occur in the major cotton-producing nations. Countries such as China, Pakistan, and India have become lower cost yarn producers and have a comparative advantage over nations like Japan and South Korea. In the Food, Agriculture, Conservation, and Trade Act of 1990, provisions were enacted to ensure that U.S. cotton will be competitive on the world market. Although the effectiveness of the program was questioned during the 1992 season, U.S. cotton exports are expected above the long-term average of about 9 percent of total foreign mill consumption in the near future (table 10).

Table 10—U.S. cotton supply and use, 1980/81-94/95

Crop year	Supply				Disappearance				
	Beginning stocks[1]	Production2	Imports	Total	Mill use[3]	Exports	Total	Unaccounted[4]	Ending stocks
	1,000 480-lb. bales								
1980	3,000	11,122	28	14,150	5,891	5,926	11,817	335	2,668
1981	2,668	15,646	26	18,340	5,264	6,567	11,831	123	6,632
1982	6,632	11,963	20	18,615	5,513	5,207	10,720	42	7,937
1983	7,937	7,771	12	15,720	5,921	6,786	12,707	(238)	2,775
1984	2,775	12,982	24	15,781	5,538	6,215	11,753	74	4,102
1985	4,102	13,432	33	17,567	6,413	1,960	8,373	154	9,348
1986	9,348	9,731	3	19,082	7,452	6,684	14,136	80	5,026
1987	5,026	14,760	2	19,788	7,617	6,582	14,199	182	5,771
1988	5,771	15,411	5	21,187	7,782	6,148	13,930	(165)	7,092
1989	7,092	12,196	2	19,290	8,759	7,694	16,453	163	3,000
1990	3,000	15,505	4	18,509	8,657	7,793	16,450	285	2,344
1991	2,344	17,614	13	19,971	9,613	6,646	16,259	(8)	3,704
1992	3,704	16,218	1	19,923	10,250	5,201	15,451	190	4,662
1993	4,662	16,134	6	20,802	10,418	6,862	17,280	8	3,530
1994[5]	3,530	19,662	20	23,212	11,250	9,600	20,850	88	2,450

[1]Compiled from Bureau of the Census data and adjusted to an August 1, 480-lb. net-weight basis. Excludes preseason ginnings. [2]Includes preseason ginning. [3]Adjusted to August 1-July 31 marketing year. [4]Difference between ending stocks based on census data and preceding season's supply less disappearance. Negative numbers are in parentheses. [5]Estimated.

Distribution and End Uses

The path from raw fiber to finished consumer product may take many forms (fig. 12). More than half of a 500-pound bale of cotton is used to produce clothing, 27 percent is used in home furnishings, and 6 percent is used in industrial products. Only 4 percent of a 500-pound bale is unusable waste.

Distribution of an Average Bale

Upon delivery to the textile mill, a bale of raw cotton averages about 500 pounds. Of this total, approximately 20 pounds is bagging and ties or bands (tare). However, an increasing volume of cotton is strapped with improved materials weighing as little as 7 pounds. The remaining 480 pounds of cotton contain an average of 22 pounds of nonlint waste such as dust and vegetable matter. An additional 38 pounds of usable waste is produced in the first stages of the yarn production process. This usable waste is sold to the textile waste industry which uses it primarily for padding and upholstery filling. In addition, about 20 pounds go into nonwoven products. On average, the remaining 400 pounds, or 80 percent of the original bale, is manufactured into yarn. About 138 pounds are used to produce knit goods, 7 pounds are made into sewing thread, and 1 pound is used to produce carpet and tufting yarns. The largest share of total yarn production, 254 pounds or nearly 64 percent, is woven into fabric.

Finished cloth (bleached, dyed, and printed) is the primary outlet for cotton fiber with approximately 181 pounds, or about 38 percent of the original bale, consumed in this use. Unfinished gray goods, which are raw unbleached fabrics, account for 9 pounds of the bale and are used primarily for industrial applications. About 64 pounds are used to produce yarn-dyed fabrics where yarn is first dyed and then woven. Most cotton denim products are constructed from yarn-dyed fabric and account for a significant share of total cotton use.

Specific Cotton End-Use Markets

Except for waste and tare, all of the original cotton bale ends up in one of the three major end-use categories: clothing, home furnishings, or industrial products. In 1991, clothing accounted for 295 pounds of total end use of a bale, compared with 256 pounds in 1984. Home furnishings consumed 133 pounds of the total end use and industrial products accounted for 30 pounds, compared with 138 and 64 pounds respectively in 1984.

In 1993, woven fabric accounted for 64 percent of all fabric construction, about 3 percent more than in 1984 (table 11). Knit fabric, however, decreased from 39 percent of total fabric use in 1984 to 34 percent in 1993. Cotton's share of the denim market has grown from 84 percent in 1984 to over 95 percent in recent years.

Men's and boys' apparel is by far the largest individual market for cotton fiber. In 1993, nearly 4.1 million bales, or about 40 percent of total domestic mill consumption, was used in men's and boys' apparel (table 12). Trousers and shorts are the most important items within this category.

Cotton Prices

There is no single price for cotton. On any given day, there are many prices depending on the form, type, quality, and location of a particular bale of cotton. Even the term "average price" has many meanings, as the price of cotton is regularly averaged at four levels of the marketing system: farm, cash market, mill delivered, and northern Europe. Prices are also averaged by State, in designated cash markets, and to a lesser extent on the New York futures market.

The price of cotton responds rapidly to actual and anticipated changes in supply and demand market forces. Both cash and futures prices provide a broad base for market transactions. Also, all major growths of cotton are substitutable for each other directly or indirectly, and all qualities of cotton have a direct relationship to each other based on relative spinning values. This section describes the cotton price series most often quoted, the characteristics of cotton that most affect prices, and the relationships between different cotton price series (table 13).

Farm Prices

Farm prices are reported by USDA's National Agricultural Statistics Service (NASS) and based on surveys of prices paid to farmers for cotton lint at the point of

Table 11—Major cotton markets by type of fabric construction, 1993

	Fabric construction			
Market	Woven	Knit	Other[1]	Total
	1,000 bales			
Apparel	3,130	3,507	0	6,637
Home furnishings	3,062	19	67	3,149
Industrial uses	477	4	160	640
Total	6,668	3,531	227	10,426

[1]Includes tire cord, tufting yarns, thread, rope, cordage and twine, and nonwovens.

Source: National Cotton Council, *Cotton Counts Its Customers*, various issues.

Figure 12
Distribution of an average bale of U.S. cotton

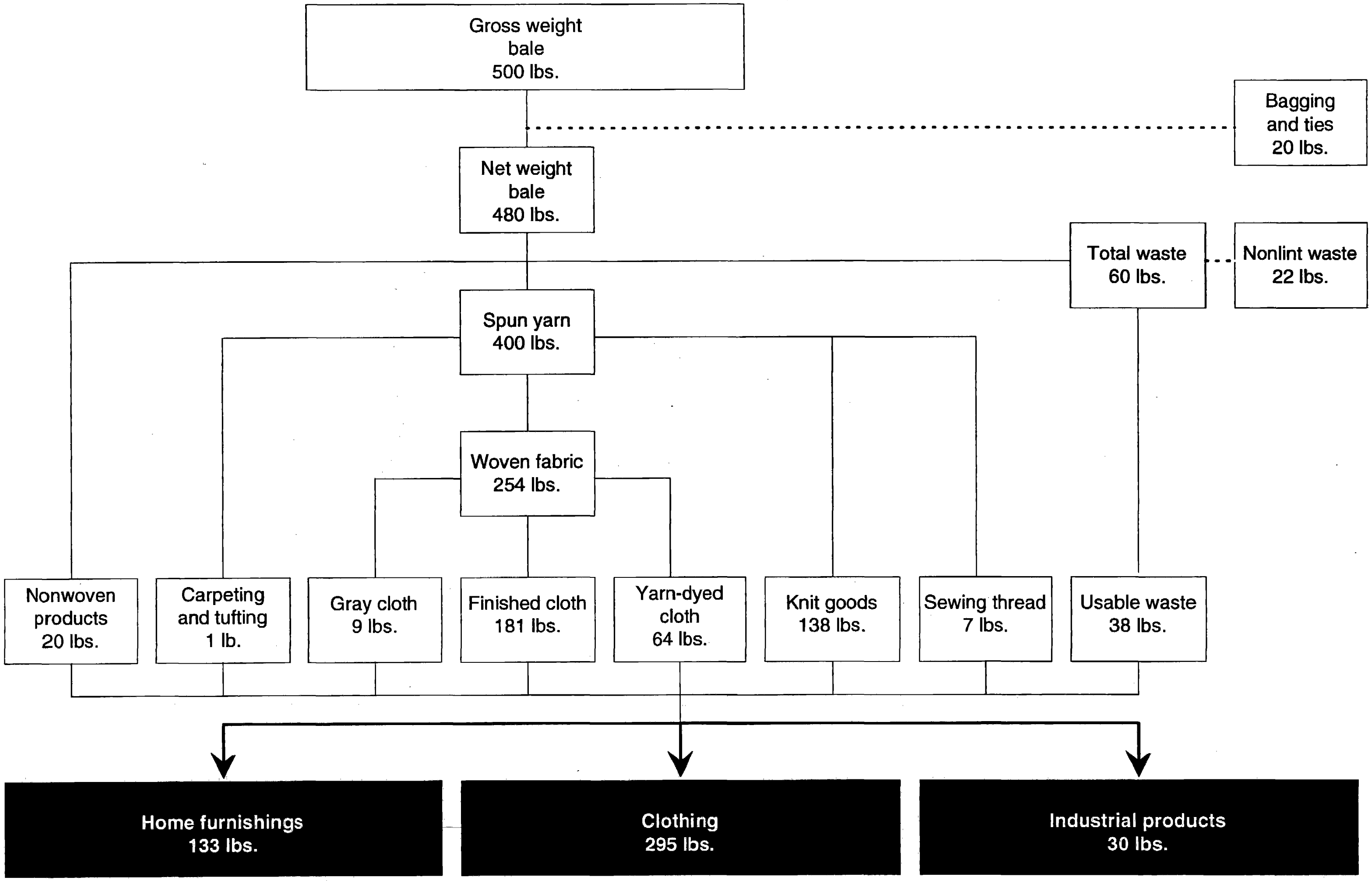


Table 12—Major cotton end-use markets, 1981 and 1993

Product	Cotton content			
	Equivalent 480-pound bales[1]		Market share[2]	
	1993	1981	1993	1981
	Thousands		*Percent*	
Apparel	6,637	3,144	65	36
Men's and boys'	4,086	2,110	73	46
Women's and misses'	1,836	735	52	22
Girls', children's, and infants'	716	299	66	34
Home furnishings	3,149	1,697	25	18
Bedspreads and blankets	237	100	48	28
Draperies and upholstery	770	252	48	20
Retail piece goods	247	161	61	23
Sheets and pillowcases	598	366	65	41
Towels and washcloths	933	613	98	93
All other	364	203	4	4
Industrial uses	640	797	12	19
Abrasives	49	47	71	89
Automotive uses	18	26	1	2
Bags	7	14	5	2
Medical supplies	137	165	41	4
Rope, cordages, and twine	35	50	8	14
Shoes and boots (excludes waterproof)	26	61	32	41
Tarpaulins (woven)	64	52	43	57
Thread (industrial)	115	126	25	39
Wiping and polishing cloth	24	40	65	92
All other	165	213	15	21
Total all uses	10,426	5,637	37	25

[1]Raw cotton content of textile products adjusted for processing losses. [2]Cotton materials consumed as a percentage of all textile materials used in a specific category.

Table 13—Selected cotton price series, 1986/87-93/94

Crop year	Upland farm price[1]	Upland spot price[2]	Upland mill price[2]	"A" Index3	Memphis Territory[4]	"B" Index[5]	Orleans/ Texas[6]	AWP[2]
				Cents/pound				
1986	51.50	53.16	61.84	61.99	61.84	54.95	54.33	49.21
1987	63.70	63.13	71.29	72.26	76.34	67.50	70.55	60.34
1988	55.60	57.67	65.39	66.42	69.15	61.33	62.29	51.89
1989	63.60	69.78	77.80	82.34	83.57	77.30	77.68	65.05
1990	67.10	74.80	84.06	82.87	88.18	77.60	78.58	67.00
1991	56.80	56.68	64.69	62.90	66.29	58.39	61.66	47.23
1992	53.70	54.10	63.01	57.70	63.08	53.71	57.55	43.81
1993	58.10	66.12	71.24	70.75	73.10	67.76	68.82	56.42

[1]Average received by upland producers. [2]Based on SLM 1-1/16" base quality cotton at average location. [3]Average of the five lowest priced quotes of M 1-3/32" cotton offered on the European market. [4]One of two U.S. A-type cottons offered for sale on the European market. [5]Average of the three lowest priced quotes of coarse grade cottons varying in staple length from 1" to 1-1/16" offered on the European market. [6]The U.S. B-type cotton based on SLM 1-1/32".

first sale. Monthly average farm prices are weighted by volume of sales in each State and across the country. Because about three-fourths of farm sales occur during October-January, annual average farm prices are largely determined by prices during those months. Farm prices are averaged across all qualities and include forward contracting upon delivery, so average farm prices may not reflect market conditions during a given month.

Forward contracting is one way farmers can reduce price risk. For the crop years 1985-92, forward contracting averaged 24 percent, with a range of 9-39 percent. Most forward contracting occurs during December-March prior to planting, and most forward contracts are written in terms of acres harvested rather than bales produced. That is, farmers agree to sell the harvest from specific acreage rather than selling a specific quantity of cotton. In years of high yields, the farmer has sold all the unexpected production from the contracted acres at a fixed price. When yields are low, however, the farmer is not obligated to buy cotton to satisfy a contract.

Forward contracts are written in terms of a base quality; the CCC schedule of premiums and discounts determines the value of cotton of different qualities. In areas with highly variable yields, like the High and Rolling Plains of Texas and Oklahoma, the proportion of cotton forward sold is low because forward buying is not generally attractive to merchants.

Forward contracts are usually either fixed-price or call contracts. Fixed-price contracts set the price of the base quality in specific cents per pound. Call contracts fix the basis between the price received by the farmer and a futures contract. A farmer then has the option to call the buyer any time prior to expiration of the futures contract and settle on the actual price. Call contracts allow farmers and cotton buyers to use futures contracts as perfect hedging tools, although few cotton farmers actually hedge their production with futures contracts.

In 1992, NASS changed the definition of the price received by farmers effective for 1992 and succeeding crop years. The definition that most nearly achieves the goals for this price series is an "f.o.b. warehouse" price. This price includes the cost of transporting cotton to the warehouse and warehouse receiving charges, but excludes other warehouse charges such as compression and load out, which have historically been paid by the buyer. Other marketing expenses, such as storage or interest expenses incurred by producers after delivery to the warehouse, are included in the price reported to NASS, but only if the producer retains ownership of cotton after it is delivered to the warehouse. The previous definition of the price received by farmers for cotton was not determined at a specific point in the marketing process. The average cotton price farmers receive is not expected to change materially from that obtained using the previous definition. Only direct government payments to cotton producers and gains from repaying loans at less than the loan rate are excluded from the price.

An important use of farm prices is to determine government deficiency payments. The calendar-year farm price for upland cotton, computed as a sales-weighted average of monthly farm prices, is compared with the target price. Payments are made to eligible producers when the target exceeds the farm price, with the payment rate equal to the difference. However, the payment rate cannot exceed the difference between the target price and the loan rate.

Farm prices may not be the best series for determining the relative tightness of supply and demand conditions within a season. This is especially true in years when forward contracting is heavy because it increases the dependence of the average farm price on the supply and demand conditions of the previous season. Also, since most farm marketings are completed by February, price changes after February have little effect on the marketing year average. This makes the relationship between farm and spot prices less predictable. In general, farm prices are not often used by analysts interested in market-price forecasting.

Compared with spot prices, farm prices show greater variation across States because of the differences in average quality of cotton produced in each area, as well as differences in distance to major markets. Still the geographic pattern is the same for spot and farm prices. The lowest farm prices in the country are in Texas and Oklahoma. Usually cotton has a lower grade and shorter staple length in these areas than in other areas.

Spot Prices

Probably the most representative price of U.S. cotton on any given day is the average spot market, or cash price, quoted by USDA's Agricultural Marketing Service (AMS). This price is the average quoted for the base quality in each spot market on each day and is not weighted by the volume traded in each market. Unlike farm prices, the average spot price is specific to cotton of a particular grade and staple length.

Until 1988, AMS reported season average spot prices at various cities in the Cotton Belt. Since 1988, reports have been for seven marketing areas. Cotton market news is collected by area market news reporters in person and by telephone. At this level, which is the growers' and local merchants' level, rapid and frequent collection of cotton market news is emphasized. This information is supplemented with data from local classing offices for inclusion in regional and national reports.

Area market reporters are also responsible for gathering price information and establishing spot cotton price quotations for designated markets under their supervision. The seven areas are designated by the Secretary of Agriculture as bona fide spot cotton markets under provisions of the Cotton Futures Act. This legislation provides that quotations will be issued each trading day for the qualities quoted in each of the markets. Area reporters gather price information to determine quotations for the various cotton qualities. In the absence of actual trading in a market, quotations are determined by prices paid for similar qualities in other markets. Similarly, if there is no trading in certain qualities, quotations are determined by the prices paid for other qualities. This procedure makes cotton a unique commodity in that price quotations are issued each day in each designated growth area even though there may have been no sales in some markets.

The western area reporter covers the San Joaquin Valley and Desert Southwest designated markets (Arizona, California, western and central New Mexico, and the El Paso area of Texas). The southwestern area reporter covers the West Texas and East Texas-Oklahoma designated markets (Oklahoma, eastern New Mexico, and all but the El Paso area of Texas). The south-central area reporter covers the north Delta and south Delta designated markets (Missouri, Tennessee, Arkansas, Louisiana, and Mississippi). The southeastern area reporter covers the southeastern designated market (Alabama, Georgia, North Carolina, South Carolina, Virginia, and Florida) as well as the domestic textile market.

The daily spot cotton quotations are issued each trading day throughout the year. Price quotations for the seven designated markets include: (1) base prices for grade 41, leaf 4, staple 34, mike 3.5-3.6 and 4.3-4.9, strength 23.5-25.4 grams per tex, and (2) premiums and discounts for each official grade, leaf, staple, and mike quoted in the market.

AMS publishes *Cotton Price Statistics* monthly and annually. It contains a detailed summary of cotton prices compiled and averaged by months. In addition to daily spot prices, the report includes monthly average premiums and discounts by market, daily and seasonal volume of spot cotton purchases at each designated market, and daily futures settlement prices for active cotton futures contracts, as well as other price data.

Prices are usually lower in the markets farthest from consuming centers than in markets near U.S. textile mills and major export terminals. Textile mills in North Carolina and South Carolina use the largest proportion of cotton in the United States; mills in Alabama and Georgia use most of the remainder. Exports have been ranging from 40 to 60 percent of production over the last few years, and a large portion of exports are shipped through Los Angeles and San Francisco. The highest spot prices usually occur in the easternmost and westernmost markets reflecting differences in marketing costs to the mills or the ports.

Because spot prices are simple averages, they may be skewed by aberrant prices in markets with low trading volumes. Lack of weighting makes this series less suitable than farm prices for determining farm value. Also, the spot cotton price is not a good candidate for a "wholesale" price because of the difficulty in establishing where the wholesale point is in the cotton marketing chain and what costs should be included. Spot prices, however, do represent a point in the early stages of the wholesale chain.

Mill Prices

The cotton price that is usually considered to be the domestic mill price is called the Group B mill price. The Group B mill price refers to a specific quality of cotton delivered to mills in the western half of North Carolina and South Carolina. The price includes all associated transportation and marketing costs and is the price at the end of the wholesale chain. Like farm prices, mill prices are affected by forward purchases of cotton as well as hedges placed with a futures contract. Therefore, monthly changes in Group B mill prices may not strictly reflect only current market conditions. Still, the annual average mill-delivered price of Strict Low Middling (SLM) 1-1/16 inch cotton can be compared with spot prices for a measure of transportation costs to mills, storage costs on cotton prior to mill delivery, and merchandising expenses.

Because Group B mill prices fully account for a mill's cotton acquisition costs, the SLM 1-1/16 inch price is often compared with manmade fiber prices to indicate cotton's competitive position in the raw fiber market. The reported market average price of mill-delivered 1.5 denier polyester staple is frequently used to represent manmade fiber prices. To increase comparability, the raw fiber prices may be multiplied by a factor to adjust for waste in processing; USDA uses 10 percent waste for cotton and 4 percent for polyester. The waste factors are not completely accurate, however, because certain kinds of waste can be collected and used or sold.

International Prices: A and B Indexes*

More than 100 countries trade in raw cotton, and many countries use grading systems, units of measurement, and transportation, storage, and packaging systems that are different from those used in the United States. Some cotton is bartered, as many countries isolate their domestic markets from world markets. Few countries have organized commodity markets in which cotton is traded by public outcry. Therefore, it is often difficult to determine the actual price of cotton in a foreign country.

Cotlook World Cotton/TM futures and options on the New York Cotton Exchange (NYCE) have been recognized as barometers of international raw cotton price trends. A summary of these vehicles measures international prices, often using the Outlook "A" and "B" indexes. The indexes are averages taken from a market basket of daily offering prices and are published in *Cotton Outlook* by Cotlook, Ltd., in Liverpool, England, an independent company with no trading interest in either the cash or futures markets.

The Cotlook A Index/TM is based on a Liverpool concept of Middling 1-3/32 inch cotton traded internationally and expressed in U.S. cents per pound. The B Index is a "coarse count" index. The shipping terms are cost, insurance, and freight (CIF), cash against documents on arrival of vessel (including profit and agent's commission) at North European ports.

Currently, 14 growths produced around the world are eligible for inclusion in the A Index. A majority are from the Northern Hemisphere in recognition of its overwhelming contribution to output each year, but there are also Southern and Equatorial descriptions which bridge the spring and summer gap in available supplies from the north. The Index is the daily average of the five lowest quotations. The averaging is straightforward, but the process of determining a representative offering price gives rise to constant debate.

At the close of trading each day, Cotlook Ltd.'s Memphis office collects offering prices from merchants across the United States who trade in the international market. Offering prices for U.S. and foreign growths are provided on a confidential basis by a broad cross section of large and medium-sized organizations and are electronically transmitted each night to Liverpool. Because of the time difference, the Liverpool staff collects prices for the same and other growths the following morning from the European trade, both in the United Kingdom and on the Continent. Price information received overnight from the Far East is also included.

From this market basket of quotations, a representative value for each description is determined daily. Movement in the New York futures, actual selling prices provided by the trade, the level at which cotton was purchased as reported by spinners, as well as traditional and sometimes not-so-traditional price relationships between competing growths are among a number of considerations in this daily assessment.

To assure consistency, a monitoring program matches sellers' descriptions against quotes provided to the Liverpool concept for quality. From time to time, shippers' samples are checked in a classing room to ensure that the daily offering price meets Cotlook Ltd.'s quality concept for cottons eligible for inclusion in the Indexes.

Because the Cotlook Indexes are meant to illustrate the most representative offering price in the market that day, there is no guarantee that business will be transacted at the reported level. When cotton is trading freely, the quotations most likely will closely reflect actual selling levels. However, when raw cotton demand is low or there is little competition in a particular growth, there may be disparity between offering prices and transaction prices. Buyers strive to conclude a sale at less than the initial offer, while sellers may accept less than the original offer in order to improve their position or to limit a loss.

Export competitiveness of U.S. cotton is often suggested by comparing the northern European price of Memphis Territory cotton with the A index (table 13). This can be misleading, however, as price differences alone can be a confusing indicator of U.S. competitiveness. For example, they do not always tell whether strong foreign demand for U.S. cotton is pulling up the U.S. price or whether a short U.S. crop is pushing it up. In addition, the "A" and "B" indexes are not weighted by quantity traded, and shipment dates often vary by several months for different types of cotton used to compute each index. Also, since most of U.S. cotton exports go to East Asia, using Europe as an index for international prices can be misleading.

Adjusted World Price

The adjusted world price (AWP) is the prevailing world market price for upland cotton adjusted to the United States. The AWP is a weekly price series that began in 1986 and is calculated and published by the USDA each Thursday. The AWP is equal to the northern Europe price (an average of the five lowest priced growths for Middling 1-3/32 inch cotton, CIF northern

*The majority of this section was provided by Keth Henley, Director, Cotlook Ltd., Memphis, Tennessee.

Europe) adjusted to average U.S. quality and location. In addition, the AWP may be adjusted downward under certain conditions. See the farm programs chapter for details.

The AWP for individual qualities is determined by applying the schedule of loan premiums and discounts and location differentials. An additional coarse count adjustment (CCA) may be applicable for cotton with a staple length of 1-1/32 inches or shorter and for certain specific lower grades with a staple length of 1-1/16 inches and longer. The AWP and CCA are announced for the subsequent week. The AWP is important in determining loan repayment rates, loan deficiency payments, marketing loan gains, and, in conjunction with other price relationships, is considered for U.S. upland cotton competitiveness.

Futures Prices

A futures price is the current price of cotton to be delivered at some future date. Just as cotton prices vary by quality and with distance from consuming centers, prices also vary with time prior to mill use. A widely used form of price risk management is cotton futures and options contracts traded on the NYCE. Since 1870, the NYCE has provided a means for the cotton trade to hedge the price of cotton they buy or sell to protect themselves from unexpected price fluctuations. When options on cotton futures were introduced in 1984, new hedging and trading strategies became available. Two additional vehicles became available recently, the Cotlook World Cotton/TM futures and options.

The New York contract is for 50,000 pounds of SLM 1-1/16 inch cotton. The primary delivery dates are March, May, July, October, and December. Delivery points include Houston and Galveston, Texas; Greenville, South Carolina; Memphis, Tennessee; and New Orleans, Louisiana.

Both producers and buyers closely monitor the heavily traded December contract as an indicator of new crop supply and demand conditions because December is the first delivery month following the harvest of the majority of the crop. Up to half of the cotton sold by farmers each year is priced using the December contract. The March, May, and July contracts are watched for indications of midseason changes in cotton demand because the season's supply is known with virtual certainty by January. The quality and quantity of early harvested cotton in south Texas, changes in demand, and expectations for the total harvest influence the October contract.

Spot and futures prices theoretically should have a predictable relationship. Spot prices should be less than futures prices, with the difference, or basis, representing the cost of storage plus delivery. As the contract delivery date approaches, the cost of storage to delivery decreases and the basis should narrow to only the cost of delivery and certification that the cotton meets contract specifications. Prices can vary from the expected pattern, however. As forecasts of supply, use, and ending stocks change, the market signals smaller or larger rewards for cotton storage. When current supplies are tight and an expected good harvest portends rising stocks, spot prices can exceed futures prices. The reverse can occur when fears of a shortage of cotton become prominent.

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Chapter 2

The Cotton Marketing System

Edward H. Glade, Jr.*

The production of several hundred combinations of fiber qualities and staple lengths adds to the complexities of efficient and effective cotton marketing. Distinct differences in fiber properties result from the numerous varieties produced and from variations in soil types, weather conditions, and harvesting and ginning practices. However, the diversity of modern textile manufacturing methods and equipment ensures the need for cotton with distinct fiber properties. A wide range of fiber characteristics may be required, depending upon the final product to be manufactured. This requirement is traditionally accomplished by blending and mixing bales of cotton with specific, known fiber properties in the first stages of textile processing. The effective matching of fiber properties to end-use requirements is critical to the competitiveness of textile firms. For foreign consumers of U.S. raw cotton, the wide range of qualities available in large supplies is a positive factor for U.S. export marketings.

The primary function of the cotton marketing system is to obtain and assemble adequate volumes of quality cotton in locations such that a dependable and continuous supply is available to both domestic and foreign users. In order to effectively and efficiently carry out these marketing requirements, numerous cotton gins, warehouses, merchandising firms, and others work cooperatively in the performance of certain basic activities:

1. Movement of harvested seed cotton from farms to local gins.
2. Separation of lint from the seed, baling and wrapping lint, and transporting bales to storage facilities.
3. Cotton storage, sampling, and other associated warehousing services.
4. Cotton merchandising activities.
5. Transportation of bales to domestic mills and ports.
6. Fiber quality determination and testing.

While these basic activities of cotton marketing represent a traditional function of the system, changing market conditions have brought about numerous adjustments. During the past two decades, competition from manmade fibers, sharp increases in imported textiles, and steady growth in foreign cotton production have been important factors in shaping current cotton marketing services and practices. The emergence of the Far East as the major U.S. cotton export market has altered traditional distribution channels and transportation cost structures. Also, the return to more market-oriented cotton programs since the early 1980's has brought about wider swings in cotton prices and volumes, significantly affecting the number, size, and location of marketing firms. As a result, today's cotton marketing system has evolved into a highly efficient and interdependent network. The performance of activities at each stage in the marketing process is critical to the effective operation of successive steps along the marketing chain.

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Overview of Marketing Flows

Marketing cotton from farms to domestic textile mills and foreign markets is a complex process involving the coordination of many physical services and merchandising activities. Cotton is marketed from 34,812 farms located in 17 States to over 3,000 domestic mills and 50 foreign countries. This process involves the services of nearly 1,383 gins, about 400 warehouses, and about 300 marketing firms.

Physical Movement

Cotton marketing begins when harvested seed cotton is assembled and hauled from farms to local gins (fig. 1). At the gin, the lint, seed, and trash are separated, and the lint is compressed into bales weighing 475-525 pounds.

From the gin, most bales are loaded onto trucks and moved to local warehouses for storage. Bales are weighed, sampled, and tagged before being placed in storage. A negotiable warehouse receipt is issued that identifies the location and ownership of the bales. Cotton samples are sent to one of the 14 USDA cotton classing offices for quality determination, and the results are returned to the owner of the bales for use in marketing.

The distance of haul for most gin-to-warehouse movements may vary from a few blocks to about 100 miles. In some areas of the Cotton Belt, bales may be shipped longer distances directly to warehouses normally considered reconcentration points, especially if the final destination is known. Shipment of cotton from interior warehouses to reconcentration points is primarily for consolidating bales into larger lots of like qualities for eventual movement to domestic and foreign mills.

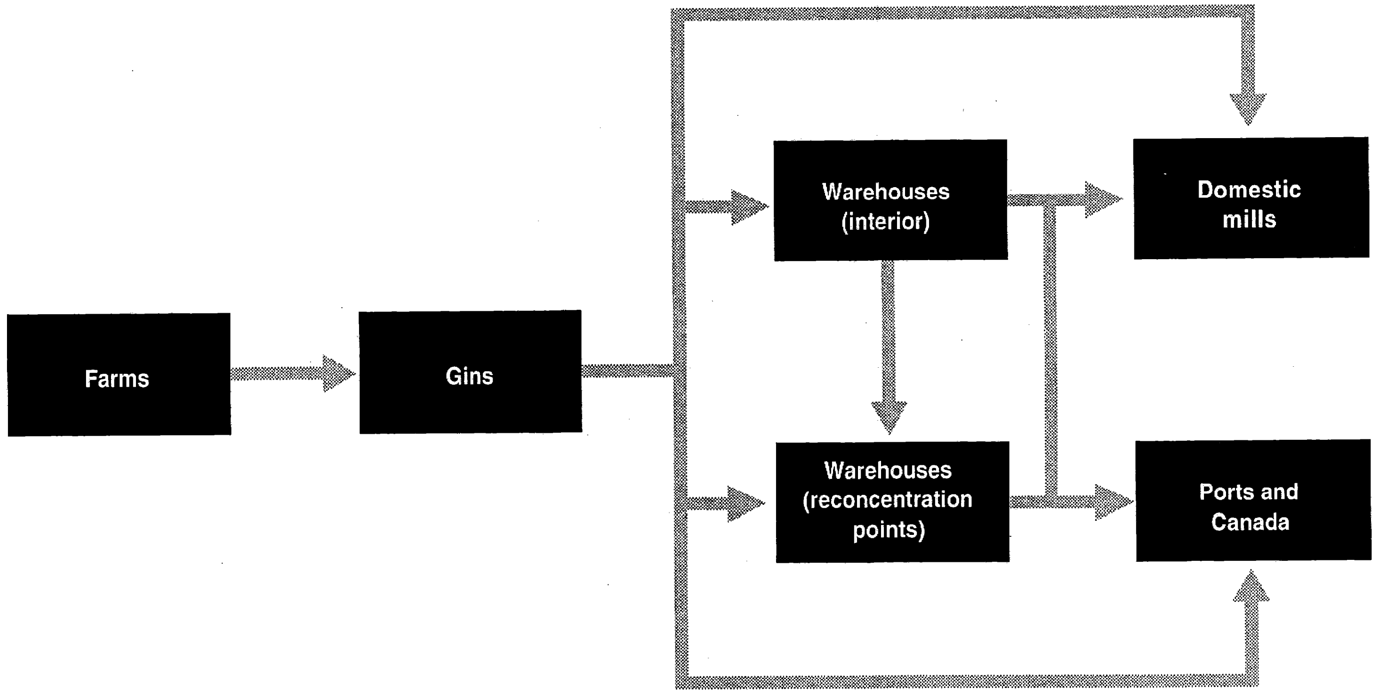
Domestic textile mills typically maintain only a 30- to 45-day supply of cotton and must constantly replenish their stocks. Therefore, bales are shipped from warehouses to mills in fairly even volumes throughout the year. In contrast, movements to ports for export follow stronger seasonal patterns. January, February, and March are the heaviest export months.

Approximately 10-15 percent of the U.S. cotton crop moves directly from gins to domestic mills or ports, bypassing the traditional warehouse system. In the Southeast, cotton may move directly to mills without storage or further compression because of the closeness of textile facilities. In other areas, some bales are compressed to universal density at gins, loaded into containers, and shipped directly to gulf and west coast ports.

Ownership Transfers

The chain of ownership transfers begins when the producer sells cotton or pledges it as collateral for a CCC

Figure 1
Physical flow of U.S. cotton



loan. Pledging cotton as collateral is not transferring ownership. The producer has the option of repaying the loan, plus interest and storage charges, and selling the cotton before the loan period expires and the Government takes title. The first transaction can take place at gin points where the cotton producer can sell to the ginner or other local buyer (fig. 2). Producers who do not sell at the gin move cotton to local warehouses, retaining title. Some producers employ brokers to sell their cotton or arrange sales through commission firms. Farmer cooperatives are an important means of marketing in the major production areas of the Cotton Belt. Producer members agree in advance to deliver their crop, or a portion of their crop, to the cooperative. The cooperative is then responsible for marketing, and the net proceeds are returned to the producer.

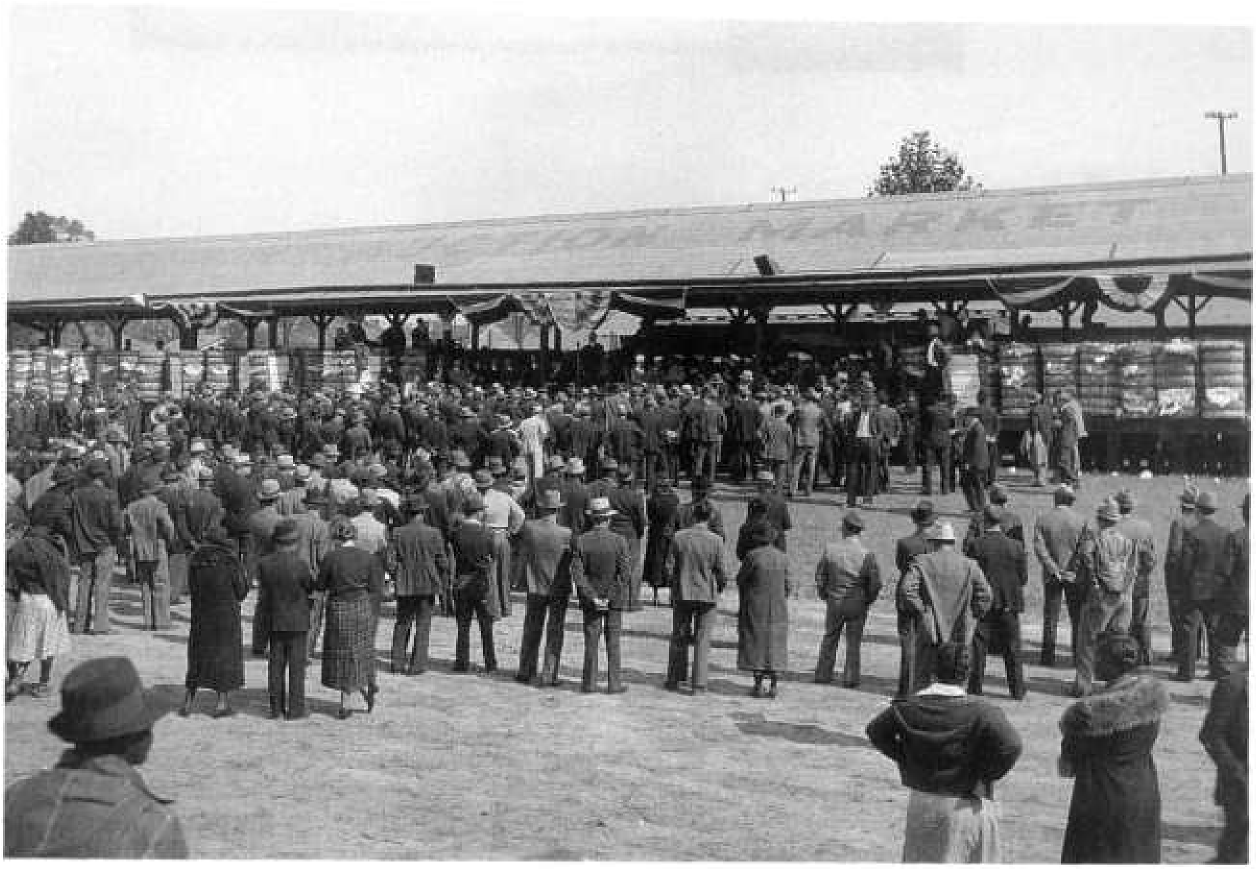
Firms operating as cotton shippers are the primary link between the farm producers and the mill consumers of raw cotton. These firms buy baled cotton in lots of mixed qualities near the point of harvest and as soon as it enters marketing channels as practicable. This ownership transfer may involve direct purchases from producers or the exercise of forward crop contracts and purchases from ginners, local buyers, the CCC, and from cooperatives. Shippers also buy and sell cotton among themselves to fill orders for specific qualities. In selling to domestic and foreign mills, shippers generally arrange for and pay the cost of transportation in addition to most costs and risks associated with other marketing functions and services. About 65 percent of farm sales are handled by cotton shippers (fig. 3). Cooperatives handle about 25 percent of the crop, and sales to ginners, brokers and mill buyers, and other outlets account for the remainder.

Marketing Services and Costs

Moving cotton from farms and delivering it to consumers in the form of clothing and other textiles requires several intermediaries. Each stage provides additional utility and added costs to each bale.

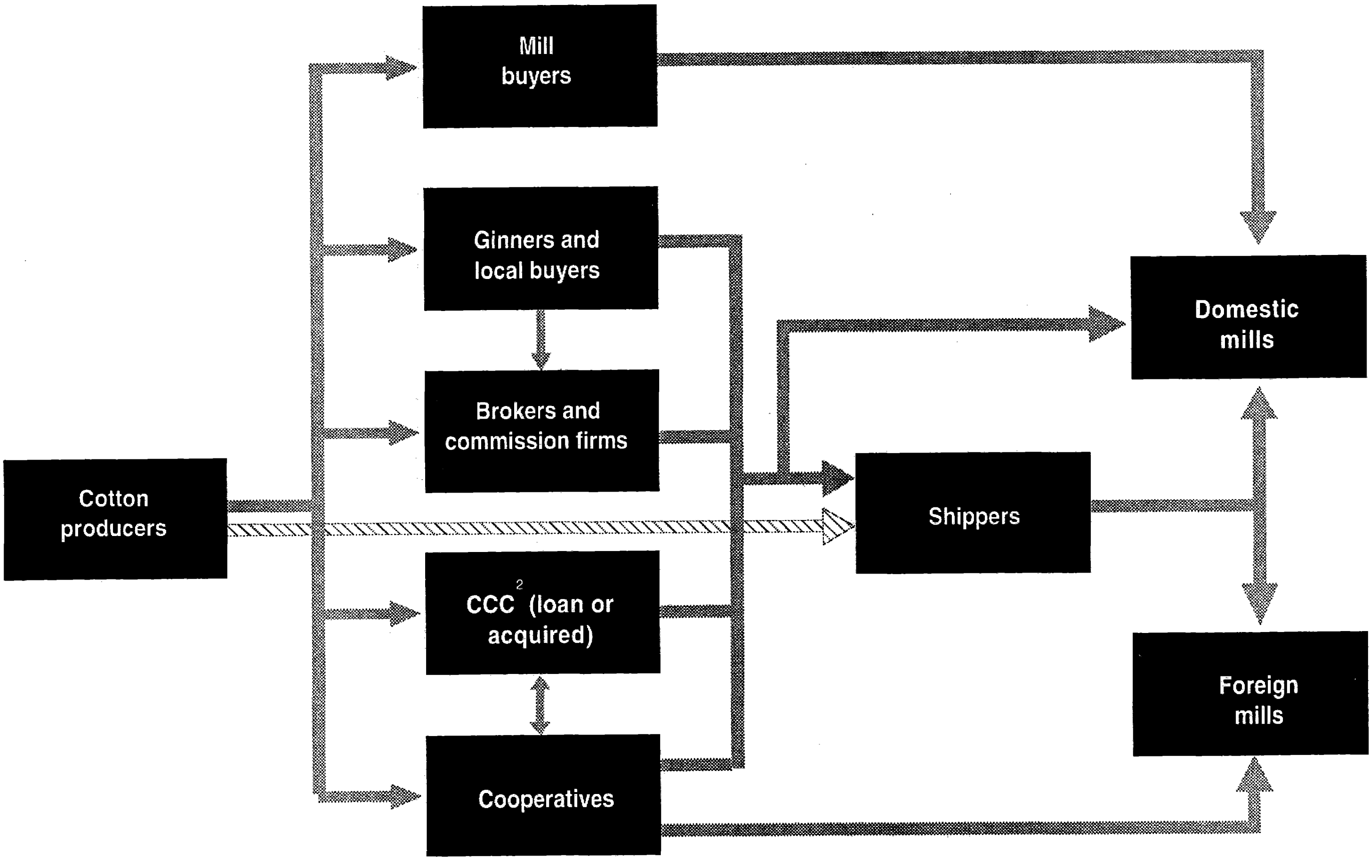
Seed Cotton Handling

Cotton producers have historically assumed responsibility for transporting seed cotton to the gin. In some



Sale of cotton has changed from the days of public auction to electronic offers and biddings.

Figure 2
Flow of ownership documents for merchandising U.S. cotton [1]



1 Ownership documents are warehouse receipts and bills of lading.
2 Commodity Credit Corporation.

areas, however, gins have undertaken much of this function as a competitive device and may give rebates to growers who have their own trailers. Most cotton trailers carry an amount of seed cotton that yields six to eight 480-pound bales of cotton lint. A few of the newer trailers have a 10-bale capacity.

The volume of seed cotton required to produce a 480-pound net-weight bale can vary widely from year to year, between areas of growth, and especially by method of harvesting. For the 1992/93 season, about 1,452 pounds of machine-picked seed cotton were needed to yield a bale, 2,253 pounds when machine stripped, and about 1,739 pounds when machine scrapped or gleaned from the ground (table 1). While estimates are no longer available because of extremely small volumes, hand-picked cotton required an average of about 1,370 pounds of seed cotton to produce a 480-pound bale of lint.

An estimated 84 percent of the 1992 crop was machine picked and 16 percent machine stripped. Less than one-half of 1 percent was machine scrapped. These figures compare with 62 percent machine picked, 39 percent machine stripped, and 1 percent machine scrapped during the 1981 season.

Mechanical harvesting of cotton caused harvesting capacity to greatly exceed ginning capacity in many areas at peak times during harvest. Therefore, trailers became backed up at gins. When available trailer space is filled, the harvesting operation is interrupted and the chance of crop damage due to adverse weather conditions increases. On the other hand, intermittent interruptions

Figure 3
Distribution of U.S. cotton farm sales, 1992

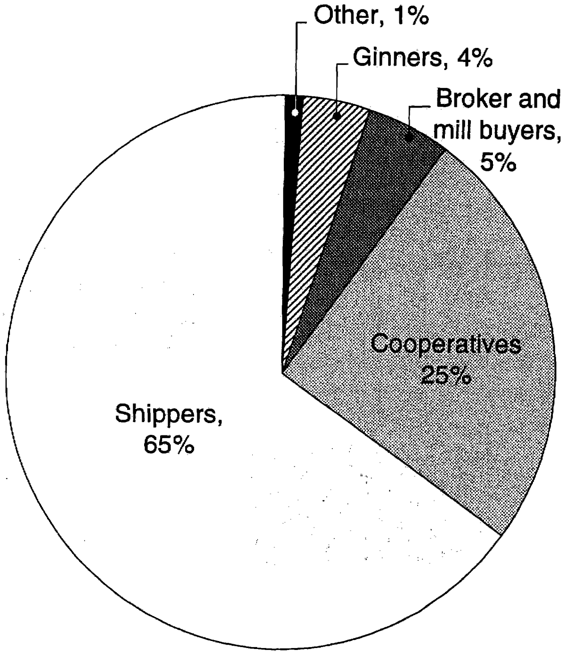


Table 1—Seed cotton required for a 480-pound bale, by method of harvesting, 1982-92 seasons

Crop year	Machine picked	Machine stripped	Machine scrapped
		Pounds	
1982	1,518	2,263	1,901
1983	1,490	2,239	1,919
1984	1,517	2,271	1,857
1985	1,515	2,136	2,094
1986	1,487	2,460	1,861
1987	1,490	2,392	1,857
1988	1,482	2,246	1,830
1989	1,471	2,311	1,948
1990	1,468	2,187	1,854
1991	1,466	2,185	1,795
1992	1,452	2,253	1,739

Source: U.S. Department of Agriculture, Economic Research Service.

of harvest may exhaust the gin supply of seed cotton, forcing gins to shut down until harvest can be resumed. In an effort to even out the flow of seed cotton to gins and extend the total ginning season, the industry tried numerous methods of seed cotton storage, including covered trailers, enclosed buildings, and wire baskets. None of these methods proved efficient as practical methods of operation. Beginning in the mid-1970's, however, attention focused on field storage of seed cotton. This type of storage involves placing loosely compressed seed cotton on the ground or on movable pallets at turn rows and covering it with a tarp.

The primary methods of turn row storage included free-form standing ricks and modules. Ricked cotton required special handling before being placed in a trailer or other container for transportation to the gin. This method is no longer practiced because of this extra handling. Seed cotton handled by the module method, however, involves the use of a "module builder" or compactor in which seed cotton is dumped during harvest. Large modules containing approximately 12,000-18,000 pounds of seed cotton are produced on pallets or on the ground. Modules are moved to the gin by a trailer-transporter or a truck-mounted mover that does not require a pallet. Modules are now the primary method of seed cotton storage. Most cotton-producing States use module-handling systems.

Table 2—Seed cotton handling methods, 1981-92 seasons

	Share of production handled by:	
Crop year	Trailers	Modules
	Percent	
1981	60	39
1982	64	36
1983	58	42
1984	64	36
1985	61	39
1986	55	45
1987	49	51
1988	47	53
1989	49	51
1990	43	57
1991	37	63
1992	33	67

Source: U.S. Department of Agriculture, Economic Research Service.

About 67 percent of the 1992 harvest used modules throughout the Cotton Belt, compared with only 39 percent 11 years earlier (table 2). Use of field-stored modules as a method of delivering seed cotton to gins will probably continue to increase. A large number of producers

Bales at gin await shipment to local warehouses.

rely entirely on modules. But many producers still use trailers, employing the module system only for overflows.

Ginning

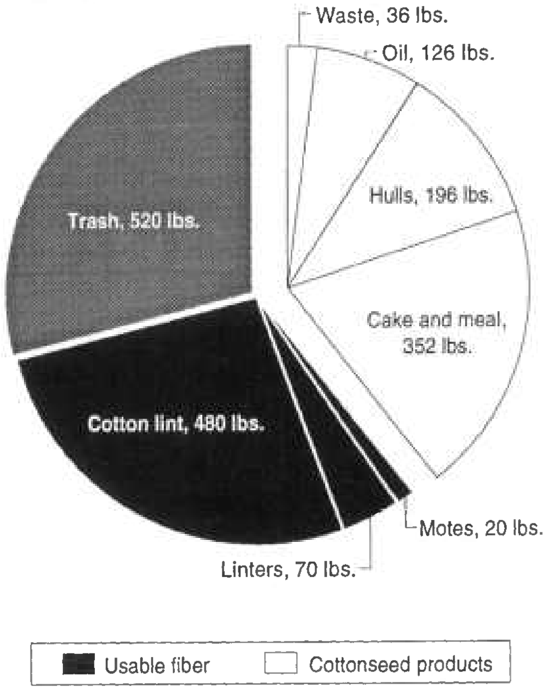
The cotton ginning sector provides the initial transformation of raw cotton into a marketable textile fiber. The critical services performed at the gin affect the quality of cotton and, therefore, its end-use value.

Process and Services

When harvested, seed cotton contains dirt, hulls, leaf fragments, stems, and other material which must be removed in the ginning process for the lint cotton to have the highest market value. For each 480 pounds of lint produced, approximately 520 pound of trash (such as dirt, hulls, leaves, and stem) are separated, approximately 20 pounds of motes (very short immature fibers) are reclaimed for sale, and 780 pounds of cottonseed products are produced for crushing and planting seed (fig. 4).

The cotton ginning process primarily involves six steps or stages that separate and remove these materials and prepare the lint for market. These stages are common processes in all regions of the Cotton Belt, but more elaborate systems are sometimes used in areas where extensive machine stripping is practiced because of variations in production and harvesting practices.

Figure 4
Distribution of harvested seed cotton, 1,800-lb bale [1]



[1] Weighted average of all methods of harvesting.

Drying. Drying seed cotton is the first major process in improving cotton grades and increasing ginning efficiency. Nearly all gins in the United States are equipped with one or more stages of drying. Driers condition the seed cotton for smoother and more continuous operation of the gin by removing the excess moisture and fluffing the partially opened locks. Dried cotton releases more foreign matter, resulting in smoother ginned lint.

Cleaning. The second major process in ginning is bulk cleaning. The cleaning machines remove burs, sticks, grass, stems, dirt, and sand. These machines increase the lint grade and, thus, the value of cotton, and reduce manufacturing waste in mills.

The types and amounts of cleaning equipment used vary widely through the Cotton Belt and are closely related to the kinds of cotton grown and the harvesting method used. Gins in the Southeast are generally older and have less elaborate overhead cleaning equipment than those in other regions. Gins in the stripper-harvest areas (large parts of Texas, Oklahoma, and New Mexico) generally have extra cleaning equipment not usually needed in the spindle-harvested areas; thus, total investment in these areas for gin facilities is usually higher. Ginning charges also tend to be higher.

Extracting. The third step in seed cotton treatment is removing 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 the extracting process, the locks of seed cotton are seized when they pass beneath a stripper or beater; burs, sticks, stems, and other large pieces of foreign matter are separated out.

Separating. Cotton lint is removed from the attached seed at this stage of the ginning process. For practically all U.S. upland cotton, the separation is accomplished by the saw-ginning method. The gin stand consists of a series of rotating saws which essentially slice the fiber from the seed. Most ELS cotton, however, is processed on roller gins. Although only a small volume of ELS cotton is produced, these facilities are designed to remove the fine, longer staple fibers by means of opposing rollers that pull the fibers from the seed.

Lint cleaning. The separated cotton lint moves on to the lint cleaners, while cottonseed is transported to a seed storage area. Lint cleaners are common in nearly all U.S. gins and effectively remove any remaining small leaf particles, motes, green leaves, and grass left in the cotton by cleaners and extractors. Lint cleaners improve the cotton's grade, but the process reduces bale weights by as much as 50 pounds or more. The 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, the losses in bale weight may offset the value of grade improvement.

Packaging. The final step in the cotton ginning process is packaging the lint into bales covered primarily with woven polypropylene wrapping and secured with six to eight metal straps or bands. Cotton was traditionally compressed at the gin into "gin-flat" bale forms with a density of 12-13 pounds per cubic foot. They were later recompressed at the warehouse into "standard density" (23 pounds per cubic foot) for domestic shipments or into "high-density" bales (32 pounds per cubic foot) for overseas shipments. Compression of bales to greater density reduces size. This enables cotton to be shipped at a more favorable transportation rate and also decreases the volume required for warehouse storage.

Most bales are now compressed to a "universal density" of 28 pounds per cubic foot, which is the acceptable density for both domestic and foreign shipment. Most universal density compression used to be performed at warehouses, but most cotton gins have now replaced their old flat-bale presses with new universal density equipment or modified their existing equipment to accommodate the dimensions of universal density presses at warehouses. Approximately 67 percent of all U.S. gins had installed universal density bale presses by 1991, and 33 percent had either modified their flat-bale equipment or kept the traditional flat-bale press. Most flat-bale or modified presses, however, are located in gins in the Southeast, where large gin-to-mill shipments make further compression unnecessary.

Gins may also provide other important marketing services. While most bales are sampled at warehouses, gins in some areas handsample bales in gin yards, while others have installed expensive automatic samplers where gin volume is sufficient. Use of automatic sampling is concentrated primarily in the California-Arizona area and in some areas of Texas, Mississippi, and Arkansas, where most newly constructed, high-capacity gins employ automatic samplers in conjunction with universal density compression.

Cotton gins are important collection points for USDA classification and sampling fees and various association and industry self-help program dues. Also, many gins haul modules from fields to gins and transport bales to warehouses. Some ginners buy a substantial portion of the crop, either for their own account or as an agent for shippers. Most cottonseed is purchased through or by ginners for resale to oil mills, and some ginners sell various farm supplies in an effort to attract and hold business.

Number, Size, and Location

Cotton gins are strategically located throughout the cotton-producing States, usually near cotton-producing farms. During the 1992/93 season, 1,383 U.S. cotton gins operated, with about 70 percent concentrated in the Delta and Southwest (table 3). The number of active gins has declined over the years in response to increasing operating costs, shifts in location of production, and the construction of newer, high-capacity facilities. Despite declines in number, gins today process a larger size crop than in earlier years. During the 1992 season, the 1,383 active gins processed 15.7 million bales, compared with 14.6 million bales by 1,642 gins during the 1988 season. This trend toward fewer, more efficient gins probably will continue.

Average gin size (as measured by rated capacity) can vary significantly by State. Approximately 14 percent of all gins were rated at eight bales per hour or less in 1991 (latest data available), with many of these small facilities concentrated in Arkansas, Mississippi, and Texas (table 4). Many high-capacity gins (19 bales per hour or more) are located in the Western States—especially California and Arizona—and in Mississippi, Louisiana, and Arkansas. Average gin size tends to decrease from west to east or from the newer to the older production areas. In recent years, however, increasing cotton production in some areas of the Southeast has provided sufficient volumes of cotton such that a number of new, high-capacity gins have been built in these areas.

Ginning Charges

Charges paid by cotton producers for ginning services also vary considerably by State because of differences in the condition of seed cotton, method of harvest, and the kind and amount of services provided. During the 1992/93 season, ginning charges averaged $42.50 per bale, but ranged from $56.63 per bale in New Mexico to $32.70 in Tennessee (table 5). Machine-stripped cotton, produced primarily in Texas, Oklahoma, and parts of New Mexico, requires that an additional 700-800 pounds of seed cotton be ginned to yield a typical

Table 3—Number and location of U.S. cotton gins, 1988-92 crop years

Region/State	1988	1989	1990	1991	1992
			Number		
Southeast:					
Alabama	82	75	72	70	68
Georgia	64	63	59	58	59
North Carolina	37	36	39	45	42
South Carolina	43	41	40	43	41
Total	226	215	210	216	210
Delta:					
Arkansas	129	125	122	138	121
Louisiana	82	81	80	85	77
Mississippi	210	201	192	181	181
Missouri	49	48	48	45	41
Tennessee	76	74	70	69	62
Total	546	529	512	518	482
Southwest:					
Oklahoma	64	65	63	61	64
New Mexico	28	28	26	22	20
Texas	543	507	494	472	405
Total	635	600	583	555	489
West:					
Arizona	89	89	90	85	81
California	146	148	138	126	121
Total	235	237	228	211	202
United States	1,642	1,581	1,533	1,500	1,383

Source: U.S. Department of Commerce, Bureau of the Census.

Table 4—Distribution of U.S. cotton gins, by size, 1991/92

Region/State	Gin capacity (bales/hour) 1-8	9-13	14-18	19+	Total
			Number		
Southeast:					
Alabama	17	24	9	20	70
Georgia	10	17	17	14	58
North Carolina	7	11	12	15	45
South Carolina	11	14	12	6	43
Total	45	66	50	55	216
Delta:					
Arkansas	42	18	36	42	138
Louisiana	0	11	33	41	85
Mississippi	22	44	45	70	181
Missouri	3	6	19	17	45
Tennessee	8	20	25	16	69
Total	75	99	158	186	518
Southwest:					
Oklahoma	10	27	17	7	61
New Mexico	14	3	5	0	22
Texas	54	127	139	152	472
Total	78	157	161	159	555
West:					
Arizona	4	40	20	21	85
California	4	21	11	90	126
Total	8	61	31	111	211
United States	206	383	400	511	1,500

Source: Data obtained from unpublished industry surveys.

480-pound bale, compared with machine-picked cotton. Processing this added material, in addition to the extra cleaning equipment needed, adds to the ginning charge. Also, actual gin operating costs are strongly influenced by prevailing wage rates, electricity charges, insurance costs, and general overhead.

Ginners use a number of methods to assess ginning charges. However, most ginners adopt and use the same basic method within a particular area or region. The most common methods used to assess ginning charges are:

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

Since many cotton gins operate as farmer cooperatives, a portion of the ginning charge may be rebated to the producer. The amount of rebate given varies from gin to gin, usually depending on the total equity available at the end of the ginning season.

Table 5—Cotton ginning charges, by State and crop year

Region/State	1988	1989	1990	1991	1992
			Dollars/bale		
Southeast:					
Alabama	36.84	36.67	34.78	35.10	38.11
Georgia	43.06	42.70	41.59	41.04	42.03
North Carolina	46.80	45.79	47.81	49.06	50.15
South Carolina	44.07	46.57	46.59	46.90	46.40
Average	42.69	42.93	42.69	43.02	44.17
Delta:					
Arkansas	39.31	38.99	37.63	36.20	36.68
Louisiana	36.98	36.43	36.84	36.54	36.18
Mississippi	38.40	37.42	38.20	36.39	36.50
Missouri	42.17	42.19	40.61	38.95	38.71
Tennessee	35.02	34.59	34.06	34.19	32.70
Average	38.38	37.92	37.47	36.45	36.15
Southwest:					
Oklahoma	47.74	45.63	50.46	50.47	52.35
New Mexico	53.43	55.51	56.26	57.33	56.63
Texas	51.45	51.55	48.47	48.93	50.09
Average	50.87	50.90	51.73	52.24	53.02
West:					
Arizona	41.04	42.15	41.95	41.88	41.49
California	47.31	47.77	46.32	45.54	46.42
Average	44.17	44.96	44.13	43.71	43.95
United States[1]	45.14	44.26	43.68	42.61	42.50

[1]Weighted average of State charges.

Source: U.S. Department of Agriculture, Economic Research Service.

Storage and Handling

The cotton warehousing system is vital to the efficient marketing of U.S. cotton. Large amounts of storage space are needed, especially during the peak seasonal period, to ensure an orderly flow of cotton to domestic mills and foreign customers. The cotton merchandising trade depends heavily on the warehouse industry for numerous services in relation to the physical handling of cotton required in the process of concentrating, distributing, and marketing.

The demand and price for storage and handling services depend on a number of variables, many of which are generally beyond the control of the warehousing industry. The move from high cotton loan rates to deficiency payments greatly reduced government stocks in public warehouses. Abandonment of strict acreage allotments allowed production to shift geographically. As a result of declining volumes during the mid-1960's and structural changes within the cotton industry, the total number of storage facilities has dropped nearly 50 percent since 1965, but U.S. storage capacity has only declined by about 20 percent. Many small, inefficient warehouses have closed or have converted space for storage of general merchandise. Others have remained in business through mergers and consolidation. Nevertheless, considerable over-capacity exists in many areas.

Warehouse Functions and Services

Cotton warehouses provide four major physical functions prior to shipping bales to textile mills or export points: receiving, compressing, storing, and "outhandling" services. Not all cotton storage facilities, however, have compression equipment. Most warehouses in the Southeast do not recompress cotton before shipment to nearby textile mills. In other regions, 10-15 percent of all cotton warehouses operate without compression equipment. These facilities provide immediate storage for bales close to production areas, with compression to universal density performed at the gin or at reconcentration points.

The first warehouse function is receiving bales for storage. Upon arrival at the warehouse, bales receive a tag bearing the warehouse name and an identification number affixed to the bale. The bale is examined for unusual conditions such as fire damage. The bale is then moved to a scale where it is weighed by a weigher usually licensed under the Federal or State Warehouse Act. As the bale is moved forward from the scale, a sample is cut either by hand or by mechanical sampler on each side of the bale. These two subsamples weigh about 6 ounces each and are combined to form the sample. A coupon from the tag initially affixed to the bale is placed with each sample, which is then wrapped in paper or placed in a plastic bag. A warehouse record is prepared at the same time, showing the gin tag number for each bale, the warehouse tag number, and the weight of the bale. A negotiable warehouse receipt is then issued for each bale.

The sample and receipt are forwarded to the owner or, on request of the owner, to a USDA cotton classing office, cotton broker, or other agency. The warehouse receipt is universally accepted as representing the described bale. Likewise, in a sales transaction, the sample receives the same degree of validity.

Cotton merchants seldom see the actual bale of cotton that they merchandise. Therefore, the warehouse receipt is extremely important in all transactions involving each bale. 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 to a delivery point, the receipt is canceled and returned to the warehouse, where it is maintained as proof that delivery was made.

Compression of cotton to reduce the bales' cubical size reduces storage requirements and lowers transportation charges relative to flat bales. A universal density bale is typically 55 inches high, 25 inches wide, and 21-22 inches thick. Flat or modified flat bales received from gins are either compressed before being placed in storage or compressed at the time of shipment. The time of compression generally depends on available warehouse space, anticipated volumes, labor requirements, and general warehouse practices. Most cotton is now compressed to universal density at gins, and warehouses receiving these bales generally pay a rebate to the gin for this service. The charge for compression, however, is included with other warehouse charges and is paid by the owner of the cotton at time of shipment.

Cotton storage is the primary service performed by warehouses. Immediately after bales are received and compressed, they are moved to specified storage areas in the warehouse. The exact location of each bale is noted on the warehouse record for inventory management. The warehouse maintains an extensive water sprinkler system for fire protection and also insures the bales. Bales are placed into storage in a number of patterns, depending on the size and shape of the warehouse structure, construction and condition of the floor, type of handling equipment available, and anticipated cotton production and stock levels.

When the cotton warehouse receives shipping orders from the cotton owner indicating the desired date and destination, the warehouse is responsible for arranging timely shipment of that cotton. Services performed in the outhandling operation include identifying the bales in the shipping compartment, removing the bales from storage, and transporting them to the shipping area, press room, or loading platform. This process is time consuming and costly, requiring a great amount of labor and machinery. In removing each bale from storage, many other bales may have to be moved. Moreover, each bale must then be either loaded on a trailer or train for transport or transported by lift truck to some other designated area of the warehouse. When bales reach the designated shipping area, they are separated into lots by bale tag number, rechecked against the shipping order for accuracy, and, if correct, loaded into railcars or onto trucks according to instructions.

Warehouses also provide other related services when required by the cotton owner. Services frequently requested are reconditioning, reweighing, resampling, and ranging. Reconditioning is usually performed as a result of fire or weather damage. Damaged fibers are removed and the bale is left 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 must note on the bale that it was received in fire- or weather-damaged condition.

Bales are reweighed because cotton fibers tend to absorb and lose moisture. Successive buyers of cotton sometimes have cotton reweighed if it appears beneficial. Bales may gain weight in high humidity areas and lose weight 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 the classification.

Table 6—Number and size of cotton warehouses, by region, 1992/93

Warehouse storage capacity in bales	Total warehouses by region[1]				
	Southeast	Delta	Southwest	West	United States
			Number		
Fewer than 5,000	25	0	0	1	26
5,000-15,000	65	10	8	1	84
15,001-25,000	24	10	7	1	42
25,001-50,000	21	28	19	5	73
50,001-100,000	6	37	23	4	70
100,001 or more	1	15	24	9	49
Total	142	100	81	21	344
			1,000 bales		
Total capacity[2]	2,469.8	6,251.2	7,059.0	3,096.5	18,879.5

[1]Number of warehouses with capacity falling in respective size groups. [2]Total CCC-approved capacity of cotton warehouses in the region.

Source: Unpublished data, U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service.

Ranging is the process of removing bales from compartments, setting them out, and arranging then in rows so that the owner or prospective buyer can visually inspect individual bales. These procedures are some of the most expensive handling services warehouses provide in preparing cotton bales for market because of the labor and machinery input involved.

Number, Size, and Location

About 344 cotton warehouses with a total capacity of 18.9 million bales operated during the 1992/93 season (table 6). The largest concentration of facilities is in the Southeast with 142 warehouses, representing 41 percent of the total. Warehouse numbers total 100 and 81 facilities, respectively, in the Delta and Southwest or a combined total of 53 percent of all warehouses throughout the Cotton Belt. The West represents only 6 percent of all cotton warehouses, but they generally have large capacity with high utilization rates. In contrast, many Southeast warehouses are small, with a capacity of 15,000 bales or less. Total storage capacity for all warehouses in the region accounts for only 2.5 million bales or about 13 percent of the total capacity. Average warehouse size in the Southeast reflects the wide variations in the concentration of production within the region. Delta warehouses are widely dispersed throughout the region, representing approximately 33 percent of U.S. capacity.

After dropping rapidly during the 1970's, U.S. cotton storage capacity reached a low of 16.5 million bales in 1985, but has since increased and appears to be leveling off near the current total of around 18.9 million bales (table 7). However, the regional distribution of

Table 7—U.S. cotton storage capacity, by region[1]

Year beginning August 1	Southeast	Delta	Southwest	West	United States
			Million bales		
1970	4.3	8.5	5.1	2.3	20.2
1980	2.3	6.1	5.8	2.9	17.1
1985	2.2	5.4	6.2	2.7	16.5
1990	2.5	6.4	7.1	3.1	19.1
1992	2.5	6.3	7.0	3.1	18.9

[1]Storage capacity of CCC-approved warehouses.

Source: Unpublished data, U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service.

storage space has continued to adjust from prolonged overcapacity in some areas and increased demand for storage in other areas.

Southeast warehouse capacity has remained at about 2.2-2.5 million bales since 1980. Although this appears to be excessive in terms of annual production volumes, many warehouses are older, fully depreciated facilities that operate at a low capacity-utilization rate. Because of their proximity to textile mills, Southeast warehouses also serve as important assembly points for an orderly flow of cotton to mill locations.

Storage capacity continued to decline in the Delta region until 1985, when expanding production increased the demand for storage space. The current capacity of Delta warehouses, 6.3 million bales, is now more in balance with the annual production volume in the region. The installation of universal density compresses in most Delta gins has encouraged shipments of some cotton directly from gins to mills or ports, reducing the demand for usual storage and handling services.

Since 1970, storage capacity has grown by about 2 million bales in the Southwest and 800,000 bales in the West. These two regions produce nearly 60 percent of the U.S. crop and have about 54 percent of the storage capacity. The generally larger storage volumes have improved warehouse utilization. However, wide swings in annual production require that sufficient storage space be maintained for peak periods. For example, since the 1981 season, cotton production has ranged from 2.6 million bales to 6.2 million bales in the Southwest and from 2.7 million bales to 5.1 million bales in the West.

Warehouse Ownership

Cotton warehouses traditionally operate as independent facilities in a single location, as chain warehouse firms owning two or more storage facilities in separate locations, or as cooperatives operating in either a single location or multiple locations. While individual warehouse capacity may vary from 1,000 to 400,000 bales, chain warehouses usually operate facilities of greater average size than do independent companies.

Considerable investment is necessary to build and operate a cotton warehouse. Chain warehouses help maintain stability within the industry by spreading certain costs over more than one facility. These efficiencies include central control of recordkeeping, equipment purchases, insurance coverage, and inventory management. Because of their scale of operation, chains also are often able to take advantage of the latest advances in cost-saving technologies.

Chain warehouses are dominant in the West, where they account for nearly 70 percent of the total storage capacity while operating only 10 percent of all facilities. In the Delta and Southwest, approximately 55 percent of the regional storage capacity is in chain warehouses. In contrast to other areas, the Southwest cotton warehousing industry contains a number of large, independent storage facilities that account for a significant proportion of the total storage capacity in the region. Southeast warehouses are primarily small independent facilities, with less than 10 percent of the total warehouse numbers and storage capacity controlled by chain warehouse companies.

Warehouse Charges

Charges for warehousing services vary from year to year and from area to area, with differences in the cost of providing the service and the kind and amount of services included. Warehouses in some areas may not charge for receiving cotton because of competition, tradition, or other reasons, or they may include a short period of storage at no cost to the owner if compression is performed at their facility. When bales are received from the gin already compressed to universal density, the warehouse usually pays an agreed-upon rebate to the gin. However, a compression charge is attached to the list of charges accrued against that particular bale to be paid by the current owner of the cotton when it is shipped from the warehouse.

Average charges for the four primary cotton warehousing functions during the 1992/93 season are shown by State in table 8. The number of cotton warehouses operating in each State is also shown. Charges generally tend to be higher in the Delta States, especially for outhandling services, while lower charges in the Southeast reflect the absence of compression charges, except in Alabama. Warehouse storage charges are calculated on a monthly basis or portion thereof. But, storage charges stop in most areas if cotton is not shipped within 10 days of the date requested by the owner.

Cotton Merchandising

The critical link between cotton producers and final domestic and export markets is provided by various types of cotton marketing firms. These firms operate in both local farm markets and in the major central markets. Most cotton is sold by growers to the first buyer on the basis of the official USDA classification. Most of the rest goes directly to a mill under pre-arranged agreements.

Merchant-shippers and cooperative marketing associations handle most of each year's cotton crop, both in terms of assembling cotton from small country markets into larger volumes and in facilitating sales to textile mills and foreign customers through well-established contracts. Nevertheless, other types of marketing firms also play an important role in the cotton marketing process.

Methods of Operation

Private firms, referred to as merchant-shippers, perform all the functions involved with moving cotton from producers to mills. These firms take title to the cotton at the time it is sold by farmers and maintain control until it is sold and delivered to a domestic or foreign mill. All associated costs and risks of carrying and transporting cotton during this period are the responsibility of the merchant-shipper.

Shippers operate in all areas of the Cotton Belt, but many relatively small firms confine their operations to one area. In these latter cases, the shippers' customers are usually domestic mills that purchase all or part of their requirements from shippers located in the area involved. Many small shippers have developed grower and buyer clienteles over the years. Moreover, there is always competition among 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 cotton from different areas of growth and of different qualities. Large shippers also maintain overseas affiliates to handle foreign sales.

Shippers who purchase from growers in the absence of an immediate corresponding sale to a buyer hedge their purchases by selling a corresponding number of bales in futures on the NYCE. If a textile mill sells a large order of cloth for future delivery, a purchase of equivalent raw cotton will be made from a shipper. The shipper will buy either futures as a hedge against the sale or raw cotton from the forthcoming crop. Both buyers and sellers use hedging as protection against wide price fluctuations. Generally, the shipper is not in business to speculate on raw cotton prices, and the textile firm is in business to manufacture fabrics and not to play the futures market. Thus, both parties offset their price risk via the futures market.

Once a sale is made by a shipper, the necessary volume is accumulated or earmarked from already existing stocks. Terms of the contract usually specify that quality factors such as grade, staple-length, micronaire, and strength be based on official USDA classification. However, the quality specifications may also be based on private-type descriptions or types developed by the purchaser with which the shipper is familiar. Also, shippers sometimes sell to one another to fill out lots for a particular order or to dispose of unwanted inventory. A number of large shippers are also active in buying and selling foreign-grown cotton.

Table 8—Number of cotton warehouses and average charge for primary service by State, 1992/93

Region/State	Warehouses	Average warehouse charge for: Receiving services	Monthly storage	Universal density compression	Outhandling service
	Number	*Dollars/bale*			
Southeast:					
Alabama	31	3.02	1.72	7.25	5.21
Florida	2	2.00	1.50	[1]	4.50
Georgia	53	2.91	1.64	[1]	4.69
North Carolina	29	3.41	1.48	[1]	3.11
South Carolina	27	2.66	1.51	[1]	3.68
Delta:					
Arkansas	27	3.17	1.94	8.00	8.30
Louisiana	18	4.03	2.07	7.75	8.12
Mississippi	31	3.76	2.02	8.50	8.70
Missouri	8	1.52	1.91	7.75	8.28
Tennessee	16	3.55	1.96	8.25	8.37
Southwest:					
Oklahoma	4	2.25	1.78	7.50	4.05
New Mexico	6	1.84	1.73	7.25	4.71
Texas	71	2.57	1.68	8.50	4.55
West:					
Arizona	5	[2]	2.00	6.30	5.16
California	16	[2]	1.86	6.50	5.17
United States[3]	344	2.98	1.81	7.90	5.88

[1]Warehouse compression not performed. [2]Separate charges customarily not made. [3]Warehouse charges are weighted average of State charges.

Source: Unpublished data, U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service.

Cooperative cotton marketing associations operate essentially in the same way as the merchant-shipper, except that any equity is rebated to the grower. Two major cooperatives operate their own warehouses. Approximately 28-30 percent of the U.S. cotton crop is merchandised by cooperatives, which provide only the basic service of pooling and assembling like qualities. However, four major regional cooperatives account for most of cooperative volume: Calcot Ltd., Bakersfield, California; Plains Cotton Cooperative Association, Lubbock, Texas; Southwestern Irrigated Growers Association, El Paso, Texas; and Staple Cotton Cooperative Association, Greenwood, Mississippi. These large cooperatives are engaged in extensive fiber testing and merchandising activities. These four cooperatives jointly formed Amcot in 1971 as an interregional marketing association to provide its members with market information, establish greater global coverage for different cotton varieties, and arrange domestic or export transactions. Amcot sales offices are in both domestic and foreign textile mill centers.

Cooperatives may have several sales options available for members' use. One type of contract specifies a total number of bales with a base quality and discounts for qualities below this base. The type of contract depends on the degree of competition and variation in lint quality existing in the forward contracting area. Another sales option is a seasonal pool, designed to even out wide price fluctuations throughout the year. This is accomplished by blocking cotton into selected categories and fitting different qualities within the pool into sales to firms with narrow quality requirements. A third type of sale is a call option where the grower fixes a price on a part of the crop prior to harvest. Sales are made on a fixed number of bales with price based on a base quality. Final prices are adjusted according to the contract for quality variations above or below the specified base quality.

The Plains Cotton Cooperative Association uses an electronic cotton marketing system. Information on quality and lot size is flashed on the screen for bidding using a computer and high-speed data printers located in shippers' offices in Lubbock, Dallas, Memphis, and several other locations. Minimum prices that producers will accept are stored in the computer for each lot and, when the bid price reaches the minimum, the computer automatically offers the lot or lots for sale. The cooperative is also involved in the bidding process, along with merchants who participate in the cities involved.

As the names imply, brokers, agents, or commission people act only as intermediaries between a grower (seller) and a purchaser (usually a shipper or textile firm) or between a seller (shipper) and a buyer (a textile firm). The purchaser usually specifies the minimum price. The intermediaries then negotiate the sale and receive a commission for the volume bought or sold. They neither take title to the cotton nor perform any other corollary functions involved in shipping, such as financing, hedging, and arranging for transportation. Their real function is to assemble the individual bales or small lots into substantial volumes of cotton for others, or to act as selling agents in the textile manufacturing area for shippers or large growers.

Most gin-buyers function to supplement their income. This type of operation would classify the ginners as merchant-shippers in that they take title to the cotton. Although this may be correct technically, they actually have a pre-arranged outlet for this volume, either to a shipper or directly to the cotton department of a textile firm.

The marketing procedure of direct mill buying from producers developed in the 1950's and 1960's, largely because of fiber quality problems encountered in the harvesting and ginning areas. A mill buyer typically would contract directly with a large grower with stipulations that the crop would be processed according to a predetermined set of conditions for a preset price to the grower.

Although the situation has changed over the years, there are still arrangements whereby the same firm purchases a particular grower's crop year after year. This situation is chiefly based on the confidence established among the parties to the agreement. However, this arrangement is not generally practiced for two reasons: (1) textile-firm cotton departments do not have the personnel to contract with a large number of growers across the Cotton 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 dispute. Furthermore, the cost of staff maintenance, as well as personnel availability, would probably be more than the cost of doing business through a third party, who is usually a shipper. Direct contracting between mills and growers would probably become more prevalent if short supplies for particular qualities were foreseen by mills.

Marketing Costs

Cotton marketing costs represent a significant part of the total price of U.S. cotton delivered to domestic and foreign customers. During recent years, costs associated with marketing have added about 8-10 cents per pound to farm prices on domestic sales and about 13-15 cents per pound to the U.S. price of cotton delivered to foreign markets. These costs include expenses involved in assembling cotton into lots from local markets, warehouse handling and storage charges, transportation charges from storage points to final destination, insurance and financing fees, selling costs, operating overhead, and other miscellaneous expenses of marketing firms. For foreign shipments, additional expenses are incurred, such as marine insurance, wharfage, forwarding and controlling fees, and a longer financing and storage period.

The estimated U.S. weighted average cost of marketing cotton to all domestic and foreign destinations combined totaled $55.36 per bale during 1992/93. This compares with $42.86 per bale in 1977/78, and $26.98 per bale in 1972/73 (table 9). The sharp rise resulted from increases in nearly all cost items, especially transportation and financing expenses. Since 1974, however, increases in transportation costs have moderated, but costs associated with financing cotton purchases have continued to climb. The costs of warehousing services currently represent about 35 percent of the total marketing bill, compared with 26 percent in 1977/78.

While the total cost of delivering cotton to foreign markets exceeds that for domestic movement, the difference has narrowed in recent years, reflecting substantial changes in ocean rates and rate structures. The cost of shipping cotton from west coast ports to Far East markets was about 20-25 percent below prevailing rates in 1977/78. The approximate proportion of the total marketing bill that each individual cost item represented during 1992/93 is shown in table 10.

Nationally, over 69 percent of the $55.36-per-bale total marketing bill reflects costs for the physical warehousing and transporting of cotton. Storage, compression, and outhandling average over 30 percent of the total cost. Transportation expenses averaged nearly 39 percent of the total cost. Financing of cotton purchases, including hedging and bank exchange fees, is a significant and necessary cost in marketing cotton. Financing expenses for 1992/93 accounted for about $8.78 per bale, with interest rates, cotton values, and length of financing primarily determining this level.

Table 9—Estimated average cost of marketing U.S. cotton to domestic and foreign outlets, selected crop years

Crop year	Domestic	Foreign	All outlets[1]
		Dollars/bale	
1972/73	19.57	34.57	26.98
1974/75	24.14	55.05	38.63
1977/78	31.76	55.38	42.86
1983/84	41.95	63.23	54.10
1992/93	46.30	68.40	55.36

[1]Weighted average cost to all domestic and foreign outlets.

Source: Estimated from unpublished USDA data obtained from marketing firms.

Overhead costs of marketing firms were estimated at 12 percent of total marketing costs during 1992/93. Although overhead costs for a particular season may vary widely by firm due to volume marketed, average overhead costs per bale show much less variation over the longer term.

The remaining cost items (buying, selling, and insurance fees), although of a lesser magnitude than those previously mentioned, represent vital services in obtaining cotton in mixed lots and assembling and distributing it at the time and place demanded by domestic mills or export customers.

Transportation

Train and trucks are the primary means of moving cotton from gins and warehouses to domestic consumption centers and port areas for export. Shipment by rail can involve (1) the use of boxcars with a capacity of 150-250 bales depending on type of equipment, (2) piggyback truck trailers on flatcars, each trailer containing 80-85 bales, or (3) containers that are used in most export movements from ports. Containers averaging 80 bales each are regularly "stuffed" at ports for ocean shipment, but a significant volume of cotton, especially from the Southwest, is shipped in containers from inland locations to the port areas. Trucks usually pull containers 40 feet or more in length carrying 80-95 bales. Flatbed

Table 10—Distribution of U.S. average cotton marketing costs, 1992/93 season

Cost item	Share of total cost
	Percent
Transportation	38.8
Warehouse services:	
Compression	15.1
Outhandling	11.8
Storage	3.4
Overhead	12.0
Buying and selling	9.7
Financing	7.2
Cotton insurance	2.0
Total	100.0

Source: Estimated from unpublished USDA-ERS data.

trailers are also used in areas of low rainfall and short-line haul distances.

U.S. Overview

Trade patterns for U.S. cotton shifted significantly during the 1970's with the growth of the export market, especially in the Far East. Traditionally, most cotton moved to domestic textile mills in the Southeast. By the mid-1980's, however, cotton exports accounted for nearly 50 percent of all cotton shipments. The volume of U.S. cotton exported has continued to increase into the 1990's. But, domestic mill use has risen even more rapidly, accounting for over 60 percent of total use during 1992/93.

The changing production patterns have caused adjustments in the location and operation of cotton marketing facilities and the demand for transportation services. Also, higher rail operating costs and deregulation have changed the means by which cotton travels to its ultimate destination.

For 1992/93, nearly 58 percent of all U.S. cotton shipments went directly to domestic textile mills in the Southeast (table 11). Approximately 9 percent of all shipments went to mills in other States, to reconcentration warehouses, and to destinations identified as "unknown." Export shipments through the few major port areas totaled 28.2 percent, while exports to Canada and Mexico accounted for 1.1 and 3.9 percent of all shipments.

Since 1975, trucks have replaced railroads as the primary transporter of U.S. cotton. Currently, 80-85 percent of the annual cotton crop is shipped to textile mills or port areas by truck. The increased proportion of cotton moving by truck resulted from more competitive truck rates, flexible scheduling, quicker delivery, and efficiencies gained by containerized shipments, especially for export movements. A competitive feature of rail transportation, however, is the transit privilege. Under the transit rate system, rail charges for cotton are based on the most direct route from origin to final destination. The rate system allows intermediate stops to consolidate particular lots of cotton, lowering the total transportation bill.

Regional Patterns

The westward movement in cotton production, differences in cotton quality among regions, shifts in consumption patterns, and changing transportation rates have affected regional cotton transportation patterns. Since the mid-1980's, however, the rapid adjustments of earlier years have moderated.

In the Southeast, cotton is traditionally shipped to local textile mills. Over 97 percent of all Southeast cotton transported in 1992/93 went to the Southeast mill area, compared with about 95 percent 10 years earlier. The stable distribution pattern reflects the significant transportation cost advantages of consuming cotton grown within the region. Most of the Southeast crop can also be shipped to textile mills without further compression,

Table 11—Distribution of U.S. cotton shipments, by region, 1992/93

Destination	Southeast	Delta	Southwest	West	United States
			Percent		
Southeast mills[1]	97.4	75.3	54.1	28.0	57.6
Ports:[2]					
Atlantic	1.2	0.6	*	—	0.3
Central Gulf	0.5	3.7	0.4	—	1.3
West Gulf	—	0.8	15.9	2.5	7.6
Pacific	—	1.7	9.0	67.5	19.0
Canada	0.5	0.7	1.3	1.5	1.1
Mexico	—	0.8	8.4	0.5	3.9
All other[3]	0.4	16.4	10.9	*	9.2
Total	100.0	100.0	100.0	100.0	100.0

*Less than 0.05 percent.

— = No reported shipments.

[1]Textile mills located in Alabama, Georgia, North Carolina, and South Carolina. [2]Atlantic coast ports of Savannah, GA, and Charleston, SC; Central Gulf ports of New Orleans, LA, and Mobile, AL; West Gulf ports of Houston, Galveston, and Brownsville, TX; and Pacific ports include all California ports and Seattle, WA. [3]Other minor States and destinations reported as unknown.

Source: Based on unpublished USDA-ERS survey of cotton warehouses, covering shipment of about 9 million bales during the 1992/93 season.

either directly from the gin or from local warehouses, saving about $8.00 per bale in compression costs. Trucks haul 90-95 percent of all Southeast cotton shipments, with railroads accounting for the remainder.

Cotton produced in the Delta or South Central region has also been primarily distributed to the Southeast mill area. Over three-fourths of Delta cotton moved to Southeast mills in 1992/93, about the same proportion as 10 years earlier. About 8 percent of all shipments were to the ports for export and to Canada and Mexico. The Delta's large supply of cotton across a wide range of qualities has kept overseas sales constant in recent years despite the high exporting costs compared with other regions.

The Delta region has undergone rapid adjustment in cotton transportation. In the mid-1970's, nearly 50 percent of all regional cotton movements were by rail, compared with only 10 percent during the 1992/93 season. The increased use of trucks reflects the competitiveness of motor carriers, scarcity of railcars, and the abandonment of numerous connecting (or spur) rail lines within the area.

About 54 percent of Southwest cotton marketed in 1992/93 was shipped to the Southeast mill area, primarily for use in coarse yarn fabrics such as denim and corduroy. The proportion of Southwest cotton used by domestic mills has increased from about 37 percent during the mid-1980's. Continued growth in denim markets and greater use of open-end spinning methods has boosted domestic demand for Southwest cotton.

Exports continue to account for a significant share of the market for Southwest cotton. Most exports are handled through the west gulf ports of Houston and Galveston, but a large volume is shipped directly to the Pacific coast. Merchants can use the "minibridge" system for exports to the Far East. Under this arrangement, cotton is preloaded into exportable containers at the point of origin and then shipped either by rail or truck to Pacific ports. During the 1992/93 season, 9 percent of all Southwest marketings were minibridge movements. Southwest cotton shipments to Mexico accounted for over 8 percent of the total.

The Southwest region is more dependent on rail transportation than other regions. Nearly 40 percent of all cotton shipments were by rail in 1992/93. Rail is the chief mode of transportation to the Pacific ports, while trucks dominate shipments to the Gulf ports and Southeast mills.

Cotton grown in the Western region is primarily exported. About 72 percent of all marketings were export shipments, mainly to Pacific ports. Some Western cotton is exported through the West Gulf ports for shipment to Europe. About 28 percent of Western cotton was shipped to Southeast mills in 1992/93, compared with 40-50 percent during the early 1980's. This change reflects a decline in the premiums paid by domestic mills for Western cotton as mills increasingly blended cottons of different quality.

Because of the large share of Western cotton moving to nearby ports, trucks transported about 80 percent of the 1992/93 crop. Nearly all of the cotton shipped to Pacific ports travel by trucks, and about half shipped to Southeast mills uses trucks because of shorter delivery times than rail.

New Developments in Marketing

The U.S. cotton marketing system continues to adjust and adapt to ever-changing domestic and foreign conditions. Efforts to improve current marketing practices and develop new innovative approaches have made the entire industry much more efficient.

The demand for cotton fiber has increased rapidly since 1985, growing from 8.4 million bales (mill use and exports) to over 15.5 million by 1992/93. If the United States is to continue to meet the expanding demand from domestic and foreign customers, each sector of the cotton marketing system must work toward identifying those areas where increased marketing efficiencies are possible.

For cotton gins, a number of significant trends continues to enhance ginning efficiency. Gin consolidation and the installation of new, high-speed equipment have enabled a declining number of gins to process an increasing volume of cotton. In 1972, a total of 3,517 gins operated in the United States, ginning about 13.1 million bales or an average of 3,725 bales per gin. By the 1992 season, gin numbers had declined to 1,383, but processed a large crop of 16.7 million bales, or over 12,075 bales per gin. This trend, while slowing in recent years, is expected to continue, especially in the Mid-South and Southeast areas.

Gin universal density (UD) compression is another area of increased efficiency. With UD compression equipment at gins, bales need only be pressed and packaged once in the marketing chain for domestic or export shipment. Double and sometimes triple compression has been eliminated, helping reduce bale contamination and unnecessary handling. Gin UD compression comprised nearly 40 percent of the 1979 crop, but had reached over 90 percent of all bales produced by 1992. Economic incentives, such as rebates from warehouses, have been the major factor associated with this change, along with the trend toward gin consolidation.

A primary benefit of gin UD bales is the ability to ship cotton directly from gins to mills or ports, bypassing the traditional warehouse sector and the associated charges. While about 10-15 percent of the annual crop is marketed in this manner, further development of gin-direct shipments will be limited by the amount of cotton that mills can use at one time. However, a number of gins are building bale warehouses, which may allow for some savings in transportation and reductions in storage and handling costs.

The module system for handling and storing seed cotton has been practiced since 1972. The continued growth in the use of this system has greatly affected ginning efficiency. Approximately 67 percent of the 1992 crop was ginned from modules compared with about 37 percent 10 years earlier. Improved module moving equipment and automated unloading and feeding systems have also contributed to significant improvement in the ginning process.

New advances in measuring fiber properties and using these factors in fiber processing will affect how cotton is ginned. Beginning with the 1991/92 crop, all cotton eligible for CCC loans must be classed using the USDA-high volume instrument (HVI) system of determining fiber properties. Also, beginning with the 1993/94 crop, cotton grade was reported as a separate value for color and trash content. Prior to that time, grade had been determined as a composite of the two factors. Cotton gins may be required to process cotton in specific ways in order to preserve or enhance desired fiber properties required by textile mills for use in specific end products as a result of these changes. Custom ginning at the request of the producer or mill customer is becoming an increasingly important responsibility of the ginning sector.

Effective cotton marketing also depends on timely storage and shipping of cotton bales. Cotton warehouses are a critical link in the marketing chain because they provide a place where producers have protected, insured storage, but more importantly, provide assembly points where cotton merchants can concentrate large lots of like-quality bales. As the industry continues to gain experience in marketing cotton using HVI-quality factors, cotton warehouses, especially at the mill, are putting increased emphasis on bale management. With cotton spinning performance and product quality directly related to specific fiber properties, warehouses are developing improved systems for bale identification and shipment of those bales with the desired properties.

Industry efforts to develop a "just-in-time" delivery system for textile mills is an effort to improve marketing efficiency and reduce costs. Textile mills are maintaining significantly lower raw cotton inventories at mill warehouses, but work closely with cotton merchants to ensure that required volumes and qualities of cotton are delivered just ahead of production schedules. Interior cotton warehouses are also working closely with merchants to provide prompt shipment of bales when necessary and to receive advance shipping orders to anticipate demand for warehouse services.

Cotton merchants have traditionally purchased cotton from producers based on grade, staple length, and micronaire, but sold cotton to mills based on those and other fiber quality factors. As confidence using USDA HVI values increases, most cotton could be marketed based on HVI values, with mill contracts requiring specific fiber properties associated with each bale. Purchases from producers would also be based on the new HVI system of classification. Contracts with foreign mills for the purchase of U.S. cotton are increasingly specifying HVI measurements as a basis of sale.

Most large U.S. cotton merchants are becoming more involved in the purchasing and marketing of imported cotton. U.S. law currently restricts the import of significant volumes of foreign cotton into the United States. But, merchants with overseas offices and contracts buy foreign cotton and market it to foreign mills, sometimes in competition with U.S. supplies. This practice could grow, along with other changes in textile and apparel trade, with the recent completion of the General Agreement on Tariffs and Trade and the North American Free Trade Agreement.

In recent years, all sectors or groups within the U.S. cotton industry have worked more closely together to promote a growing domestic industry and keep U.S. cotton competitive in world markets. While individual sectors may have conflicting goals on certain issues, the overriding effort is now directed toward improving efficiency of the entire marketing system and ensuring continued growth of the overall cotton industry.

Chapter 3

Cotton Classification and Quality

Jesse F. Moore*

Knowledge of cotton quality is a necessary component of an efficient marketing system. Because cotton exhibits a wide variation in fiber properties among samples, effective description and measurement of these properties are essential. The use of quality information by textile mills enables production managers to develop optimum blending levels, which reflect the best combination of fiber properties required for each end use. For cotton producers, premiums paid for higher qualities and discounts for less desirable qualities provide incentives to produce high-quality cotton for manufacturers and consumers of textile products.

Cotton Classification

Cotton classification in this section refers to the application of standardized procedures developed by AMS that measures the physical attributes of raw cotton that affect finished product quality and/or manufacturing efficiency. AMS classification currently consists of determinations of fiber length, length uniformity, strength, fineness, color, leaf, preparation, and extraneous matter.

Annually, AMS classifies most baled cotton for producers on a user-fee basis. While classification is not mandatory, growers generally find that the quality information provided is essential to marketing their crop and for obtaining price support loans. AMS also classifies (certifies) all cotton tendered for futures contracts on the NYCE and provides arbitration services to industry organizations. Individual buyers, manufacturers, breeders, researchers, and others also avail themselves of the service.

Classing methodology is changing. It is moving from a methodology based on the classer's touch to one that uses HVI, which measures more quality factors with greater accuracy. Currently, some quality determinations are still made by classers, but it is the intent of AMS to move to all-HVI as quickly as the instruments can be developed. During the transition period, there is some overlapping of manual (classer) determinations and HVI measurements.

Since 1980, USDA has rapidly expanded the availability of the HVI system. By the 1987/88 season, HVI testing was available at producer request in 16 of the 20 AMS marketing services offices. HVI values were supplied in addition to the standard Smith-Doxey classification. The fee for HVI service in 1987/88 was 50 cents per bale in addition to the $1.20 per bale for conventional classing. Approximately 40 percent of the total cotton crop was HVI-tested during 1987/88. The HVI-tested volume of each successive crop expanded and was available in all USDA offices by the 1989/90 season.

Beginning with the 1991 crop, HVI testing of cotton samples became mandatory for all cotton to be eligible for CCC loan protection. During the season, over 17 million bales received the official USDA HVI quality determination. The availability and effects of the expanded quality measures are being felt throughout the cotton industry.

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HVI Determinations

HVI classification of cotton is now performed in each of the AMS classing offices. Seasonal charges for these services are based on the estimated AMS cost involved. For the 1992/93 season, HVI classing services were $1.87 per bale. The primary fiber properties measured by the HVI system are described in the next six sections on fiber length, uniformity, strength, fineness, color, and trash.

Fiber Length

Fiber length measures the average length of the longest half of the fibers (upper-half mean length). It is reported in both 100ths and 32nds of an inch and is measured by passing a "beard" of parallel fibers through a sensing point. The beard is formed when fibers are grasped by a clamp from a sample of cotton and then combed and brushed. Combing and brushing parallels the fibers and removes the crimp.

Cotton fiber length is largely determined by variety, but it can also be influenced by weather and soil conditions. Excessive temperatures, inadequate moisture, and mineral deficiencies can cause fiber deterioration, which can result in decreased fiber length. Fiber length measurements are essential to the yarn manufacturing process, as fiber length is directly related to yarn fineness, yarn strength, and spinning efficiency.

Length Uniformity

Length uniformity is a measure of the degree of uniformity of fiber lengths (the ratio between the mean length and the upper-half mean length, expressed as a percentage). The measurements are obtained in the same manner as that for fiber length. The same beard of cotton used for measuring fiber length is used to measure length uniformity. If all of the fibers in the sample were of the same length, the mean length and the upper-half mean length would be the same and the uniformity index would be 100. However, cotton fibers within a sample vary considerably, so length uniformity will be less than 100 (table 1). Improper gin machinery settings, over-cleaning, and excessive drying can contribute to fiber breakage during the ginning process, which in turn results in lower length uniformity.

Length uniformity is related to such yarn characteristics as spinnability, yarn uniformity, and yarn strength. It is also related to short fiber content. Cottons with a low uniformity index are likely to have a high percentage of short fibers (shorter than one-half inch). Such cottons may be difficult to process into yarn because of excessive fiber breakage in spinning.

Fiber Strength

Strength measurements are reported in terms of grams per tex (table 2). A tex unit is equal to the weight in grams of 1,000 meters of fiber. Therefore, the strength reported is the force in grams required to break a bundle of fibers 1 tex unit in size. Strength measurements are made on the same tapered beard of cotton used for measuring fiber length. The tapered beard of cotton is moved into a 1/8-inch opening between clamping jaws where the fibers are broken. Fiber strength is largely determined by variety. However, other factors such as improper ginning, soil deficiencies, environment, and weather can affect fiber strength.

In processing cotton into yarn, fiber strength is especially important to the opening and cleaning process, where fibers are exposed to harsh treatment. During the subsequent processes such as carding, drawing, roving, and spinning, the fibers must have adequate strength to withstand breakage due to pressures applied during drafting. Fiber strength is generally considered to be the most important fiber property for predicting the strength of rotor-spun yarn, and, with the exception of length, is the most important fiber property for predicting the strength of ring-spun yarn.

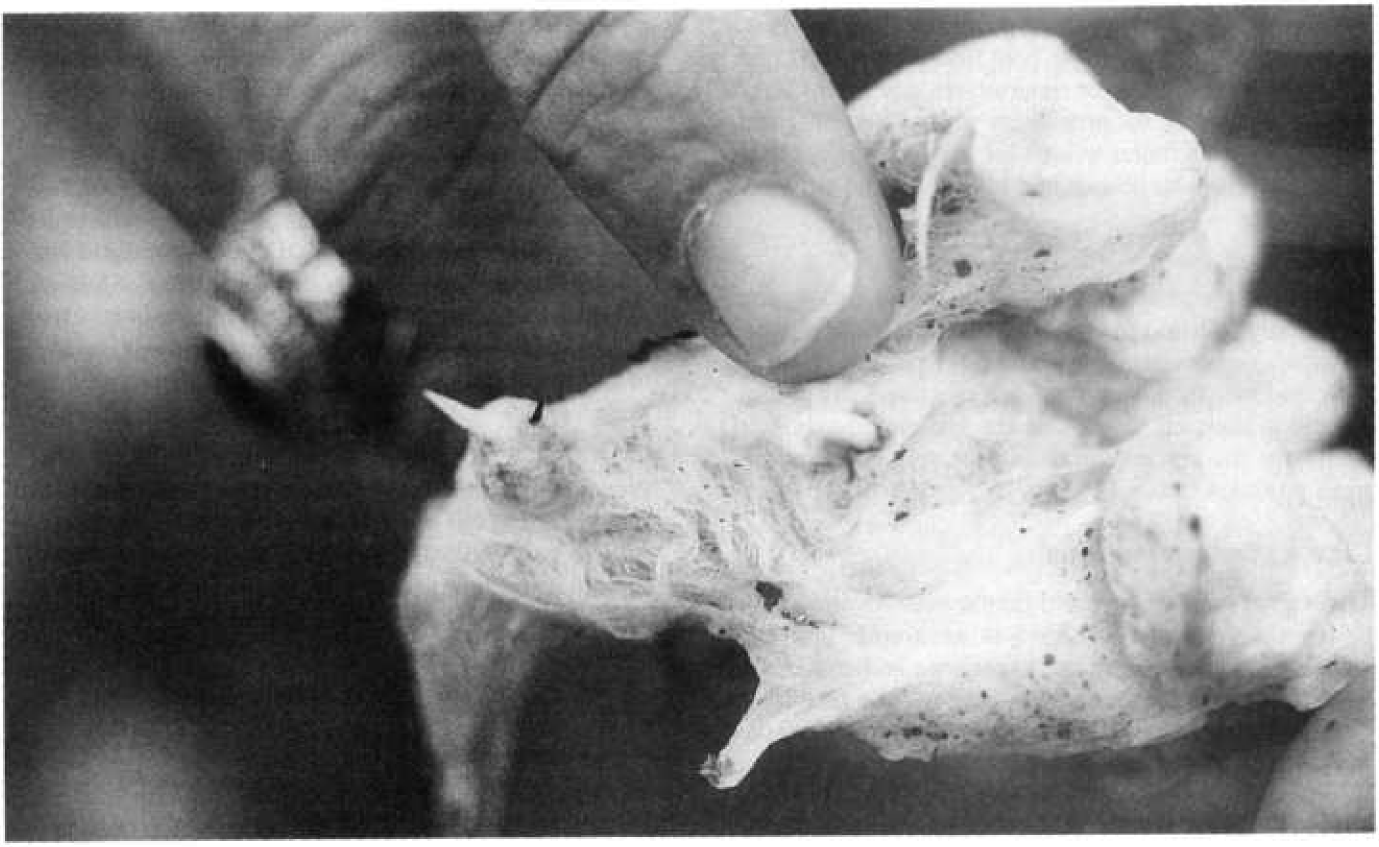
Table 1—Length uniformity description and HVI index

Description	HVI-length uniformity index
	Percent
Very high	> 85
High	83-85
Intermediate	80-82
Low	77-79
Very low	< 77

Table 2—Fiber strength description and HVI readings

Description	HVI strength[1]
	Grams/tex[2]
Very strong	30 and above
Strong	27 - 29
Intermediate	24 - 26
Weak	21 - 23
Very weak	20 and below

[1]Force in grams required to break a bundle of fibers 1 tex unit in size. [2]1 tex unit = Weight in grams of 1,000 meters of fiber.



Cotton leaf and bark in the sample affect grade.

Fineness

Fiber fineness is determined by the measurement of the air permeability of a mass of cotton fibers when compressed to a fixed volume. An airflow instrument compresses the fibers, and the measurement is commonly referred to as "micronaire" or "mike." The information is used to determine the relative size or fineness of fibers. The micronaire reading can also provide a relative indication of fiber maturity or cell wall thickness for varieties of cotton with similar fiber parameters. Fiber fineness can be influenced during the growing period by environmental conditions such as moisture, temperature, sunlight, soil fertility, and extremes in plant or boll population.

Fiber fineness affects mill processing performance and the quality of the end product in several ways. In the opening and cleaning process, cotton with low micronaire readings or fine-fiber cottons require gentler handling at slower speeds. In carding cotton with finer fibers, slower carding rates are necessary to prevent damage to the fibers. In the drawing process, the knowledge of fiber fineness and length is critical for making the proper roller settings. In the roving and ring-spinning processes, fiber fineness can influence the amount of twist needed in the roving and the yarn. In rotor-spun yarn, finer fibers or more fibers per cross-section will result in stronger yarns. Dye uptake by the fibers will vary with micronaire readings. Dye absorbency and retention are generally higher for coarser fibers, which give high micronaire readings.

Color

The color of cotton is measured by the degree of reflectance (Rd) and yellowness (+b). Reflectance indicates how light or dark a sample is, and yellowness indicates how much yellow color is in the sample. A three-digit color code is used to indicate the color grade and the particular quadrant within that color grade on a color diagram called the Nickerson-Hunter cotton colorimeter diagram. The color code is determined by locating the point at which the Rd and +b values intersect on the color diagram for upland cotton.

The color of opened cotton in the field can be adversely affected by excessive rainfall, freezes, insects, fungus, and soil or leaf staining. Cotton color can also be adversely affected by excessive moisture and temperature levels during storage, both before and after ginning.

Studies of fiber and spinning properties indicate that color reflectance is related to both fiber strength and yarn strength. As cotton color deteriorates due to environmental conditions, the probability for reduced fiber and yarn strength is increased. Color may also affect the ability of fibers to absorb and hold dyes and finishes.

Trash

Trash in raw cotton is measured by a video scanner, commonly referred to as a trashmeter. The trashmeter measures the amount of leaf and other particles from the stalk and extraneous matter such as grass. The cotton sample is scanned by the camera and the computer calculates the percentage of surface area occupied by trash particles (table 3).

Classer Determinations

Traditional manual (human) cotton classification continues to be provided by AMS in addition to the HVI values. As the industry gains experience and confidence in the HVI system, manual classing will be phased out. Until then, visual inspection is used to determine the fiber characteristics discussed below.

Color Grade

Though color measurements are provided by HVI, the traditional method of determining color grade by visual classer inspection continues to be used. There are 25 official color grades for American upland cotton plus five categories of below-grade color (table 4). Of these 30 grades, USDA maintains physical standards for 15 of the color grades. The others are descriptive standards that fall between, above, or below the physical standards.

Leaf Grade

The classer's leaf grade is a visual estimate of residue of leaf from the cotton plant in samples of raw cotton. There are seven leaf grades, and all are represented by physical standards. Leaf content is viewed as waste in manufacturing, and there is a cost associated with its removal. Leaf content is affected by the different types of harvesting methods and harvesting conditions. The amount of leaf remaining in the lint after ginning depends on the amount present in the seed cotton and on the type and amount of cleaning and drying equipment used during ginning. Even with the most careful harvesting and ginning methods, a small amount of leaf will remain in the cotton lint. Generally, there is less leaf in ginned cotton now than in past years, primarily because of improved harvesting and ginning methods.

Preparation

Preparation is a measure of the degree of roughness or smoothness of the ginned lint cotton. As a general rule, smooth cotton has less spinning waste and produces a smoother, more uniform yarn than rough cotton. Various methods of harvesting, handling, and ginning can produce readily apparent differences in preparation. Because of improvements in equipment and practices, abnormal preparation now occurs in less than one-half of 1 percent of the crop during harvesting and ginning. Abnormal preparation is noted in the remarks of the classification data.

Extraneous Matter

Extraneous matter is any substance, such as bark, grass, spindle twist, dust, and oil, found in the sample other than the cotton fiber or leaf. Extraneous matter is noted in the remarks of the classification data.

Classification Facilities and Procedures

AMS currently operates 14 cotton classing facilities across the Cotton Belt (fig. 1). These classing offices determine the quality of a cotton bale based on small samples that are representative of the bales of cotton from which they are drawn. A sample of American

Table 3—Trashmeter measurement and resulting leaf grade

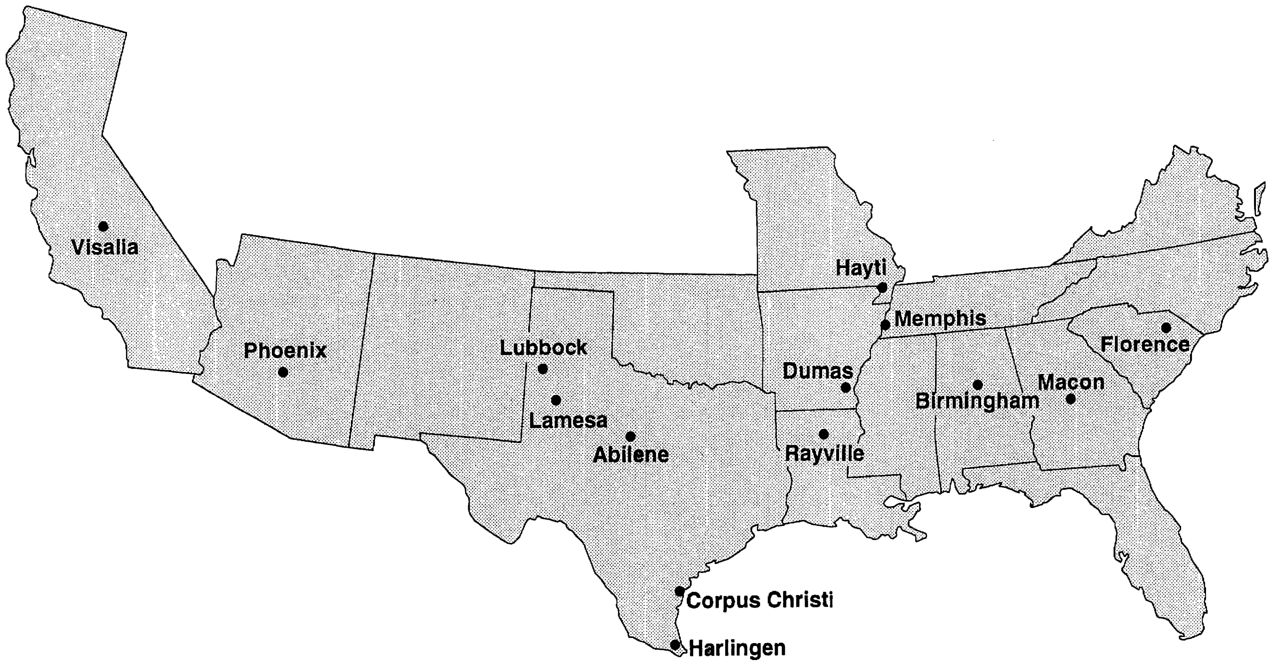
Leaf grade	Trashmeter area
	Percent
Grade 1	<0.1
Grade 2	0.1
Grade 3	0.2
Grade 4	0.4
Grade 5	0.6
Grade 6	1.1
Grade 7	1.5
Below grade	>1.5

Table 4—Color grades of upland cotton

Color grade	White	Light spotted	Spotted	Tinged	Yellow stained
Good middling	11*	12	13	—	—
Strict middling	21*	22	23*	24	25
Middling	31*	32	33*	34*	35
Strict low middling	41*	42	43*	44*	—
Low middling	51*	52	53*	54*	—
Strict good ordinary	61*	62	63*	—	—
Good ordinary	71*	—	—	—	—
Below grade	81	82	83	84	85

*Physical standards. All others are descriptive.

Figure 1
USDA classing facilities



upland cotton weighs at least 6 ounces and consists of two parts of at least 3 ounces each taken from opposite sides of the bale. A sample of American Pima cotton weighs at least 10 ounces and consists of two parts of at least 5 ounces each taken from opposite sides of the bale. The identity of the sample is carefully maintained by keeping an identification tag between the two sides of the sample. Samples are drawn by licensed sampling agents, who are usually ginners and warehousemen. The samples are delivered by the sampling agent or designated haulers to the nearest classing facility.

Because environmental conditions affect fiber properties, the temperature and humidity is very tightly controlled in AMS classing facilities. Temperature is maintained at 70 degrees, plus or minus 1 degree, and relative humidity at 65 percent, plus or minus 2 percent. Cotton samples to be tested are allowed to reach moisture equilibrium (when a cotton sample no longer takes moisture from or gives moisture to the surrounding environment). Cotton samples to be tested in AMS classing laboratories are conditioned at least 48 hours before classing. Moisture content of the samples must be between 6.75 percent and 8.25 percent.

Cotton classification data are available to producers through telecommunications, diskettes, computer tapes, punch cards, and printed cards. The predominant method of data dissemination is via telecommunications. Cotton gins usually act as agents for producers in obtaining the data from classing facilities. Grower-authorized marketing agents may also obtain classing information.

A central data base has been established by AMS in Memphis, Tennessee, for telecommunication of cotton classification data to subsequent owners of the cotton, primarily merchants and manufacturers. This data base contains classification data from all classing facilities for the current and previous crop. Current crop data are available within 72 hours of the time of classification. Bale ownership is certified by the caller during the logon procedure. Classification data are then accessed by entering gin code and bale numbers.

Fiber properties are also measured for American Pima cotton. While the basic testing procedures for American Pima cotton are the same as those for American upland cotton, different grade standards are necessary because the color is a deeper yellow and the leaf is unique to this cotton. The preparation is also different from the preparation for upland cotton, as American Pima cotton is ginned on roller gins rather than saw gins. There are seven official grades for American Pima cotton. Six are physical standards represented by practical forms, and one is a descriptive standard.

Cotton Quality Premiums and Discounts

Because of wide differences in cotton fiber quality and its resulting end-use value, premiums and discounts are established from a specified base quality. A schedule of premiums and discounts for grade, staple length, micronaire, and strength is provided each year by the Agricultural Stabilization and Conservation Service (ASCS) for government cotton loan program purposes. Spot market price quotations are also published by AMS each business day for all quality combinations of cotton deliverable on the New York Cotton Futures Exchange. A new schedule of premiums and discounts is constructed by ASCS before each season based on observed market differences between qualities and expert judgment of quality differentials. In general, as cotton fiber increases in whiteness, length, strength, and micronaire, premiums increase or discounts decrease. The value of premiums and discounts is given in points per pound—one point equals 1/100 of a cent, or 100 points equals 1 cent. Separate premium and discount schedules are established for upland and American Pima cotton.

Upland Cotton

The 1994 upland cotton schedule is shown in appendix tables 25 and 26. There are six white grades, five light spotted grades, five spotted, and four grades designated as tinged. Each grade has nine staple length categories and, beginning with the 1994 crop, is also divided into seven leaf levels. There is only a discount for excessive bark, with two levels indicated. The schedule of micronaire differences is calculated for 10 reading levels and two staple length groupings. Generally, a wide band between 3.5 and 4.9 is established, with discounts for readings above or below this band. The HVI measure for strength is shown in 12 ranges beginning with 18.5 grams per tex and increasing to 30.5 grams per tex and above. All readings below 23.5 grams per tex are assigned a discount, while readings above 25.4 grams per tex receive a premium.

ELS Cotton

ELS, or American Pima, cotton is classified with six grade codes indicating degree of color and fiber preparation (appendix table 27). Two staple length categories are established; however, in contrast to upland cotton, differences between the various grades and staples are shown as the actual CCC loan rate in cents per pound. There are no fiber strength premiums or discounts for American Pima cotton, but discounts for micronaire below 3.5 grams per tex are given.

Importance of Fiber Quality

Each sector of the cotton industry receives significant benefits from the present system of measuring and reporting cotton quality. Cotton producers use fiber property values as a check on production and harvesting methods. These values also help determine what premiums or discounts farmers can expect for the marketed quality, if applicable. For the ginner, cotton quality measures are very useful as a means of establishing specified ginning procedures. HVI values and other quality measures permit the cotton merchant to more effectively assemble bales into even-running lots (large numbers of bales of like quality) to better satisfy textile mill specifications on purchase contracts.

Quality measures are also used in forward contracts and on organized exchanges, in addition to uses in the usual farmer-to-merchant-to-mill marketing chain and indirect farmer-to-mill sales. Forward contracts, which are signed prior to harvest, call for the farmer to place a quantity of cotton production from certain acreage under contract. For a grade and staple contract, a single price may be established for all cotton meeting a preset minimum quality or the price may depend on quality deviation from a base quality. Futures contracts, such as those on the NYCE, specify within narrow limits the quality acceptable for delivery. Information on quality, despite its addition to marketing costs, is essential for efficient operation of all alternative marketing arrangements and helps enhance the competitiveness of U.S. cotton.

For textile mills, different end-use requirements, such as yarn strength and yarn and fabric appearance, require different fiber qualities (table 5). The ability of a fabric to hold dyes, as well as recently developed finishes such as shrink resistance, flame retardance, and durable press, depends on fiber qualities. For given product requirements or spinning characteristics, a textile producer may not be able to obtain all the raw fiber qualities needed when buying a particular generic type cotton from a given location. Fiber quality of a particular cotton variety can vary widely by farmer and year. In such instances, quality measures become the basis for a recipe of sorts; the textile producer blends, or lays down, mixes of various types of cotton to obtain a specific quantity of cotton with the required quality measures. Some properties, such as trash or length uniformity, spindle speed,

Table 5—Cotton quality factors and their effects on textile mill processing

Quality factor	Processing characteristics affected
Grade:	
Color	Dyeing, bleaching.
Trash	Processing waste, textile machinery contamination, product appearance, cotton dust levels.
Preparation	Processing waste, product appearance.
Staple	Yarn and fabric fineness and strength, nep formation during processing.
Character:	
Fineness and maturity, yarn and fabric strength, waste, ends down.	Nep formation during processing, product appearance, processing.
Length uniformity	Processing waste, ends down.
Strength	Yarn and fabric strength, ends down.

end breakage, or losses due to waste, also affect cost of production. Staple length or fineness and maturity affect yarn and fabric quality such as appearance, strength, and fabric feel.

The growth toward more stringent standards for end-product quality, as dictated by consumers, has been an important element in establishing the relationships among classes of cotton, spinning performance, and product quality. Technological advances in textile production have sharpened the importance of the relationship between processing costs and fiber quality.

Poor quality fiber results in higher waste levels, increased ends down (interruptions in the yarn formation process), and more seconds in finishing operations. Manufacturers must have detailed fiber quality information to keep pace with increasing processing speeds and to assess the potential for cost-cutting innovations, which increase the competitive position of the U.S. textile industry.

Significant potential exists for continued growth in the market for U.S. cotton. Domestic use should continue to expand, and fiber market share should remain near current high levels. Exports of U.S. cotton are also expected to account for about 25 percent of world cotton trade—slightly above the traditional level. To reach this level, cotton fiber must have the desired qualities to move quickly through market channels to enhance its marketability. Various marketing strategies must be developed and refined that incorporate the new fiber quality measurement and reporting systems.

Chapter 4

Textile and Apparel Manufacturing

Edward H. Glade, Jr.*

The textile and apparel industries transform raw fiber into finished consumer and industrial products (fig. 1). These industries represent one of the largest sectors in the U.S. economy, providing employment for 1.7 million people in 1991. The textile industry consumed 13.7 billion pounds of raw fiber in 1991 and produced a record high level of output. Growth in mill use of all fibers over the last decade has been slow but fairly steady (table 1).

Cotton was the major fiber used in U.S. textile production until 1967, when cotton's share of total fiber use fell below 50 percent for the first time. Manmade fibers continued to take a larger share of the fiber market, causing cotton's share to fall to only 25.1 percent by 1984. Cotton has since increased its share of fiber consumption, reaching 32.3 percent in 1992. Wool use has remained at about 1 percent of total fiber use for many years.

The Fiber-to-Fabric Process

The mechanical processes of turning individual fibers into finished cloth or fabric involves numerous complex machines and manufacturing operations. A 1-pound sample of raw cotton contains about 100 million separate fibers, which must be processed into a usable product.

The first step in this process begins when the fiber arrives in the opening room of the textile mill. Cotton from a number of bales is blended together and separated into large tufts. The blending and mixing of bales with known fiber properties is necessary to maintain uniform processing performance and yarn quality. The number of bales used in a mix depends on the amount of detailed knowledge of the fiber properties of each bale and on the type of product to be manufactured. Be-

Table 1—U.S. mill use of fibers and cotton's market share, 1980-92

	U.S. mill use		
Year	All fibers	Cotton	Cotton's share
	- - - - Million pounds - - - -		*Percent*
1980	11,227	3,036	27.0
1981	10,722	2,716	25.3
1982	9,389	2,488	26.5
1983	11,129	2,808	25.2
1984	10,823	2,715	25.1
1985	11,109	2,813	25.3
1986	12,053	3,259	27.0
1987	12,966	3,753	28.9
1988	12,866	3,520	27.4
1989	13,559	4,046	29.8
1990	13,445	4,115	30.6
1991	13,724	4,348	31.7
1992	14,762	4,762	32.3
1993	15,364	4,938	32.1

Source: U.S. Department of Agriculture, Economic Research Service.

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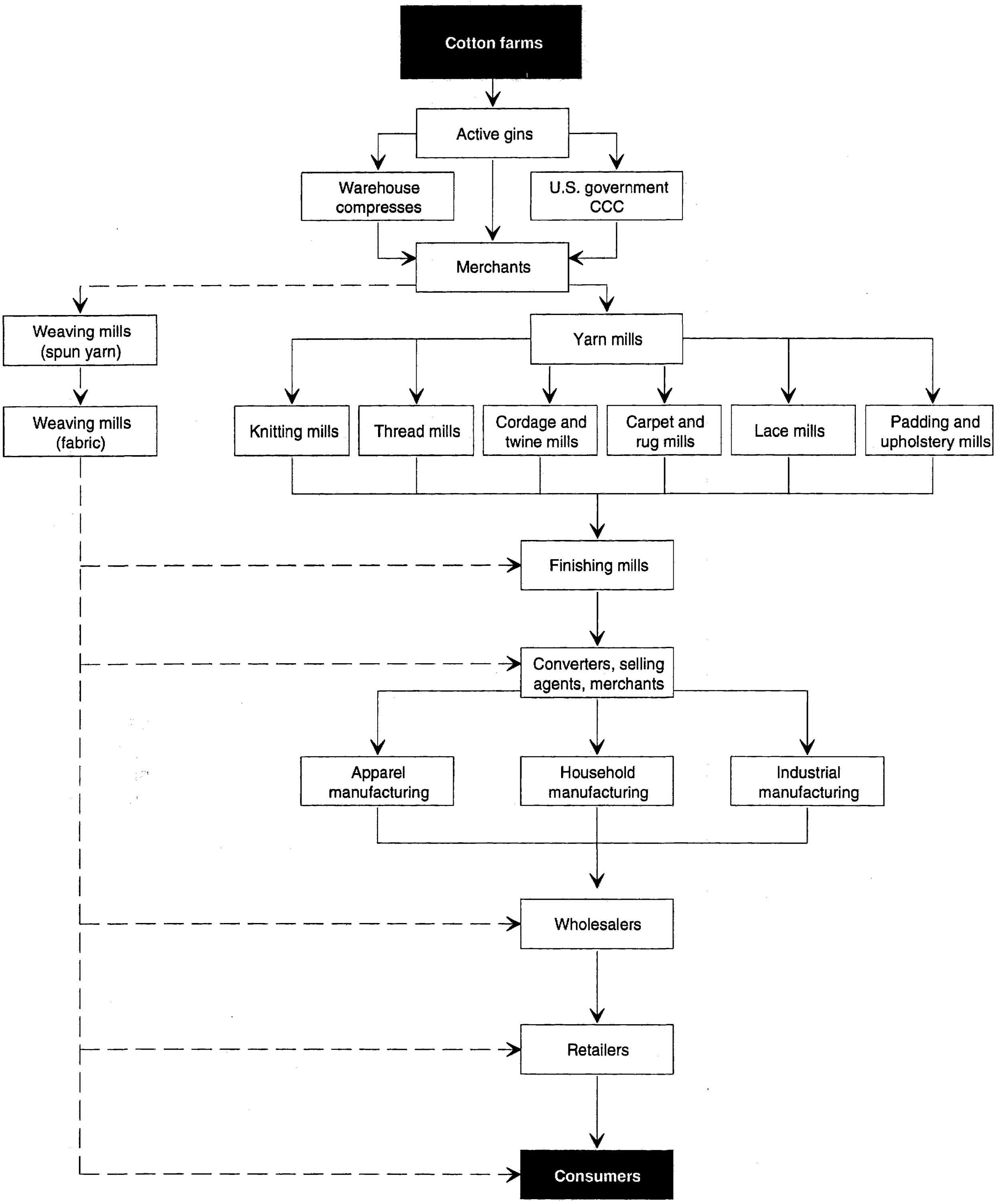
Figure 1
U.S. cotton industry flow chart



tween 6 and 12 bales are typically mixed, but the number can total more than 50 bales in some applications.

After leaving the blending machines, the large tufts of cotton pass through cleaning equipment where they are reduced in size and fluffed, and trash (such as stems, leaf, and seed coat fragments) is removed. The next step is picking, where trash removal continues and small tufts are formed into a continuous sheet known as a picker lap. The picker lap is then fed into carding machines. Carding is the most important process in yarn manufacturing. The small tufts of fiber are worked into a high degree of separation or openness, most of the remaining trash is removed, and the fibers are then collected into a ropelike form called card sliver. The sliver is coiled in large drums for further processing.

Approximately 80-85 percent of all cotton yarn produced in the United States is carded yarn. The remainder is processed as combed yarn, which involves a much higher degree of cleaning and fiber preparation. Combing machines remove most of the short fibers and some poorly formed longer fibers. This material, called "noils," has resale value for use in coarse cotton yarn, nonwoven products, and some industrial uses.

Drawing and roving are the last processes before the final yarn formation on the spinning frame. The drawing operation uses a system of rollers drawing out the slivers and making the fibers parallel. This process evens fibers by merging as many as eight individual slivers into one strand about the width of a thick rope. The roving process further reduces the weight per unit length of the sliver to a suitable size for spinning into yarn, and twists the fibers together to maintain integrity of the strand. Roving twists the strand just enough to allow it to be spun without breaking. Fiber length or staple is very important at this stage. Longer, finer cotton requires less twist in roving and spinning than shorter, coarser cottons for equivalent yarn strength.

Spinning is the most expensive single process in converting fiber into yarn. Because of the high cost of yarn production and the critical relationships among fiber properties, yarn quality, and end-product performance, considerable research efforts have been directed toward increasing the economic efficiency of this operation.

Two primary methods of yarn spinning are used by textile firms throughout the world: ring spinning and open-end spinning. Approximately 30-35 percent of cotton yarn is produced by ring spinning, and 65-70 percent is produced by the open-end process. New technologies employing advanced methods of yarn formation, such as air-jet spinning, are being tested. These techniques may result in a wide selection of spinning methods that are directly tied to the type and style of end-product.

The traditional ring spinning process involves passing roving yarn through rollers of the spinning frame where the strands are twisted 10-30 times per inch to form a strong yarn. The yarn is then wound into conical, foot-long bobbins. Yarn produced by this method varies from the coarsest yarns, for use in such products as mops and ropes, to the finest yarns, for use in specialty fabrics such as ribbons and fine apparel. Improvements in ring-spinning technology over the years have greatly increased processing speeds and yarn quality and have significantly reduced labor requirements. Current ring spinning equipment operates at approximately 10,000-20,000 revolutions per minute, more than double the speeds of 20 years ago.

Open-end spinning eliminates the roving process and occasionally one drawing operation, resulting in lower processing costs and shorter manufacturing runs. With speeds of over 100,000 revolutions per minute, the production rate of open-end equipment is significantly higher than for ring spinning. To produce open-end spun yarn, drawing sliver is pulled into the system, where a small opening roller with wire teeth pulls off individual fibers, then into an airstream, and finally into a rapidly spinning rotor. Fibers are deposited on the perimeter of the rotor where they are evenly distributed in a small groove. Then, using a started yarn, the rotor with spinning action twists the fibers together. Yarn from open-end spinning is more uniform than ring-spun yarn, but may be weaker and have a harsher feel. Its properties are well suited for heavier fabrics such as denim, toweling, and corduroy. Cotton with lower micronaire (coarse fibers) and high fiber strength are best suited for open-end spinning.

Before yarn can be processed into fabric, an additional step is usually performed. Yarn is transferred from bobbins onto packages of yarn called cones by high-speed winding machines (winders). This operation cannot be economically produced at the time of spinning. Also, depending on end-use and properties desired, yarns may be plied after winding. Plying involves the twisting together of two or more single yarns. Plied yarns are more uniform and stronger than single yarns and have better abrasion resistance; thus they are used primarily in fine apparel and industrial fabrics.

Weaving and knitting are the two primary methods of transforming yarn into fabric. Weaving is performed on a loom process in which lengthwise (warp) yarns are interlaced with crosswise (filling) yarns. Warp yarn is fed to the loom from a beam—a cylindrical object shaped like a spool containing thousands of yarns. Filling yarn is inserted by passing a shuttle containing a bobbin or yarn through the warp yarns. Other methods of filling insertion include using rapiers or jets of air to propel the filling yarn. The cycle (called a pick) is repeated continuously to form a fabric.

The weaving industry is changing. Technology has advanced rapidly in recent years, making significant increases in weaving speeds possible. Looms typically have been capable of producing fabric at nominal rates of 300 picks per minute. Modern high technology looms are now capable of almost twice this rate. These faster speeds and higher production rates place added stress on yarn quality, and, consequently, fiber property requirements are affected. Yarns used in high-speed weaving must be stronger and more uniform than yarns formerly used. These demands for improved strength and uniformity have magnified the need for instrument measurements in the marketing and use of cotton.

Preparing yarn for knitting is relatively simple, compared with the process required for weaving. Fabric can be knitted directly from cones of good quality yarn without any preparation other than application of wax or lubricant to help reduce fly (airborne fiber particles) and to facilitate movement through thread guides and devices for maintaining uniform tension as the yarn is fed in the machine.

Knitting is performed by forming loops with a single, continuous yarn and joining each loop to form a fabric. The loops of a knitted fabric form a series of chains, called wales, that run lengthwise in the fabric. The loops also form lines, called courses, at right angles to the wales. Wales and courses in knitted fabric are equivalent terms to ware and filling in woven fabrics. Knitted fabrics can be either warp knit or weft knit. In weft knit fabrics, the yarns forming the loops generally run crosswise in the fabric. In warp knits, the yarns run lengthwise. Knitting machines may be either circular or flat. Flat knitting machines have needles arranged in one plane or in two planes at right angles to each other. Flat knitting machines may produce either flat or tubular fabrics. Circular machines have one or two sets of needles arranged in a circle and produce tubular fabrics.

Nonwoven fabrics are manufactured by chemically or mechanically bonding individual fibers to form a mat or web. Numerous methods and adhesives are used to complete the nonwoven structure. Typical nonwoven products include disposable clothing, medical supplies, filters, and wiping cloths. Most types of manmade fibers, cotton, and wool are used in nonwoven products. Cotton is the primary fiber for nonwoven applications where absorbency is important.

Fabric finishing is the final step in the textile manufacturing process. Some fabrics (called gray cloth), such as that used in bagging, are ready for fabrication when they come from the loom. All other fabrics are finished in various ways. These finishing steps include bleaching, dyeing, and Sanforizing to prevent shrinking. Sometimes packages of yarn are dyed in vats before the yarn is made into fabric (called yarn-dyed cloth).

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, such as sheets or blouses, calls for a design, the cloth is printed on one side only. This is done by roller or screen printing. Improved technology permits printing up to 12 colors on fabric at speeds of 150 yards per minute. Designs are also added to fabric through heat-transfer printing, a sophisticated version of printing that uses an electric hand iron. 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.

After finishing, the fabric is shipped to manufacturers who fabricate apparel, home furnishings, other consumer products, and industrial products. A small portion of yarn, gray cloth, and finished fabric is exported without further processing. During 1991, approximately 8 percent of total U.S. mill consumption of cotton was accounted for by cotton contained in exported semi-manufactured products.

Textile Manufacturing Industries

Firms that spin yarn, weave, knit, and finish fabric, and produce other miscellaneous textiles are classified by the U.S. Office of Management and Budget in Standard Industrial Classification (SIC) group 22, Textile Mill Products.

Number and Location of Mills

In 1992 (latest year available), 4,768 companies operated about 5,534 textile mills (table 2). From a decade earlier, the number of companies declined 11 percent and the number of plants decreased over 9 percent. The largest declines in plant numbers have been in the knitting industry and in dyeing and finishing plants. Growing consumer and industrial demand for new and innovative products, however, has increased the number of

Table 2—Number of companies and establishments in textile mill products industries

Industries[1]	Companies 1982	Companies 1987	Companies 1992	Establishments 1982	Establishments 1987	Establishments 1992
			Number			
Yarn and thread mills	220	414	372	714	611	598
Cotton weaving mills	209	246	288	269	301	331
Manmade fiber weaving mills	342	315	327	523	433	428
Wool weaving mills	115	105	87	131	120	99
Narrow fabric mills	241	248	225	281	276	259
Knitting mills	2,103	1,979	1,574	2,399	2,104	1,731
Dyeing and finishing plants	708	607	442	753	648	482
Floor covering mills	NA	420	385	505	467	450
Miscellaneous textile mills	984	1,004	1,068	1,055	1,078	1,156
Total	4,922	5,338	4,768	6,630	6,038	5,534

NA = Not available. Not included in totals.

[1]Three digit, SIC industry groups as defined by the Standard Industrial Classification Manual, 1987. SIC codes for selected industries are: yarn and thread mills, 2281, 2282, and 2284; cotton weaving mills, 2211; manmade fiber weaving mills, 2221; wool weaving mills, 2231; narrow fabric mills, 2241; knitting mills, 2251, 2252, 2253, 2254, and 2257; dyeing and finishing plants, 2261, 2262, and 2269; floor covering mills, 2273; miscellaneous textile mills, 2295, 2296, 2297, 2298, and 2299.

Source: 1992 Census of Manufactures, various industry series.

weaving mills and the number of miscellaneous textile goods manufacturers.

A major migration of the textile industry from New England to the South started in the 1920's. Lower taxes, plentiful labor supplies, adequate water power, and closeness to raw materials were factors contributing to this shift. Today, the textile mill products industry is concentrated primarily in North Carolina, South Carolina, Alabama, and Georgia. In 1992, approximately 90 percent of all raw cotton consumed by domestic mills was used in these four States, and about 65 percent was used in the States of North and South Carolina alone. Yarn mills and weaving mills are primarily located in these Southern States, while about half of all knitting mills are located in the South. Knitting mills are also heavily concentrated in the States of Pennsylvania and New York, but they are generally smaller mills primarily producing knit outerwear such as coats and sweaters. The production of carpets and rugs is a large industry, mainly concentrated in Georgia. Total value of shipments from floor-covering mills exceeded $9.8 billion in 1992.

Most textile finishing plants do not take title to the cloth they process but perform these services on order for others. Firms known as converters purchase gray cloth and move it through finishing plants for sale to manufacturers of apparel, household products, and industrial products. Converters and finishing plants, therefore, tend to be located near their primary market outlets. In 1992, North Carolina, South Carolina, and California each had about 10 percent of the finishing plants with the remainder scattered through 15 States in the South and New England.

Employment and Earnings

The textile mill-products industries employed 590,800 people in 1992, down 20 percent from 10 years earlier (table 3). With a total payroll of over $11 billion, textile mills remain a significant economic factor in many areas of the United States. In 1977 and 1982, weaving mills employed the most workers (about 34 percent). By 1987, weaving mills had dropped below knitting mills in employment even though employment in knitting mills was decreasing. Knitting mills, because of their large numbers, represent approximately 31 percent of employment, but are generally small mills with an average of about 95 employees per establishment, compared with an average of 186 employees for yarn mills and 174 employees for the average weaving mill.

Textile mill employment grew throughout the 1960's, reflecting expanding industrial production and U.S. economic activity. However, total employment declined during the mid-1970's as did the average number of employees per mill. A growing volume of U.S. textile imports reduced the demand for American-made products. In an effort to remain competitive, U.S. mills have rapidly adopted numerous labor-saving innovations such as automated bale opening and feeding systems, open-

Table 3—Employment and payroll in textile mill products industries

Industries[1]	Employment 1982	Employment 1987	Employment 1992	Payroll 1982	Payroll 1987	Payroll 1992
	Thousand			*Million dollars*		
Yarn and thread mills	108.6	113.9	92.2	1,277.7	1,505.8	1,743.9
Cotton weaving mills	76.9	72.5	56.1	964.6	1,262.7	1,149.8
Manmade fiber weaving mills	140.8	89.1	87.0	1,815.2	1,610.4	1,847.2
Wool weaving mills	13.1	15.0	13.8	175.8	243.9	281.4
Narrow fabric mills	17.5	19.0	16.9	215.5	304.4	325.8
Knitting mills	225.1	199.9	170.1	2,352.4	3,004.0	2,873.9
Dyeing and finishing plants	58.0	55.2	51.1	851.9	1,028.8	1,152.2
Floor covering mills	41.8	53.2	49.4	603.1	998.4	1,084.7
Miscellaneous textile mills	53.7	52.9	54.2	807.6	1,107.9	1,397.7
Total	735.5	670.7	590.8	9,063.8	11,066.3	11,856.6

[1]Three digit, SIC industry groups as defined by the *Standard Industrial Classification Manual*, 1987.

end spinning equipment, and high-speed shuttleless weaving looms.

Total wages and salaries paid in the textile mill products industries have continued to increase, despite declining employment and mill numbers. Inflation has been one factor in higher wages, but more important is the nature of the work force itself. Greater emphasis on automation and the adoption of new technology in mills have increased the demand for more highly skilled workers, including textile school graduates. Also, increased competition for skilled labor between textile and nontextile employers in many areas of the South has tended to increase the overall level of wages.

Value of Shipments

The value of shipments from weaving mills (cotton and manmade fiber) exceeded $14.5 billion in 1992. Knitting mills shipped over $14.4 billion of products, and yarn and thread mills shipped nearly $11.3 billion (table 4). Altogether, nearly $68 billion worth of textile materials were shipped from mills in 1992.

Growth in textile mill value of shipments between 1982 and 1992 reflects increases in overall inflation and actual growth in product shipments. Since 1982, the Producer Price Index went up 42 percent, while the value of textile shipments grew by 48 percent. Shipments from yarn and thread mills increased by over 61 percents in value, while cotton, wool, and narrow fabric weaving mills also experienced strong growth in output. Knitting mills and dyeing and finishing plants had above-average growth in value of shipments between 1982 and 1992 because of sharp increases in consumer demand for these products.

Table 4—Value of shipments in textile mill products industries

Industries[1]	Value of shipments 1982	1987	1992
	Million dollars		
Yarn and thread mills	7,036	10,261	11,277
Cotton weaving mills	3,972	5,508	5,912
Manmade fiber weaving mills	8,187	8,049	8,678
Wool weaving mills	763	1,051	1,611
Narrow fabric mills	852	1,136	1,320
Knitting mills	9,627	12,024	14,458
Dyeing and finishing plants	4,972	7,062	7,052
Floor covering mills	5,882	9,795	9,841
Miscellaneous textile mills	4,863	6,372	7,790
Total	46,154	61,258	67,939

[1]Three digit, SIC industry groups as defined by the Standard Industrial Classification Manual, 1987.

Source: 1992 Census of Manufactures, various industry series.

Integration of Production

Many textile firms have combined (vertically integrated) two or more stages in the manufacture and distribution of products under one management. These stages may include (1) spinning and weaving; (2) weaving and finishing; (3) spinning, weaving, and finishing; (4) finishing and fabricating; (5) fabricating and wholesaling; or (6) fabricating, wholesaling, and retailing. Most of the largest companies in the textile industry fall into the group combining spinning, weaving, and finishing. Some of these large integrated companies also produce some finished consumer items. A few companies combine all stages from spinning through retailing.

Cotton weaving mills bought 34 percent of the raw cotton purchased by manufacturing in 1992 and also produced yarn and broadwoven fabric (table 5). Gray goods (unfinished cloth) made up the major part of production in those mills and also accounted for a large part of finished fabric. Broadwoven fabric mills sold finished fabric to apparel and other manufacturers or used it to produce sheets, pillowcases, towels, and similar consumer items.

Some knitting mills manufacture the yarns they use in knitting. Some mills knit, dye, and finish fabrics, and some manufacture outerwear, underwear, and nightwear from fabric they have knitted in the same establishments. Companies have integrated production to ensure an uninterrupted supply of suitable raw materials and to come in closer contact with buyers further along in the marketing channel. Thus, some companies are able to develop and promote branded products. Furthermore, integration usually means spreading some overhead costs over more units of production.

Apparel Industries

The apparel industry is made up of many relatively small firms. These firms tend to have modest capital and produce numerous styles, sizes, and types of clothing in small lots. Firms in the apparel industry are frequently called cutters. These firms buy finished fabrics from converters, finishers, or textile mills. They manufacture apparel items such as coats, trousers, dresses, shirts, and hats, and sell the finished products. Firms that buy fabrics and manufacture apparel are known as manufacturers. Firms known as jobbers mainly buy raw materials, arrange for their manufacture in plants operated by contractors, and sell the finished products. Some jobbers use materials in their own establishments; contractor firms process materials owned by others.

In 1992, 12,729 companies produced apparel and related products in 13,433 manufacturing establishments (table 6). The number of companies has declined about 12 percent since 1982 and the number of operating establishments about 17 percent. Employment was down 24 percent, but payroll increased 15 percent. The declines are in response to interrelated factors, such as increased manufacturing costs, technological advances in production, and the increasing share of U.S. apparel market supplied by imported textiles.

Manufacturers of men's and boys' apparel declined about 12 percent during 1982-92, compared with an 11-percent drop in companies producing women's and children's apparel. Establishments producing men's and boys' apparel are relatively large operations that require more labor and manufacturing equipment than most other types of apparel producers. In 1992, approximately 77 percent of all establishments producing men's and boys' apparel had more than 20 employees, while only 47 percent of the manufacturers of women's and children's apparel had more than 20 employees. For all apparel producers combined, employment totaled 737,500 in 1992 with a total payroll of $10.9 billion.

The production of apparel is widely dispersed geographically among most States. For example, men's and boys' shirts were produced in over 30 States in

Table 5—Cotton consumed in textile mill products industries

Industries[1]	Cotton consumed 1982	Cotton consumed 1987	Cotton consumed 1992	Share of total 1982	Share of total 1987	Share of total 1992
	1,000 bales			*Percent*		
Yarn and thread mills	1,625	3,160	5,103	32.6	44.8	53.5
Cotton weaving mills	2,213	2,993	3,285	44.6	42.5	34.4
Manmade fiber weaving mills	1,058	812	953	21.3	11.5	10.0
Wool weaving mills	0	0	3	0	0	3
Narrow fabric mills	15	[2]	2	.3	[2]	2
Knitting mills	47	83	115	1.0	1.2	1.6
Dyeing and finishing plants	0	0	0	0.0	0	0
Floor covering mills	0	0	2	0.0	0	2
Miscellaneous textile mills	9	[3]	50	.2	[3]	0.5
Total	4,967	7,048	9,546	100	100	100

[1]Three digit, SIC industry groups as defined by the *Standard Industrial Classification Manual*, 1987. [2]Not collected for this industry. [3]Withheld to avoid disclosing data for individual companies.

Source: *1992 Census of Manufactures*, various industry series.

Table 6—Number of companies and establishments, employment and payroll in apparel manufacture

Item	Men's and boys' apparel[1]			Women's and children's apparel[2]			Total		
	1982	1987	1992	1982	1987	1992	1982	1987	1992
					Number				
Companies	2,353	2,000	2,062	12,007	11,551	10,667	14,360	13,551	12,729
Establishments									
Total	3,073	2,541	2,311	12,980	12,116	11,122	16,053	14,657	13,433
With over 20 employees	2,156	1,874	1,775	6,451	5,381	4,560	8,607	7,225	6,335
					Thousands				
Total employment	374.1	339.7	307.0	587.7	619.8	430.5	961.8	844.7	737.5
Employees per establishment	121	134	133	45	42	39	60	58	55
					Million dollars				
Payroll	3,715	4,045	4,399	5,721	6,171	6,458	9,436	10,216	10,857

[1]Included SIC industries 2311, 2321, 2322, 2323, 2325, 2326, and 2329. [2]Includes SIC industries 2331, 2335, 2337, 2339, 2341, 2342, 2353, 2361, and 2369.

Source: *1992 Census of Manufactures.*

1992. California had the most plants, followed by North Carolina and New York. The States with the largest number of plants producing women's and children's apparel were New York, Pennsylvania, and California.

In recent years, growth in percentage of firms producing apparel has been in the South Atlantic region and in California. Declines have been mostly in the Middle Atlantic and New England States.

Chapter 5

Farm Programs for Cotton

Charles V. Cunningham*

Two separate government programs for cotton are in effect, one for upland cotton and the other for extra-long staple (ELS) cotton. The following chronology of farm programs relates chiefly to upland cotton programs, ending with a brief description of ELS cotton programs.

Upland Cotton Programs

Since the turn of the century, cotton and other farm commodities have frequently experienced excess production capacity, high stocks, and low prices. As with wheat and feed grains, government programs that control production, stabilize prices, and support farm income have been in effect for over 50 years. For cotton, acreage allotments, marketing quotas, and price supports based on a percentage of parity were in effect during most of the early years of government programs. Since 1966, the upland cotton program has been more market oriented, featuring price supports based on a percentage of the previous years' prices with direct payments to producers participating in voluntary acreage reduction programs.

Recent legislation includes additional provisions designed to keep U.S. cotton priced competitively in both domestic and export markets. These programs have helped stabilize and improve farm income and have slowed the transfer of resources out of cotton production, but they have not stopped the wide swings in production, stocks, and prices.

Early Programs

The decline in the economic condition of farmers, especially cotton farmers, after World War I led to public discussion of possible programs to stabilize commodity prices and increase farm income. Farm leaders had been advising farmers to control production on a voluntary basis as a means of stabilizing market prices.

The failure of those efforts to affect the acreage of crops in oversupply and mounting pressure for legislation to cope with a depressed farm economy led to enactment of the Agricultural Marketing Act of 1929. This act created the Federal Farm Board, which made loans to marketing cooperatives for the purchase and storage of surplus commodities including cotton. This program failed to achieve its objectives of stabilizing prices or increasing farm income. The failure was due in part to the absence of an effective program to control production, but more importantly to declining demand for cotton and other farm products during the Great Depression. This experience led to the enactment of the Agricultural Adjustment Act of 1933, a comprehensive program of designated basic commodities, including cotton. One of the major goals of the act was to restore farm purchasing power of agricultural commodities to the 1910-14 average level. This concept later became known as parity, which was translated into parity prices for each of the basic commodities. The concept was used to establish minimum levels of price support through the mid-1960's for cotton (table 1). Parity prices were based on a rigid historical formula and failed to reflect changing market conditions and technological advances.

Production control was a primary objective of the Agricultural Act of 1933 and subsequent legislation. Farmers could take land out of production in return for benefit payments. In response to very low cotton prices received

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Table 1—Average price support levels and average price received by farmers for upland cotton under early agricultural programs, 1933-63

Crop year	Percent of parity[1]	Price support loan[2]	Season-average price received by farmers (gross weight)
	Percent	*Cents/pound*	
1933	69.0	10.00	10.17
1934	76.0	12.00	12.36
1935	62.0	10.00	11.08
1936	[3]	[3]	12.34
1937	53.0	9.00	8.40
1938	52.0	8.90	8.58
1939	56.0	8.75	9.06
1940	57.0	9.40	9.83
1941	85.0	14.42	16.95
1942	90.0	17.42	18.90
1943	90.0	19.51	19.76
1944	95.0	21.33	20.72
1945	92.5	21.39	22.51
1946	92.5	24.68	32.63
1947	92.5	28.19	31.92
1948	92.5	31.49	30.38
1949	90.0	30.03	28.57
1950	90.0	30.25	39.90
1951	90.0	32.36	37.69
1952	90.0	32.41	34.17
1953	90.0	33.50	32.10
1954	90.0	34.03	33.52
1955	90.0	34.55	32.27
1956	78.0	32.74	31.63
1957	81.0	32.31	29.46
1958	80.0	35.08	33.09
1959[4]	80.0	34.10	31.56
	65.0	28.40	31.56
1960[4]	75.0	32.42	30.08
	60.0	26.63	30.08
1961	82.0	33.04	32.80
1962	79.0	32.47	31.74
1963	79.0	32.47	32.02

[1]Reflects average level. In 1944 and 1945, CCC purchased cotton at 100 percent of parity. [2]Prior to 1961, support was based on 7/8-inch Middling cotton, but all support prices have been converted to 1-inch Middling to make them comparable. Reported on gross weight basis. [3]Price support loans were not available in 1936. [4]In 1959 and 1960, producers could elect to (a) plant their allotment and receive support at not less than 80 percent of parity for 1959 and 75 percent for 1960, or (b) increase their acreage by as much as 40 percent over their allotment and receive support at a level 15 percent of parity less than that of choice (a).

by farmers in 1932 and an abnormally high carryover, a cotton plow-up campaign in 1933 successfully eliminated about 10 million acres, or one-fourth of the growing crop. Growers received cash payments for their participation in the program. However, before the 1933 crop could be harvested, the deteriorating financial condition of cotton farmers led them to demand price supports. In response, a nonrecourse loan of 10 cents per pound was authorized on the 1933 crop. Nonrecourse means that the producer may pay back the full dollar amount of the loan, or alternatively, deliver the stored cotton to the Commodity Credit Corporation (CCC). Such delivery constitutes payment of the price support loan in full, regardless of the current market value of cotton.

Marketing quotas were legislated in 1934 to prevent nonparticipants in the acreage control program from sharing in its financial benefits. The quotas restricted the quantity of cotton that each producer could sell without paying a penalty tax. Marketing quotas, which were a longstanding provision of subsequent cotton programs, ended in 1970.

The production control and financing features of the 1933 Act were declared unconstitutional by the Supreme Court in 1936. This action was followed by enactment of the Soil Conservation and Domestic Allotment Act in 1936, which provided payments to farmers who agreed to adopt soil-building practices and shift land from soil-depleting surplus crops such as cotton and wheat to soil-conserving crops such as legumes and grasses. The soil-conserving payments in the 1936 Act failed to bring the desired cotton crop reduction. Harvested acreage in 1937 climbed to 33.6 million acres, compared with an average of about 28 million acres each year from 1933 through 1936.

Mounting crop surplus and declining farm prices led to the Agricultural Adjustment Act of 1938. This act provided for mandatory price support loans and marketing quotas keyed to acreage allotments. The latter provision was intended to balance production with market needs. Acreage allotments and marketing quotas were used for cotton from 1938 to 1942. The acreage planted to cotton declined to less than 25 million acres under this program, but there was not a comparable decline in production because of increasing yields.

Cotton acreage allotments were not in effect during 1943-49 because of the need to expand production during and following World War II. However, cotton price support ranged up to 95 percent of parity during these years. Cotton acreage declined during the war and then expanded slowly, reaching 28.3 million acres in 1949, which was over 17 percent above the 1938-42 average. The anticipation of a return to acreage allotments in 1950 may have accounted for part of the large acreage in 1949.

The Agricultural Act of 1948 included mandatory price support for cotton at 90 percent of parity if producers approved marketing quotas. The Agricultural Act of 1949 established support prices for cotton and the basic commodities at levels ranging from 75 to 90 percent of parity, depending on supply. Cotton prices were supported at 90 percent of parity through 1955.

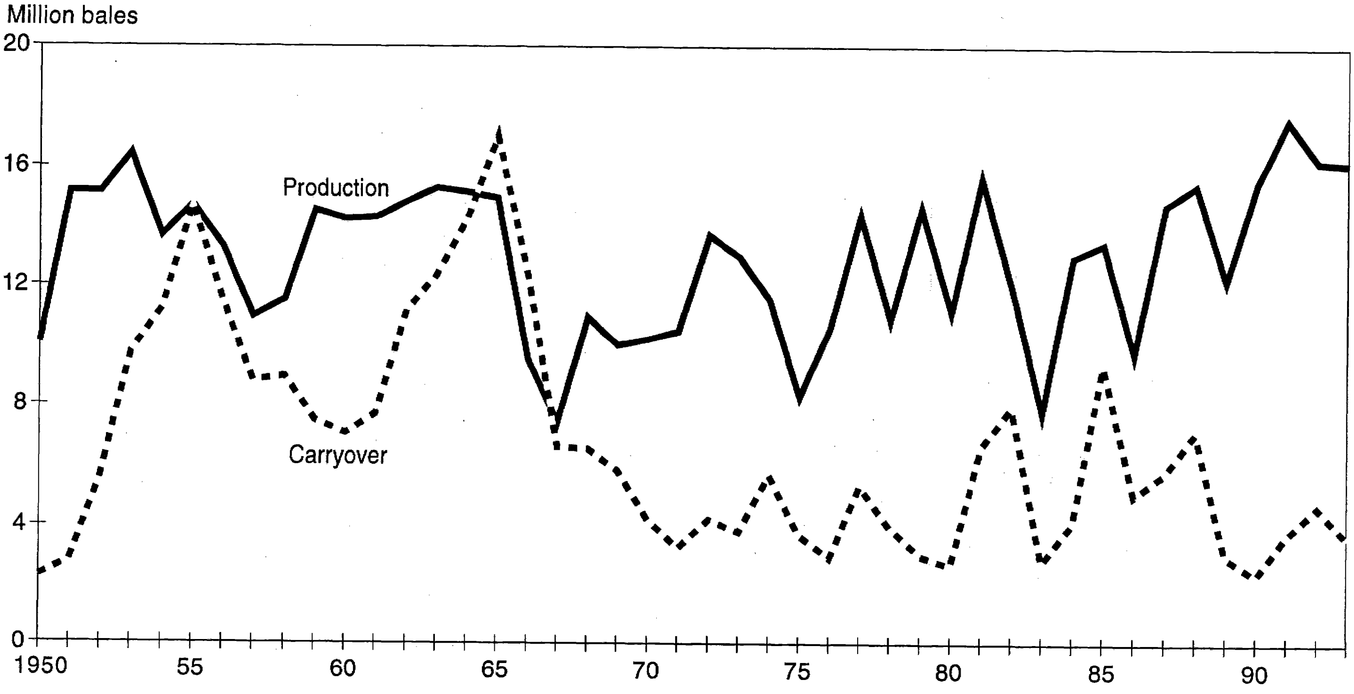
Cotton acreage dropped about 35 percent in 1950 with the return of acreage allotments and marketing quotas. Production restrictions were again removed during 1951-53 because of the Korean War, and both acreage and production increased substantially. Production reached 16.5 million bales in 1953, a level not to be exceeded until 1991 (fig. 1).

Increased production and stocks during 1950-53 prompted the renewal of allotments and marketing quotas under the Agricultural Act of 1954. Cotton was under marketing quotas continuously from 1954 through 1970. Under the 1954 Act and subsequent programs, cotton acreage declined from the 1951-53 average of 25.7 million acres to 18.1 million in 1954-55 and 13.7 million during the soil bank years in 1956-58. The soil bank was established by the Agricultural Act of 1956 to (1) reduce the amount of land planted to allotment crops and (2) provide for long-term retirement of cropland to conservation uses. The soil bank program idled acreage, but in relative terms, the reduction in capacity to produce was small. A major objection to the program was that communities were disrupted when many surrounding farmers placed whole farms in the conservation reserve. Yields continued to increase. Over the next 7 years (1959-65), cotton acreage averaged 14.8 million acres, and the accumulation of cotton stocks was substantial. Cotton prices received by farmers generally remained close to the loan level (table 1). Despite marketing quotas, supplies continued to increase because the allotment level had been reduced to the minimum allowed by legislation, leaving program administrators with no further allotment reduction discretion.

Cotton Programs in the 1960's

In the late 1950's and early 1960's, policymakers realized that surpluses were mounting and existing legislation provided no effective provision to deal with them. Stocks peaked at 17 million bales at the end of the 1965 crop year (fig. 1), which exceeded total use that year by 4.5 million bales. Most of the stocks were owned by the CCC. Legislated minimum support prices and allotments, particularly for wheat and cotton, in conjunction with increasing yields insulated producers from the market. Even so, individual producers were dissatisfied because the allotment rigidities prevented desired production

Figure 1
U.S. cotton production and carryover, by crop year



shifts among crops in which they had a comparative advantage.

The Cotton-Wheat Act of 1964 authorized the Secretary of Agriculture (Secretary) to make payments to domestic handlers or textile mills in order to bring the price of cotton used in the United States down to the export price. This essentially ended the two-price system that had been in effect since 1956. Also, a domestic cotton allotment, smaller than the regular allotment, was authorized for 1964 and 1965. Producers who planted within the domestic allotment received a higher support through a direct price support payment. This act had two elements common to attempts to deal with surpluses: demand enhancement and voluntary acreage reduction. The 1964 Act was the beginning of voluntary programs for reducing cotton production.

The Food and Agriculture Act of 1965 was a major piece of farm program legislation that included dairy, wheat, feed grains, and cotton. The act also established a cropland adjustment program. The legislation covered 1966-69, and was later extended to 1970. This act was more market oriented, with price supports for all of the covered commodities, except dairy, set below world market prices. The market price of cotton was supported at 90 percent of estimated world price levels. Incomes of cotton farmers were maintained through payments based on the extent of participation in an acreage reduction program (ARP). A minimum acreage reduction of 12.5 percent of the cotton acreage allotment was required of participants. Small farms had special provisions. For the first time, sale and lease of allotments within a State were permitted. Planted cotton acreage dropped from 14.1 million acres in 1965 to 10.3 million acres in 1966. The price support loan dropped from 29 to 21 cents. However, that reduction was offset by a price support payment (table 2). Starting in 1966, cotton producers joined wheat and feed grain producers in diverting cropland acreage to approved conserving uses. Cotton production was substantially reduced during 1966-68 because of attractive diversion payments and low yields in 1966 and 1967.

By the end of the 1970 season, the huge CCC inventory of cotton was gone. The voluntary programs to reduce acreage had met the objective of reducing or eliminating surpluses, but they had raised a new issue: the direct Treasury cost of programs and the amount of payments going to large producers. Large cotton producers were singled out as recipients of large annual payments.

Cotton Programs in the 1970's

The Agricultural Act of 1970 established a voluntary program for cotton, as marketing quotas were suspended for 3 years. The act also provided for a cropland set-aside program in which diversion of cropland to conserving uses could not exceed 28 percent of the farm's base acreage allotment. The set-aside payment to participating farmers was specified as the difference between the higher of 65 percent of parity or 35 cents per pound,

Table 2—Average price support levels and average prices received by farmers for upland cotton, 1964-73

	Level of support			
Crop year	Price support loan[1]	Price support payment[2]	Total support or guarantee[3]	Season-average price received by farmers[4]
		Cents/pound		
1964	30.00	3.50	33.50	29.62
1965	29.00	4.35	33.35	28.03
1966[5]	21.00	9.42	30.42	20.64
1967	20.25	11.53	31.78	25.39
1968	20.25	12.24	32.49	22.02
1969	20.25	14.73	34.98	20.94
1970	20.24	16.80	37.05	21.86
1971	19.50	15.00	35.00	28.07
1972	19.50	15.00	35.85	27.20
1973	19.50	15.00	41.53	44.40

[1]For Middling 1-inch cotton. Gross weight basis through 1970; net weight thereafter. [2]Available on domestic allotment for 1960-74 crops; for 1971-73, represents minimum payment rate on full base acreage allotments. [3]For 1964-70 crops, represents total support on domestic allotment; for 1970-73 crops, the final payment, together with the national average market price, had to equal the higher of 35 cents or 65 percent of parity. The final payment could not be less than 15 cents per pound. [4]Price supports and prices received were based on gross weight of cotton and wrapping prior to 1971; all quotations from 1971 to date are net weight. [5]For 1966 and subsequent years, loan rate set at 90 percent of average price of U.S. cotton in world markets during a specified period.

and the average market price for the first 5 months of the marketing year. This payment, however, could not be less than 15 cents per pound. The 1970 Act put a separate $55,000 annual limit on government payments to producers of upland cotton, wheat, and feed grains. The limit applied to all direct payments but did not include CCC loans or purchases. The loan rate was established at 90 percent of the average world price for the previous 2 years.

The provisions of the 1970 Act continued to recognize the importance of the world market price through the way the loan rate was set. The set-aside concept gave producers a wider latitude in crop selection and mix because there was no restriction on the crop mix on remaining planted acres. However, cotton producers would lose some allotment if less than 90 percent of their farm allotment were planted to cotton.

The issue of large payments was addressed by the $55,000 payment limitation. The limit had little impact on total payments because large producers often divided ownership of their units, which allowed a unit to have multiple recipients.

A set-aside program was in effect in 1971 and 1972. The 2-million-acre set-aside was half of the acreage diverted in the 1966-68 period. Planted acreage reached 14 million acres in 1972 for the first time since 1965. The increase in acreage was a result of higher price expectations at planting time and the elimination of planting restrictions. Unlike previous programs, the farm cotton allotment during 1971-73 did not limit the amount of cotton that a participant could plant. However, set-aside payments were based on production from acreage planted within the base acreage allotment rather than the total acreage planted.

By 1973, the worldwide demand for American farm products was high due to world crop shortages, devaluation of the dollar, and generally favorable worldwide economic growth. Stocks that had built to surplus levels in the 1950's and 1960's were greatly reduced. The Agriculture and Consumer Protection Act of 1973 was debated and passed in a far different setting than the acts since 1954. Many agricultural interests felt the setting had changed from a situation of chronic surpluses and income problems to a situation where the Government could minimize its role and the attendant cost for crops.

A major feature of the 1973 Act was the target price concept. Target prices were provided in recognition that agriculture faces weather and market extremes that can result in low incomes and that income support should not affect the market price. Direct payments would be made only if market prices fell below target price levels. The payment rate would vary by the actual amount the market price was below the target price during a specified period of the marketing year. Payment rates could not exceed the difference between target prices and the loan rate. The loan rate for upland cotton was established to reflect 90 percent of the average price of American cotton in world markets for the preceding 3-year period. The act specified target price levels for 1974 and 1975 and provided a specific adjustment formula based on the index of prices paid for farm inputs and changes in productivity measured by yields for 1976 and 1977. The use of set-aside was authorized, but not required, during the period covered by the 1973 Act. The payment limit was lowered to $20,000 per person and applied to payments for wheat, feed grains, and cotton combined.

Another new concept introduced in the 1973 Act was disaster payments. Participating producers in the wheat, feed grain, and cotton programs who were prevented from planting any portion of allotments or who suffered low yields due to natural disaster received a payment based on a percentage of the target level of support. Disaster payments were made for each of the 1974-82 crop years (shown by crop year in table 3). The target price, set-aside, and disaster programs applied to national-based acreage allotments that were determined and apportioned by the Secretary. Additional plantings were not eligible for support, but no penalties were imposed.

The increase in 1974 acreage over 1973 acreage largely resulted from attractive prices for cotton. However, a significant drop occurred in 1975 cotton acreage, chiefly due to a strong cost-price squeeze and significant shifts from cotton to soybeans in the Delta and Southeast. No deficiency payments were made through 1980, as the average market price received exceeded the target price.

Falling farm income dominated discussions on whether to extend or replace the 1973 farm legislation. Stocks were far below those of the early 1960's. Commodity prices had not kept pace with production costs, which resulted in a cost-price squeeze. The farm income issue focused on the price and income support structure. The basic rationale of the 1973 Act had been to protect farm income, yet farm income had fallen in 1976 and 1977 without triggering any large-scale support. No deficiency payments had been paid for cotton, but there had been some disaster payments. Export markets continued strong, so there was still optimism about demand.

The response as embodied in the Food and Agriculture Act of 1977 was to set target prices on the basis of

Table 3—Support payments for upland cotton, 1974-93

Crop year	Payments					
	Deficiency	Diversion	Disaster	Loan deficiency	Other	Total
	Million dollars					
1974	0	0	127.8	0	0	127.8
1975	0	0	117.6	0	0	117.6
1976	0	0	97.6	0	0	97.6
1977	0	0	68.8	0	0	68.8
1978	0	40.5	187.8	0	0	228.3
1979	0	0	107.5	0	0	107.5
1980	0	0	302.0	0	0	302.0
1981	468.4	0	81.2	0	0	549.6
1982	522.7	0	313.2	0	0	633.9
1983	431.4	3.0	[1]	0	1,093.9[2]	1,528.3
1984	654.3	0	0	0	0	654.3
1985	857.8	196.0	0	0	0	1,053.8
1986	1,258.3	0	0	127.2	0	1,385.5
1987	953.1	0	0	0.4	0	953.5
1988	1,144.2	0	0	41.7	0	1,185.9
1989	655.3	0	0	0	0	655.3
1990	409.4	0	44.0	0	0	453.4
1991	522.1	0	93.3	154.2	140.3[3]	939.9
1992	1,017.4	0	134.1	268.0	206.0[3]	1,625.5
1993	1,055.5	0	163.0	303.9	160.0[3]	1,682.4

[1]Payments of less than $50,000. [2]Payment-in-kind entitlement; 4.3 million bales valued at average loan redemption rate of $0.53 per pound. [3]User marketing certificate payments. Certificates were issued in 1992 and 1993 in the amount of $92 and $45 million, respectively. Cash was paid on the remainder.

cost of production. Cost of production was used as a guideline for setting the target price levels specified in the 1977 Act, and a formula using cost estimates was defined for subsequent adjustments. The per person limit on deficiency payments was raised to $40,000 in 1978, $45,000 in 1979, and $50,000 in 1980.

The loan rate continued to be based on a percentage of past market prices. The formula was expanded to use the lower of 85 percent of a preceding 3-year average of prices at domestic locations or 90 percent of the average price of specified classes of cotton in northern Europe during the 15-week period beginning July 1 of the year in which the loan level was announced. In 1980, a minimum loan rate of 48 cents per pound was specified (table 4).

Another significant change was to base the target price payment calculation on acreage actually planted rather than on a historical allotment. When no ARP was in effect, the payment could be reduced by a national allocation factor if harvested acres in the aggregate exceeded an announced national program acreage. Overall, the 1977 Act was the second attempt at establishing a price and income safety net for producers that would be effective without impinging on the desired market orientation. No deficiency payments were made through 1980, as market prices exceeded target prices.

The Food and Agriculture Act of 1977 facilitated a shift of cotton production to the lower cost regions of the West and Southwest since benefits were based on recent plantings rather than on a historically based allotment. This encouraged the movement of acreage to more efficient producers and to regions where cotton held a comparative advantage. No cropland set-aside was required during 1978-81. Cotton acreage and production increased significantly during 1978-81. The 1978-81 average acreage planted to cotton increased to 14.1 million acres from the 12.1-million average for 1974-77.

Table 4—Average price support levels and season-average prices received by farmers for upland cotton, 1974-94

Crop year	Loan rate[1]	Target price	Season-average price received by farmers (Net weight)[2]
		Cents/pound	
1974	27.06	38.00	42.7
1975	36.12	38.00	51.1
1976	38.92	43.20	63.8
1977	44.63	47.80	52.1
1978	48.00	52.00	58.1
1979	50.23	57.70	61.0
1980	48.00	58.40	75.8
1981	52.46	70.87	55.4
1982	57.08	71.00	59.5
1983	55.00	76.00	65.3
1984	55.00	81.00	58.7
1985	57.30	81.00	56.8
1986	55.00	81.00	51.5
1987	52.25	79.40	63.7
1988	51.80	75.90	55.6
1989	50.00	73.40	63.6
1990	50.27	72.90	67.1
1991	50.77	72.90	56.8
1992	52.35	72.90	53.7
1993	52.35	72.90	58.1
1994	50.00	72.90	73.0

[1]Base loan rates for SLM 1-1/16-inch base quality cotton at average location, net weight. [2]For 1979 and subsequent years, marketing-year average, with no allowance for unredeemed loans.

Cotton Programs in the 1980's

The Agriculture and Food Act of 1981 was also debated and developed under a situation of falling farm income. Net farm income had increased in 1978 and 1979, the first 2 years under the 1977 Act, but then began to decline again. The focus of the 1981 debate was on price and income supports and provisions or mechanisms affecting their adjustment. The cost-of-production adjustment formula for target prices had not worked satisfactorily. It was based on a historical moving average of per acre costs and actual yields in estimating unit costs. The formula was applied during a period of increasing inflation with the result that adjustments lagged behind actual conditions. Production costs reflect changes in production inputs and their prices but do not accurately track changing market conditions.

There was general optimism during the legislation development period that export demand would remain strong. The 1981 Act specified minimum target prices at successively higher levels for all 4 years of the legislation. The Secretary was given authority to adjust target prices based on a number of factors, including changes in the cost of production. A crop-specific acreage reduction program was established. The payment limit for deficiency and diversion payments remained at $50,000 per person during 1982-85. No limits were applied to loans and purchases.

The 1977 Act had removed the vestiges of the historical allotments and bases that traced back to the 1950's and 1960's. The 1981 Act provided for establishment of a crop acreage base upon which acreage reductions were to be based. Acreage reduction programs were in effect during 1982-84. The act specified that acreage taken from production was to be devoted to conserving uses.

The cotton loan rate formula followed the same general specifications as in the 1977 Act, based on either domestic or world prices, whichever was lower. However, the minimum loan was raised from 48 cents to 55 cents a pound. The 1981 Act allowed the Secretary to make disaster payments to producers only if emergency conditions existed or if Federal crop insurance was not available. Although Federal crop insurance was available in all cotton-producing counties in 1982, disaster payments were authorized in the Texas plains where adverse weather caused widespread abandonment of cotton acreage. Disaster payments could not exceed $100,000 per person.

The third attempt to set a price and income safety net in conjunction with a market-oriented program again conflicted with emerging conditions. The 1981 Act established the 1982-85 target prices at successively higher levels. A worldwide recession reduced both domestic and export demand, inflation rates declined, and yields hit record high levels. Surpluses quickly accumulated, despite acreage reduction programs. Supplies of cotton greatly exceeded use during 1981 and 1982. Cotton acreage in 1982 dropped 20 percent from 1981 and production fell almost 25 percent. Widespread compliance with the acreage reduction program under the 1981 Act and low cotton prices explain most of the decline. Even after the substantial drop in production, stocks remained considerably above desired levels. Deficiency payments to cotton producers in 1982 totaled over $520 million.

Increased stocks, depressed commodity prices, and lower farm income led to the implementation of the payment-in-kind program for the 1983 crop. Payment-in-kind was added to the existing acreage reduction and cash-paid diversion programs in order to idle substantially larger acreage. The 1982 loan rate for program participants was 55 cents per pound and the target price was 76 cents. Eligibility for program benefits and payment-in-kind program participation required growers to participate in the 20-percent acreage reduction program. Producers could idle up to an additional 5 percent of their base acreage in return for a cash diversion payment rate of 25 cents per pound of lint. Farmers participating in the 20-percent acreage reduction program had an option of idling an additional 10-30 percent of their base acreage and receiving a payment-in-kind equal to 80 percent of the farm program yield. They also had the option of submitting sealed bids indicating the percentage of their farm program yields for which an in-kind payment would be accepted for idling their entire base acreage.

Over 4 million cotton acres diverted to conserving uses under the payment-in-kind program, for which producers received payment in surplus cotton from CCC stocks or from cotton under loan. An additional 2.5 million acres were diverted under the regular acreage reduction program. Acreage planted to upland cotton dropped to 7.9 million acres in 1983. Production dropped by 4.2 million bales due to the payment-in-kind program and the drought, and stocks dropped from the 7.8 million bales on hand on August 1, 1983, to 2.7 million bales on August 1, 1984. If there had been no government acreage control program in 1983, an estimated 13.5 to 14.5 million acres would have been planted and ending stocks might have remained near 8 million bales, with farm prices remaining near the loan level. However, even with the payment-in-kind program and relatively high exports in 1983/84, farm prices remained below the target price. Thus, deficiency payments totaling $430 million were required by law. The estimated value of payment-in-kind entitlement was about $1.1 billion.

An acreage reduction program was in effect for cotton in 1984. In order to be eligible for nonrecourse loans and target price protection, producers had to limit their upland cotton acreage to no more than 75 percent of their cotton acreage base (average of the 1982 and 1983 acreage planted and considered planted) and restrict the diverted acreage to approved conserving uses. There was no paid land diversion. The target price was 81 cents per pound as specified by law and the loan rate was at the legislated minimum of 55 cents per pound. About 11 million acres were planted in 1984 and 2.5 million acres were devoted to conserving uses.

The record-high 1984 yield, combined with reduced mill use and lower exports in 1984/85, resulted in ending stocks of about 4.1 million bales, up about 1.3 million a year earlier. Deficiency payments to cotton producers in 1984 totaled about $650 million, based on the difference between the target price of 81 cents per pound and the calendar average price received by farmers of 62.4 cents.

The Agricultural Programs Adjustment Act of 1984 froze the 1985 target price at 81 cents per pound rather than the 86-cent level specified by the 1981 Act. The average loan rate, however, rose from 55 cents per pound to 57.3 cents for SLM 1-1/16 inch cotton. To be eligible for target price and loan rate protection, farmers could plant no more than 70 percent of their upland cotton base acreage and were required to devote the reduced acres to conserving uses. The reduced acreage was comprised of a 20-percent acreage reduction program and a 10-percent paid land diversion program. The land diversion payment was based on 30 cents per pound times the farm yield times 10 percent of the farm's acreage base. No payment was made for the regular 20-percent acreage reduction. Producers who participated in the upland cotton acreage reduction program in 1985 were eligible to receive deficiency payments on the number of pounds equal to the number of acres planted to cotton times their farm program yields.

About 10.6 million acres of cotton were planted in 1985, and yields exceeded 1984's record-high level of 599 pounds per harvested acre. Production totaled about 13.3 million bales, based on an average yield of 628 pounds per harvested acre. Production at this level greatly exceeded the 1985/86 disappearance (mill use plus exports) of 8.2 million bales, thus adding over 5 million bales to ending stocks. Deficiency payments totaled about $860 million in addition to diversion payments of about $200 million. The 1985 deficiency payment rate was 23.7 cents per pound, which is the difference between the 81-cent target price and the national average loan rate of 57.3 cents per pound. The national average price received by farmers for upland cotton lint in calendar year 1985 was 54.7 cents. Because the average farm price was lower than the loan rate, deficiency payments were based on the difference between the target price and the loan rate.

Development of farm legislation in 1985 took place when the cotton market was characterized by falling mill use, sharply lower exports, rising stocks, growing textile imports, and low farm prices. Contributing to the sluggish market for U.S. cotton was the record 1984/85 world crop of nearly 88 million bales that exceeded consumption by about 18 million bales. For the first time since 1974, foreign production in 1984/85 exceeded foreign consumption. World ending stocks in 1984/85 reached a record 42 million bales, resulting in a sharp drop in world market prices. Although world production dropped to about 79 million bales in 1985/86, ending stocks rose to about 48 million bales.

The Food Security Act of 1985 established farm policy for marketing years 1986-90. Some major features of past farm acts were retained, including acreage limitations, nonrecourse loans, and target prices, but the act vested the Secretary with more discretionary authority for administering annual commodity programs. The act provided for greater market orientation, more flexibility to promote market competitiveness, and reduced target price minimums through 1990. Loan rates continued to be tied to an average of past market prices but provisions were included for allowing loans to be repaid at levels below the loan rate if market competitiveness could be hampered by the formula-determined rate.

The basic loan rate for upland cotton in 1986 was set at 55 cents per pound for SLM 1-1/16 inch cotton. For 1987-90, the loan rates were based on essentially the same formula as that used in the 1981 Act: the smaller of (1) 85 percent of the average spot market price during 3 of the preceding 5 market years, excluding highest and lowest prices, or (2) 90 percent of the average of the 5 lowest-priced growths among the growths quoted for Middling 1-3/32 inch cotton, c.i.f. Northern Europe, adjusted downward by the average difference between the Northern European prices and U.S. spot market prices of SLM 1-1/16 inch cotton. Notwithstanding this formula, the loan rate for 1987-90 crops could not be reduced by more than 5 percent per year from the rate of the preceding crop. The minimum loan rate through 1990 was 50 cents per pound. The loan level of 52.25 cents per pound for the base quality of 1987 upland cotton reflected a 5-percent reduction from a year earlier.

A major new provision of the 1985 Act, the marketing loan, provided a loan repayment plan if the basic loan rate was not competitive on world markets. If the world price of cotton, as determined by the Secretary, was below the loan rate, a loan repayment plan had to be implemented. The Secretary could choose one of two alternative market enhancement plans for repayment of loans. Under Plan A, the Secretary could lower the loan repayment rate by up to 20 percent, thus allowing farmers to redeem their crops and sell them at a more competitive price. Under Plan A, the repayment level had to be announced at the same time the Secretary announced the loan rate (by November 1) and could not be changed. Under Plan B, the repayment rate varied periodically during the year to keep pace with world markets. If the world price for 1987-90 crops, adjusted to U.S. quality and location (adjusted world price), was below 80 percent of the basic loan rate, a loan repayment level could be set at any level between the adjusted world price and 80 percent of the loan rate. Plan A was chosen for the 1986 crop, with a loan repayment rate equal to 80 percent of the basic loan rate for each quality of cotton. Plan B was subsequently selected for the 1987-90 crops.

The marketing loan concept was an attempt to retain the basic cotton loan program, but keep U.S. cotton competitive in world markets. Under this program, the USDA calculates and publishes an adjusted world price (AWP) each week. The AWP is the prevailing world market price of cotton adjusted to U.S. base quality and location. The procedure for establishing the weekly AWP is based on a specified formula developed by the USDA. Congress gave the Secretary discretionary authority to develop and modify this formula as deemed necessary to keep U.S. cotton competitive.

If either Plan A or Plan B failed to make U.S. cotton fully competitive in world markets and the adjusted world price was below the loan repayment rate, negotiable marketing certificates had to be issued to first handlers of cotton. These certificates were redeemable only for cotton under the 1986 program provisions. The value of the certificates was based on the difference between the loan repayment rate and the adjusted world price. Payments under this program totaled almost $110 million for the 1986 crop. Since Plan B of the marketing loan program was in effect for the 1987-90 crops, first handler payments were not applicable for those crops.

To minimize the disruption in cotton marketing during the transition to the new program and to protect against a sharp price drop under the new program, inventory protection payments were made to those firms holding free stocks of upland cotton (stocks not under loan or in government inventory) on August 1, 1986. The payment rate was about 40 cents per pound, the difference between the 1985-crop loan rate plus estimated regional average carrying charges and the AWP in effect on August 1, 1986. These one-time payments totaled around $620 million and were made in the form of commodity certificates exchangeable for cotton.

Target prices for upland cotton were frozen for the 1986 crop at the 1985 level of 81 cents per pound. Subsequent minimum target price levels per pound were 79.4 cents in 1987, 77.0 cents in 1988, 74.5 cents in 1989, and 72.9 cents in 1990; but the Omnibus Budget Reconciliation Act of 1987 reduced the minimum to 75.9 cents in 1988 and 73.4 cents in 1989.

If the Secretary determined that the supply of cotton was excessive, an acreage limitation program and/or paid land diversion program was authorized. The act specified that, to the extent practicable, an acreage limitation program should create a carryover of 4 million bales of upland cotton.

Deficiency payments were made available to eligible producers in an amount computed by multiplying the payment rate by the individual farm program acreage times the farm program payment yield. The payment rate was equal to the target price minus the higher of the national average market price received by producers during the calendar year that includes the first 5 months (August-December) of the marketing year or the basic loan rate determined for the crop. If an acreage limitation program was in effect, producers planted cotton for harvest on at least 50 percent, but no more than 92 percent, of the permitted acreage (base acreage less required reduction) and the remaining permitted acreage was placed in conservation uses or certain approved nonprogram crops, then deficiency payments were made on 92 percent of the permitted acreage. This requirement is commonly known as the "50/92" provision. If producers planted less than 50 percent of their permitted acreage or planted 92 percent or more of their permitted acres, then deficiency payments were made on the acreage planted for harvest. If no acreage limitation program was in effect, payment acres were reduced by an allocation factor if total harvested acreage exceeded an announced national program acreage.

The act specified that the total combined deficiency and diversion payments that a producer could receive annually during 1986-90 under one or more programs for wheat, feed grains, upland cotton, ELS cotton, and rice could not exceed $50,000. Disaster payments were limited to $100,000 per person. Exempted from the payment limits were loans or purchases, gains realized from repayment of loans under the marketing loan provisions of the act, loan deficiency payments received by participating producers who agreed to forgo obtaining loans in return for such payments, and inventory reduction (payment-in-kind) payments received by producers who agreed to forgo loan and deficiency payments and reduce acreage by half the announced acreage reduction. The inventory reduction program was never implemented.

In October 1986, Congress established a new ceiling of $250,000 on total farm payments, effective with all 1987 commodity programs. The new ceiling included the $50,000 payment limit for regular deficiency payments, land diversion payments, and other government payments except crop support loans, grain reserve storage payments, upland cotton first-handler marketing certificate payments, and rice marketing certificate payments.

The primary objective of the cotton provisions of the Food Security Act of 1985 was to make U.S. cotton competitive in the world market. Prior to the 1985 Act, the upland cotton loan rate placed an artificial floor under U.S. prices which encouraged foreign production. When world supplies were excessive, world cotton prices would drop below the U.S. loan rate. The United States would become a residual supplier, and exports would decline. Also, because of the relatively high fixed loan rate, foreign competitors were often able to set prices below the loan rate and erode U.S. world market share.

A prime example of these conditions was the 1985/86 marketing year. The U.S. loan rate was well above world prices, and U.S. exports dropped sharply to less than 2 million bales from the preceding 5-year average of 6.1 million. This, in addition to a relatively large 1985 crop, resulted in stocks increasing from 4 million bales at the beginning of the season to 9.3 million by the end of 1985/86. The beginning of the 1986/87 season was the first instance that the marketing loan concept of the Food Security Act of 1985 was used.

The program provisions initially functioned as intended. World prices declined sharply in the months following enactment of the 1985 Act, as many major foreign competitors lowered their prices in an effort to sell their cotton prior to implementation of the new U.S. program on August 1, 1986. Foreign acreage was lowered about 3.5 percent in 1986 from 1985. U.S. cotton was once again competitive in the world marketplace. Exports of upland cotton rebounded to 6.6 million bales in 1986/87, while U.S. textile mills were running at near capacity. Domestic cotton use grew by 1 million bales in 1986/87. Stocks were reduced sharply from the 9.3 million bales at the beginning of the 1986 season to 4.9 million on July 31, 1987, almost at the level (4 million bales) targeted under the 1985 Act. Stronger demand and falling stocks caused cotton prices, both domestic and foreign, to more than double during the 1986/87 season. The AWP went above the loan rate in April 1987 and remained there until mid-July 1988, eliminating the marketing loan for more than 15 months.

At the beginning of the 1987/88 season, U.S. cotton prospects were very encouraging. But, higher cotton prices caused both foreign and U.S. cotton acreage to expand by about 5 percent and 3 percent, respectively. Prospects for continued strong demand, however, were expected to absorb the additional volume of global production.

Major provisions of the 1988 U.S. cotton program had to be announced by November 1, 1987. The prospects at that time indicated a need to lower the acreage reduction requirement for the 1988 crop from the 25-percent level in effect for the 1987 crop. Although many in the industry recommended the ARP be cut to 10 percent, USDA selected a 12.5-percent reduction.

Although domestic use increased during 1987/88, higher prices and larger foreign supplies caused U.S. exports to decline. U.S. production in 1987/88 increased nearly 5 million bales from a year earlier because of record yields, and foreign production grew by over 5 million bales. Foreign prices declined more sharply than U.S. prices because of the equity (premium above loan) demanded by producers. U.S. export sales dropped and by February 1988, U.S. cotton was no longer competitive in the world markets. U.S. stocks grew by 800,000 bales during the 1987/88 season.

A number of changes aimed at improving the effectiveness of the program were made by the USDA at the recommendation of the cotton industry in 1988 and 1989. These changes, which were made at the discretion of the Secretary, primarily affected the way in which the AWP was calculated, the payment of storage and interest, and several other adjustments that attempted to fine tune the program. Despite these changes, U.S. cotton remained uncompetitive throughout much of the 1988/89 season. U.S. exports declined by almost 600,000 bales compared with the 1987 season. In addition, the 1988 crop totaled 15.1 million bales, the highest since 1981. Increased production and lower exports resulted in a further substantial buildup in stocks. Stocks on August 1, 1989, totaled 7.0 million bales, 1.3 million above stocks at the beginning of the season.

Additional changes in the program were announced on October 3, 1989, as a result of these factors. In an effort to keep U.S. cotton competitive in world markets, discretionary authority was added to the AWP regulations to allow the Secretary to further adjust the AWP if:

1. the formula-derived AWP is less than 115 percent of the current crop year base loan rate and

2. the Friday-Thursday average price quotation for the lowest-priced U.S. growth as quoted for Middling (M) 1-3/32 inch cotton, c.i.f. Northern Europe (U.S. Northern Europe price), exceeds the Friday-Thursday average price quotation for the five lowest-priced growths of the growths quoted for M 1-3/32 inch cotton, c.i.f. Northern Europe (Northern Europe price).

The maximum adjustment authorized is the difference between the U.S. Northern Europe price and the Northern Europe price. The Secretary considers the level of cotton export sales and shipments, the U.S. share of world exports, and any other relevant data to determine whether to make an adjustment and the amount of the adjustment.

Also, beginning with the 1989 crop, producers who extended loans for the additional 8-month period are required to pay interest and warehouse charges during the loan extension period regardless of the level of the AWP. Further, if the loan collateral is forfeited to the Government, the producer is required to pay the Government 8 months of storage charges plus a handling fee of $1.00 per bale on the forfeited cotton.

For the 1989 crop, the Secretary imposed the 25-percent maximum acreage reduction allowed by law because of accumulating cotton stocks and growing program costs. The loan rate for the 1989 crop was set at the statutory minimum of 50 cents per pound for the base quality, while the target price was also lowered to 73.4 cents per pound. Other cotton program provisions for 1989 remained virtually unchanged from 1988, including program changes made during the 1988/89 season.

As a result of the higher acreage reduction requirements and lower prices, 1989 planted acreage declined to 10.2 million acres, 2.1 million acres less than in 1988. Production dropped 24 percent to 11.5 million bales. Domestic consumption increased 1 million bales, and exports went up 1.4 million. Carryover stocks plummeted from 7.0 million bales on August 1, 1989, to 2.8 million on August 1, 1990. Farm prices averaged 8 cents per pound higher than in 1988/89. The AWP stayed well above the loan rate throughout the 1989/90 marketing year, again eliminating the marketing loan provisions. Program costs dropped from $1.5 billion in fiscal year 1989 to $79 million during fiscal year 1990.

The reduced stocks resulted in the 1990 acreage reduction requirement being cut to 12.5 percent of the acreage base. The target price and loan rate were announced at 72.9 cents and 50.27 cents, respectively. Planted acreage increased to 12.1 million acres, and production rose to 15.1 million bales. Higher exports more than offset a small decline in domestic use, and total offtake again exceeded production. Because consumption exceeded production, stocks fell to 2.3 million bales. Farm prices averaged 67.1 cents per pound. The deficiency payment rate dropped to 7.3 cents, the lowest level since 1981, while program costs remained relatively low. U.S. cotton was priced competitively in both domestic and foreign markets.

The Food, Agriculture, Conservation, and Trade Act of 1990

The cotton situation and outlook was dramatically different during development of the 1990 farm legislation than it was during development of the Food Security Act of 1985. In contrast to the earlier period, cotton stocks were low and domestic use and exports were high. Primary concerns for the new legislation were to include provisions in the new farm legislation to assure that a repeat of the noncompetitive situation of 1988 would not occur, provide farmers with additional planting flexibility, and reduce the overall cost of the programs.

The Food, Agriculture, Conservation, and Trade Act of 1990 (1990 Act) established farm policy for the 5 crop years 1991-95. The Omnibus Budget Reconciliation Act of 1990 (OBRA) amended several provisions to reduce program costs. Later, the Food, Agriculture, Conservation, and Trade Act Amendments of 1991 made a number of technical corrections and other changes to the programs. These acts continue the market-oriented cotton programs authorized by the Food Security Act of 1985 with modifications to assure competitive prices for U.S. cotton in domestic and export markets, provide farmers more planting flexibility, and comply with budget reduction requirements. Target prices and deficiency payments were continued, but the minimum target price was set at the 1990 level of 72.9 cents per pound for 1991-95. The OBRA set the maximum payment acreage (MPA) at 85 percent of the crop acreage base (CAB) minus the ARP requirement. Previously the MPA equaled the CAB minus the ARP.

The same loan rate formula and minimum loan rate continued, but the 1990 Act authorized the base quality to be determined by the Secretary. The Secretary changed base quality beginning with the 1991 crop. Strength was added as a quality factor, and the micronaire base from 3.5-4.9 and was changed, separated into 3.5-3.6 and 4.3-4.9. A loan premium was added for micronaire 3.7 through 4.2 for the higher qualities. The 1991 crop loan rate was set at 50.77 cents per pound and the 1992 rate was set at 52.35 cents.

The marketing loan program was continued with some modifications. Plan A and Plan B were eliminated. The minimum loan repayment rate was set at 70 percent of the loan rate. If the AWP falls below 70 percent of the loan rate, payments must be made to first handlers of cotton at a payment rate equal to the amount that the AWP is below 70 percent of the loan rate. Loan deficiency payments must be made available to producers who forgo loan eligibility at a payment rate equal to the difference between the loan rate and the loan repayment rate. The 1990 Act requires loan deficiency payments to be made available on total production, whereas the 1985 Act limited these payments to the program payment yield.

A new 3-step procedure was included in the 1990 Act to help keep U.S. cotton price competitive in domestic and export markets:

- Step 1 incorporates into law the discretionary AWP adjustment that USDA implemented on October 3, 1989.

- Step 2 requires payments, in either cash or marketing certificates, to be made to domestic users and exporters for documented purchases by domestic users and sales for export by exporters made in a week following a consecutive 4-week period in which the U.S. Northern Europe price exceeds the Northern Europe price by more than 1.25 cents per pound and the AWP does not exceed 130 percent of the current crop year loan rate. However, no payments will be issued if, for the preceding consecutive 10-week period, the U.S. Northern Europe price, adjusted for the value of any payments issued, exceeds the Northern Europe price by more than 1.25 cent per pound.

- Step 3 requires that a special import quota be opened if, for a consecutive 10-week period, the U.S. Northern Europe price, adjusted for the value of any payments issued under step 2, exceeds the Northern Europe price by more than 1.25 cents per pound. The amount of the quota is equal to 1 week's domestic mill consumption. Importers have 90 days to purchase and 180 days to enter the cotton into the United States after the quota proclamation. Quota periods can overlap.

The step 3 special import quota is in addition to a special import quota required whenever the average spot market price for a month exceeds 130 percent of the average spot market price for the preceding 36 months. This quota equals 21 days of domestic mill consumption and exporters have 90 days to purchase and enter the cotton into the United States.

Authority for ARP's and paid land diversion (PLD) programs was continued with some modifications. The 1990 Act provides for an ARP of 0-25 percent. Based on projections at the time of the announcement, an ARP must be established at a level which will result in a stocks-to-use ratio of 30 percent at the end of the marketing year. A preliminary ARP must be announced by November 1 and a final ARP by January 1 preceding the marketing year. Based on these provisions, the 1991 ARP was established at 5 percent and the 1992 ARP was set at 10 percent.

The 1990 Act also made a change in the method of determining the amount of land required to be idled under an ARP—the acreage conservation reserve, or ACR. Beginning with the 1991 crop, the ACR is determined by multiplying the ARP percentage times the CAB. Previously, the ACR was calculated from planted acreage. Another new provision requires producers, except in arid and summer fallow areas, to plant a cover crop on 50 percent of the ACR not to exceed 5 percent of the CAB.

A PLD can be announced either with or without an ARP. However, the 1990 Act mandates a PLD of up to 15 percent of the CAB if carryover stocks at the time of the final ARP announcement are projected to be 8 million bales or more. The diversion payment rate must be not less than 35 cents per pound. No PLD was offered for the 1991 or 1992 crops.

The 1990 Act authorized target option payments (TOP) to producers who either increase or decrease their ARP requirement. In return, such producers receive an increase (decrease) in the target price. For each 1-percent increase (decrease) in the ARP above (below) the announced level, the target price may be increased (decreased) between 0.5 to 1.0 percent. Any increase in the ARP cannot be more than 10 percent, and the total ARP cannot exceed 25 percent. Any decrease cannot be less than half the announced ARP level. TOP was not implemented for the 1991 or 1992 crops.

Authority for inventory reduction payments was continued for producers who agreed to forgo loans and deficiency payments for reducing their ARP requirement by 50 percent. The inventory reduction program was not offered in 1991 or 1992.

Another new provision of the 1990 Act permits producers to plant up to 25 percent of any CAB to any commodity except fruits and vegetables (including potatoes, dry edible beans, peas, lentils, and mung beans). This acreage is known as flex acreage. The 15 percent of the CAB that is not eligible for deficiency payments is called normal flex acreage (NFA); the remaining 10 percent is called optional flex acreage (OFA). Crops that may be planted on flex acreage are any other program crop (wheat, corn, grain sorghum, barley, oats, and rice), any oilseed, any industrial or experimental crop designated by the Secretary, and any other crop except fruits and vegetables. The Secretary may, however, prohibit the planting of any specific crop. The Secretary did prohibit the planting of peanuts, tobacco, wild rice, trees, and nuts in 1991 and 1992. Crops planted on flex acreage may be eligible for loans but not deficiency payments.

The 50/92 provisions were continued but modified to reflect the 15 percent reduction applicable to deficiency payments. Producers who plant between 50 and 92 percent of the MPA to cotton and devote the remaining acreage to conserving uses or approved nonprogram crops are eligible for deficiency payments on 92 percent of the MPA. The 15 percent not eligible for payment can be flexed to other crops. In addition, a special prevented planting provision was included. Producers prevented from planting who devote that acreage to conserving uses are eligible for payment provided the sum of prevented plantings and actual plantings equal at least 50 percent of the MPA. Payments under the 50/92 and prevented planting provisions are guaranteed at no less than the payment rate projected at the time of sign-up. The guarantee does not apply to actual plantings.

The method of determining upland cotton CAB's was changed. For 1991-95, the CAB will equal the average acreage planted and considered planted (P&CP) during the immediately preceding 3 years. However, a transition was included for those farms that did not participate in the upland cotton program in 1989, 1990, and 1991. Such farms could base their CAB's for 1991 (for those who first planted in 1989) and 1992 (for those who first planted in 1990) on the average P&CP acreage for the preceding 5 years, excluding the year with zero plantings, but the CAB cannot exceed the average P&CP during the preceding 2 years. The transition rules are the same rules that were in effect in 1986-90. Another new provision prohibits a producer who is eligible to receive a deficiency payment for any program crop or ELS cotton from using P&CP acreage of any program crop or ELS cotton to increase a CAB for subsequent years. For example, a producer cannot stay out of one program and build a base if the producer is participating in any other program in which a deficiency payment is made. Producers who do not plant any acreage can protect their CAB by certifying that zero acreage was planted provided that any fruits or vegetables planted on that farm do not exceed the normal acreage planted on the farm.

For each of the 1991-95 crops, the total amount of payments a person may receive under one or more of the commodity programs (including oilseeds) may not exceed:

1. $50,000 for deficiency and diversion payments;

2. $75,000 for marketing loan gains, loan deficiency payments, and any wheat or feed grain emergency compensation payments resulting from a reduction in the basic loan level (Findley payments); and

3. a total of $250,000 for the above two limits and any payments for resource adjustment (excluding

diversion payments) or public access for recreation and any inventory reduction payments.

Total disaster payments are limited to $100,000. Technical changes to the payment limitation provisions were also included with respect to spouses, growers of hybrid seeds, and irrevocable trusts. Other payment limitation provisions of the Food Security Act of 1985 were extended for the 1991-95 crops.

ELS Cotton Programs

ELS cotton is primarily grown in certain designated counties in Arizona, California, New Mexico, and Texas. Only about 2-3 percent of the cotton grown in the United States is ELS cotton. The only type of ELS cotton currently grown is American Pima (known as American Egyptian prior to 1970), although the program would also apply to Sea Island and Sealand cotton which were grown in the Southeast in earlier years.

Early Farm Programs

In 1942, ELS cotton became a "basic" crop eligible for the first time for government loans and price support, which previously had been extended only to upland varieties. A CCC purchase program was in effect for the 1942 crop, but the CCC bought less than 6,000 bales because the market price generally exceeded the government purchase price of 43.25 cents per pound. Although CCC loans were available for ELS cotton from 1943 through 1949, acreage allotments were removed from upland cotton after 1943 and the area planted to ELS cotton dropped to less than 15,000 acres during 1944-49. When acreage allotments for upland cotton were re-established in 1950, the ELS acreage increased from 6,000 acres in 1949 to 105,000 in 1950. Most producers of ELS cotton also produce upland cotton. Growers shift from one type to another chiefly depending on expected prices and profits. This shift is facilitated by similarities of production resource requirements and marketing channels in the Southwest and western irrigated valleys where ELS production is best adapted.

ELS purchase programs during the Korean War years of 1951 and 1952 and relatively high support prices helped to maintain the U.S. acreage of ELS cotton in the 50,000- to 100,000-acre range in most years between 1950 and 1985. Legislation in 1952 provided for a mandatory program comprised of acreage allotments, marketing quotas, and price supports. The price support level was initially based on 90 percent of parity, but the support level had dropped to 65 percent of parity by 1960 (table 5). This drop was in response to the competition from foreign production and manmade fibers and the buildup of CCC inventories.

In 1968, the law was amended to provide for a combination of price support loans with direct payments. The amendment provided a loan level of 150-200 percent of the upland cotton loan level, with a direct payment to producers required to make up the difference between the loan level and 65 percent of parity. Direct payments were made each year during 1968-76, starting with $3.3 million in crop year 1968 (fiscal year 1969) and ranging from a low of $453,000 in 1976 to a high of $5 million in 1973. In late 1979, an amendment dropped the total support level to 55 percent of parity, but the minimum and maximum loan levels were increased to 185 percent and 235 percent, respectively, of the upland loan level.

The Agriculture and Food Act of 1981 eliminated the direct payment provisions and the tie to parity and dropped loan levels to a minimum of 175 percent and a maximum of 225 percent of the upland cotton loan level. Marketing quotas and acreage allotments were in effect through crop year 1983. ELS prices were forced down to the loan rate during crop years 1981 and 1982, but market prices had generally exceeded the loan rate for ELS cotton since 1969.

Recent Programs

USDA attempted unsuccessfully for several years to change the ELS cotton program to a program similar to that for upland cotton. A bill to do this was introduced in both the House and Senate in 1975. The administration's proposed legislation for the 1977 farm bill included ELS cotton, but the House Committee on Agriculture dropped the measure. These and subsequent efforts by USDA and the Congress culminated in the Extra Long Staple Cotton Act of 1983. This act, which took effect in 1984, eliminated marketing quotas and acreage allotments and provided a more market-oriented program.

The act established a minimum loan level at 150 percent of the loan rate for SLM 1-1/16-inch upland cotton and provided a target price equal to 120 percent of the ELS base loan rate. The 1983 Act also provided for deficiency payments to ELS producers whenever the average price received by farmers fell below the target price during the first 8 months of the marketing year. The act established an acreage base for each ELS producer equal to the average of acres planted and considered planted to ELS cotton in the 3 crop years immediately preceding the year previous to the year for which the determination is made. For example, 1984 base acreage was the average planted acreage for 1980, 1981, and 1982.

Table 5—Average price support levels and prices received by farmers for ELS cotton

Crop year	Price support loan[1]	Price support payments[2]	Total support or guarantee3	Season average price received by farmers[4]
		Cents/pound		
1960	53.07	0	53.07	55.1
1961	53.18	0	53.18	60.4
1962	53.18	0	53.18	53.9
1963	53.18	0	53.18	52.6
1964	49.25	0	49.25	49.1
1965	49.25	0	49.25	48.1
1966	49.28	0	49.25	48.7
1967	47.00	0	47.00	47.9
1968	40.00	8.69	48.69	40.7
1969	40.00	8.88	48.88	40.4
1970	40.50	9.29	49.79	43.3
1971	38.40	12.69	51.09	44.8
1972	38.50	12.85	51.35	44.9
1973	38.20	16.01	54.21	87.2
1974	49.72	10.86	60.58	64.4
1975	67.77	6.36	74.13	78.9
1976	73.24	1.51	74.75	104.0
1977	76.70	0	76.70	87.9
1978	83.20	0	83.20	91.7
1979	92.95	0	92.98	101.0
1980	93.50	0	93.50	108.0
1981	99.00	0	99.00	96.9
1982	99.89	0	99.89	101.0
1983	96.25	0	96.25	107.0
1984	92.50	6.50	99.00	92.8
1985	85.95	14.14	103.14	91.8
1986	85.40	14.08	102.48	89.9
1987	81.40	0	97.70	104.0
1988	80.92	0	95.70	118.0
1989	81.77	0.40	96.70	97.1
1990	81.77	0	98.10	106.0
1991	82.99	0	99.60	97.0
1992	88.15	17.65	105.80	78.8
1993	88.12	17.58	105.70	87.0
1994	85.03	1.30	102.00	105.0

[1]Average for all qualities established by law at not less than 65 percent of parity through 1967. For 1968-79, loan level based on 150-200 percent of the upland base loan level. For 1980 and 1981, the minimum and maximum ELS loan levels were increased to 185 percent and 235 percent, respectively, of the upland loan rate. For 1982 and 1983, the loan rate was equal to 175 percent of upland base loan rate. The loan rate for 1984 and 1985 dropped to 150 percent of the upland base loan rate. For 1986-94, the loan rate was equal to 85 percent of the simple average price received by producers of ELS cotton during 3 years of the 5-year period ending July 31, excluding the high and low years.[2]For 1968-79, payments were required in some years to bring total support equal to 65 percent of parity. For 1980-81, total support had to equal at least 55 percent of parity. No payments were authorized in 1982 and 1983. Deficiency payments made since 1984 equaled the difference between the target price and the higher of the average market prices received by farmers for the first 8 months of the marketing year or the base loan rate. [3]No direct payments to producers were made prior to 1968. For the 1968-79 crops, the total support was equal to 65 percent of parity. For 1980-81 crops, total support equaled 55 percent of parity. Target prices (120 percent of the ELS loan level) are shown for the 1984-94 crops. [4]Includes unredeemed loans.

The act also authorized an ARP for any ELS cotton crop for which USDA estimated that the supply would otherwise be excessive. Producers had to comply with any announced ARP to be eligible for loans and payment. When no ARP was in effect, the payment could be reduced by a national allocation factor if harvested acreage in the aggregate exceeded an announced national program average. A paid land diversion program, if needed, would help adjust the national ELS acreage to desirable levels. The act also included ELS cotton in the $50,000 limit on the total deficiency and diversion payments a person could receive under a combination of the rice, wheat, feed grain, upland cotton, and ELS cotton programs.

The Food Security Act of 1985 eliminated the requirement that the ELS cotton loan rate be based on the upland cotton loan rate. This act specified that the ELS cotton loan rate be equal to 85 percent of the simple average price received by ELS cotton producers during 3 years of the 5-year period ending July 31 in the year in which the loan level is announced, excluding the highest- and lowest-priced years. The 1985 Act also provided that the program would end after the 1990 crop year. Previously, there was no termination date. Other major provisions remained the same as those specified by the 1983 Act.

Chapter 6

International Supply, Demand, and Trade

Russell Barlowe
Scott Sanford*

Cotton usage was very limited until the Industrial Revolution. Two late-18th century events drove up cotton use: the invention of machines that spun thread and wove cloth in large quantities and Eli Whitney's invention of the cotton gin, which made lint production commercially feasible.

Cotton quickly gained popularity, and its use increased dramatically around the world during the 19th century and first half of the 20th century. Commercial consumption and production jumped from about 100,000 bales in 1800 to more than 30 million bales by 1950, accounting for about 90 percent of global fiber use. While cotton production was concentrated in the United States, India, China, and Egypt, major textile centers developed first in England and then spread to other European countries, the United States, China, India, and Japan. In the United States, production reached a record 19 million bales in 1937, and mill consumption peaked at nearly 12 million in 1941. In addition to clothing, household and industrial end-use products helped boost cotton consumption. During 1920-60, world cotton use increased at an average annual rate of about 2.5 percent.

Growth in global cotton markets slowed during the 1960's and 1970's to an average annual rate of 1.5 percent, reflecting intensifying competition from manmade fibers developed during the first half of the century. These cellulosic and noncellulosic fibers not only captured new fiber markets but also substituted for cotton in a number of apparel, household, and industrial uses. Cotton's share of the world market decreased to about 70 percent by 1960 and 50 percent by 1970, bottoming at 45 percent in the mid-1980's. Since then, cotton's share has rebounded to about 50 percent. Cotton demand has strengthened relative to manmade fibers over the past decade in response to increased consumer preference for 100-percent cotton products, increased use of cotton in blends, and a nearly 50-percent decline in world cotton prices during 1980-85.

These trends have been even more pronounced in the United States, where competition from manmade fibers caused cotton mill use to drop nearly 50 percent from the mid-1960's to the early 1980's. Mill consumption ultimately hit a 61-year low of 5.3 million bales in 1981/82, accounting for less than a quarter of total fiber use. Increasing textile imports also were a major factor in the decline. Cotton use then rebounded to over 10 million bales in 1992/93, representing a third of fiber use. Cotton's share of domestic fiber use improved to 38 percent when textile trade was included.

Several factors are responsible for the resurgence in U.S. cotton mill demand over the past decade. Perhaps the most important factor is increased consumer demand for heavier-weight denim and knitwear products. Cotton has a unique advantage in this area because of its comfort, relative low cost, easy care, and popularity

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with the fashion conscious and trendsetting younger generation. Further, the fact that heavier-weight products such as denim and knit goods use more pounds of fiber per finished unit of product than woven goods also boosted cotton use significantly. Other important factors in cotton's recent rebound include increasing expenditures on research and promotion, greater emphasis on high cotton content blends, and competitive cotton prices.

World Cotton Supply and Demand

This section focuses on international cotton developments during the past two decades. Trends in production, consumption, trade, and stocks are discussed along with some prospective developments for the 1990's.

Production

In response to favorable prices and strengthening demand, world cotton production grew about 2.7 percent annually over the past two decades. Output increased from 55 million bales in 1970 to a record 96 million in 1991 prior to declining to 82 million in 1992 (table 1). Most of this increase resulted from higher yields as harvested area increased less than 5 percent to 33 million hectares. During this period, yields trended up from 377 kilograms per hectare to about 550 kilograms per hectare, a gain of 46 percent. Producers worldwide have increased efficiency by using improved varieties and more fertilizer, irrigating more area, improving management of crop pests, and adopting other yield-augmenting techniques.

Although grown in about 80 countries, 5 countries produce the vast majority of cotton. The Big Five (China, the United States, India, Pakistan, and Uzbekistan) accounted for 73 percent of output in 1992. This is an increase over their 68-percent share in 1985, despite the emergence of Australia and several countries in the African Franc Zone (Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Cote d'Ivoire, Mali, Niger, Senegal, and Togo) as important cotton producers.

The Big Five

China is the world's largest cotton producer, accounting for a fourth of global output in 1992. It is also the second largest cotton planter with 1992 area of 6.8 million hectares. Its yields also are among the highest in the world. China's 1992 average of 659 kilograms per hectare was 20 percent above the global average, despite severe weather and bollworm problems.

Table 1—Cotton production in major countries and the world

Year[1]	China	United States	Uzbekistan	Pakistan	India	Australia	AFZ[2]	World
				Million bales[3]				
1970	10.5	10.2	NA	2.5	4.4	0.1	0.6	55.1
1975	10.9	8.3	NA	2.3	5.2	0.1	0.9	53.9
1980	12.4	11.1	NA	3.3	6.1	0.5	1.0	63.5
1981	13.6	15.6	NA	3.4	6.6	0.6	1.0	68.7
1982	16.5	12.0	NA	3.8	6.8	0.5	1.1	66.7
1983	21.3	7.8	NA	2.3	6.1	0.6	1.3	65.8
1984	28.7	13.0	NA	4.6	8.4	1.1	1.5	88.7
1985	19.0	13.4	7.9	5.6	9.0	1.2	1.7	80.3
1986	16.3	9.7	7.5	6.1	7.3	1.0	1.9	70.6
1987	19.5	14.8	6.9	6.7	7.1	1.3	1.9	81.0
1988	19.1	15.4	8.0	6.6	8.3	1.3	2.4	84.4
1989	17.4	12.2	7.6	6.7	10.6	1.4	2.1	79.7
1990	20.7	15.5	7.3	7.5	9.1	2.0	2.5	87.0
1991	26.1	17.6	6.8	10.0	9.4	2.3	2.5	96.0
1992	20.7	16.2	6.0	7.1	10.9	1.7	2.5	82.7
1993	17.2	16.2	6.2	6.0	9.4	1.4	2.3	76.1
1994[4]	19.5	19.2	5.9	7.3	10.4	1.6	2.7	85.8

NA = Not available.

[1]Marketing year beginning August 1. [2]African Franc Zone: Benin, Burkina, Cameroon, Central African Republic, Chad, Cote d'Ivoire, Mali, Niger, Senegal, and Togo. [3]480-pound net weight bales. [4]Estimated as of August 11, 1994.

Chinese cotton production has increased sharply over the past two decades, rising from 10.5 million bales in 1970 to a record 28.7 million in 1984. Since then, output has averaged about 20 million bales annually. While area has risen 37 percent since 1970, yields have increased nearly 50 percent. Future production gains may continue to come mainly from yield growth, as cotton area will be constrained by the need to increase food production for a huge and expanding population.

The United States ranks second in cotton production, accounting for a fifth of world output in 1992. Production increased over 60 percent to 16.2 million bales from 1970 to 1992. While yields increased during the period, at an average annual rate of nearly 2.5 percent, area fluctuated between 3 and 5.5 million hectares annually, primarily reflecting the impact of ARP's.

India is the largest cotton planter in the world with 1992 area of 7.5 million hectares, accounting for nearly a fifth of the world total. However, yields in India are among the lowest in the world. India's 1992 average yield of 295 kilograms per hectare was about half of the world average. Even so, their production of 10.2 million bales was the third largest in the world.

Indian cotton production has more than doubled over the past two decades. While area has remained relatively stable, yields have increased at an average annual rate of 3.6 percent. Yields remain extremely low because most of the crop is heavily dependent on the sometimes erratic monsoon season. Low yields also reflect the many varieties planted, inadequate inputs, and inefficient cultural practices.

Pakistan is one of the fastest growing cotton producers, increasing its world share from 4 percent in 1970 to nearly 10 percent in 1992. Both area and yields have trended up sharply during the past two decades, resulting in an average annual production growth rate of nearly 6 percent. Pakistan's 1991 crop totaled a record 10 million bales, a fourfold increase over 1970. However, a severe outbreak of leaf curl virus cut yields and production sharply in 1992.

Uzbekistan is the largest cotton producer in the former Soviet Union and the fifth largest producer in the world. Output totaled 6 million bales in 1992, down 12 percent from the previous year because of adverse weather at planting time. Area and production have decreased in recent years, reflecting serious soil salinity problems and the desire to rotate cotton with other crops. All cotton acreage is irrigated, resulting in relatively high yields. However, yields are also quite variable, reflecting an extremely short growing season.

Emerging Producers

Cotton production has increased dramatically in several countries and regions during the past two decades, shifting them into the major producer category. Australia and African Franc Zone countries have improved their world production rankings. Australian output totaled 1.6 million bales in 1992, after reaching a record 2.3 million in 1991. Production in 1970 was only around 100,000 bales. This average annual growth rate of nearly 15 percent over the past two decades can be attributed mainly to increased area, which jumped from 25,000 hectares in 1970 to 250,000 hectares in 1992. Cotton is largely irrigated and benefits from generally favorable growing conditions. Yields are among the highest in the world, averaging 1,770 kilograms per hectare in 1991. This acreage is equal to more than 3 bales per acre or 3 times the world average.

African Franc Zone production also expanded rapidly during the past two decades, rising from 0.6 million bales in 1970 to a record 2.5 million during 1990-92, an average annual growth of 7 percent. Increased cotton output in the African Franc Zone resulted from a 50-percent expansion in area and a 170-percent gain in yields. Still, yields of 464 kilograms per hectare in 1992 remain about 15 percent below the world average.

Stagnant or Declining Production

For various reasons, cotton production has stagnated in some countries and regions over the past two decades. Low cotton prices relative to competing crops, high production costs, insect and disease problems, lack of government support, political upheaval, and unfavorable weather are among the chief reasons that production is faltering in countries and regions such as Egypt, Sudan, Mexico, and Central America.

Egyptian cotton production amounted to 1.6 million bales in 1992, an improvement over the 1988-91 period, but still sharply below output during most of the 1970's and 1980's. Since 1970, output has declined at an average annual rate of about 2 percent. Although yields have been very erratic, the main culprit behind smaller production has been a 50-percent decline in area since 1970. Government price incentives to cotton producers have been inadequate to hold area at targeted levels, resulting in production shortfalls which triggered the need for significant imports, mostly from the United States, during recent years.

In the Sudan, cotton production also fell over the past two decades. The 1992 crop of 400,000 bales was down from 1.1 million in 1970, representing an average annual decline of about 3 percent. As in Egypt, smaller output primarily reflects reduced area. Since 1970, area has dropped 63 percent.

After showing no discernible trend during the 1970's, Mexican cotton production declined sharply over the past decade. Output in 1992 totaled less than 0.15 million bales, about one-tenth the average level of the 1970's. Smaller output during recent years primarily reflects a sharp decline in area caused by high production costs, lack of credit, unfavorable weather, and relatively low cotton prices in some years. Mexican cotton is among the most price responsive in the world. For example, sharp world price declines in the mid-1970's, mid-1980's, and early 1990's prompted immediate 50- to 75-percent cutbacks in area.

Recent cotton production trends in five Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua) have paralleled those of Mexico, where output has sharply decreased over the past decade after remaining relatively stable during the 1970's. Production in these 5 countries totaled 120,000 bales in 1992, compared with 900,000 bales in 1970. Sharply smaller output reflects reduced area stemming from some of the same problems confronting Mexico, in addition to political turmoil and unrest during recent years.

Consumption

The world fiber market has grown steadily over the years. Major factors include an increasing population along with larger per capita use stemming from rising incomes. Available FAO data for 1964-80 show per capita fiber consumption increasing from 12.3 pounds in the mid-1960's to 15.3 pounds in 1980, an average annual increase of 1.4 percent. The continuation of this trend during the 1980's would suggest use of about 18 pounds per person in the early 1990's, of which about one-half is cotton. As previously noted, cotton's market share declined sharply from 1960 to 1985 as competition from manmade fibers intensified, but has now stabilized at about 50 percent. Despite cotton's declining market share, world cotton use increased sharply over the past two decades, rising from 57 million bales in 1970 to a near-record 85 million bales in 1992 (table 2). Major factors include a growing fiber market, improving economic activity, competitive cotton prices, and a strengthening consumer preference for the natural look of cotton. The average annual growth rate during this period matched the long-term rate of 2.5 percent. Exporting countries accounted for 82 percent of the growth; these countries have accounted for 100 percent of the growth since 1987, which has had significant implications for world trade. These implications are discussed

Table 2—Cotton consumption in major countries and the world

Year[1]	China	United States	India	Russia	Pakistan	Japan	South Korea	World
				Million bales[2]				
1970	10.5	8.2	5.0	NA	2.0	3.5	0.5	57.1
1975	11.5	7.2	5.9	NA	2.1	3.2	0.9	61.6
1980	15.1	5.9	6.3	NA	2.0	3.3	1.4	65.0
1981	16.2	5.3	5.4	NA	2.1	3.4	1.5	63.2
1982	16.4	5.5	6.3	NA	2.3	3.3	1.6	66.8
1983	16.0	5.9	6.7	NA	2.1	3.3	1.6	68.5
1984	15.0	5.5	7.1	NA	2.3	3.2	1.6	69.0
1985	19.5	6.4	7.2	5.9	2.4	3.1	1.7	76.9
1986	20.2	7.5	7.9	5.9	3.2	3.4	1.8	82.8
1987	20.5	7.6	8.0	5.7	3.4	3.5	2.0	84.2
1988	20.5	7.8	8.1	5.6	3.7	3.4	2.1	85.3
1989	20.0	8.8	8.7	5.8	4.8	3.2	2.0	86.6
1990	20.0	8.7	9.0	5.5	5.6	3.0	2.0	85.5
1991	19.0	9.6	8.7	4.5	6.5	2.8	1.9	84.5
1992	21.5	10.3	9.8	2.2	6.6	2.3	1.6	85.5
1993	20.7	10.4	10.0	2.2	6.3	2.1	1.6	84.7
1994[3]	21.0	11.0	10.4	2.3	6.5	1.9	1.7	86.7

NA = Not available.

[1]Marketing year beginning August 1. [2]480-pound net weight bales. [3]Estimated as of August 11, 1994.

in greater detail in the textile and apparel trade section of this chapter.

Exporting Countries

Cotton use in net exporting countries increased 60 percent to 63 million bales over the past two decades, an average annual rate of 3 percent. Most of this growth occurred during the 1980's in the major raw cotton producing countries of China, the United States, India, and Pakistan, whose combined output accounts for nearly two-thirds of world production. Textile industries in these countries have expanded rapidly in recent years as they take advantage of large raw material supplies, relatively abundant labor, and sophisticated technology to produce yarn and value-added textile products for domestic and world markets.

China is the world's largest cotton consumer, accounting for a fourth of total use. Use has doubled to 20 million bales since 1970, an average annual rate of increase of 4 percent. There are an estimated 42 million cotton spindles and nearly 50,000 textile enterprises in China, mainly geared to producing textile products for export markets in the United States and Europe.

Despite growing textile imports, the United States is the number two textile consumer, using over 10 million bales in 1992. Consumption has nearly doubled over the past decade, reflecting strengthening demand for natural fibers and an extremely efficient textile industry.

India is the third largest cotton consumer in the world. Use increased 82 percent from 1970 to 1992's record 9.1 million bales, reflecting an average annual rate of increase of 3 percent. Currently, there are slightly more than 1,000 textile mills in India with 27 million spindles. As in China and Pakistan, a smaller but increasing percentage of India's cotton textile production is destined for the export market.

Pakistan is the world's fourth largest cotton consumer and the largest cotton yarn exporter, with an estimated 40 percent of its use going into the export market. Cotton consumption has increased at an average annual rate of 7 percent since 1970, rising to a record 6.8 million bales in 1992. Yarn export markets are concentrated in the Far East. For example, Pakistani yarn accounts for three-fourths of Japan's growing yarn imports, a major factor in reduced Japanese cotton consumption in recent years.

Importing Countries

Growth of cotton use in net importing countries, located mainly in Asia and Europe, has been slower than in exporting nations over the past two decades. Since 1970, importers' use has increased at an average annual rate of slightly less than 2 percent (excluding Russia), compared with 3 percent for exporters. In fact, cotton use in importing countries has declined about 10 percent since 1987 as a direct consequence of a more than 6-percent increase in exporters' consumption. Expanding use in exporting countries has a two-pronged effect on importers; they are confronted not only by increasing competition from yarn imports, as in Japan, but also by stiffer competition from exporters' textile products in traditional markets.

Cotton textile industry growth in net importing countries is a mixed bag, ranging from declining or stagnant (Russia, Japan, and Hong Kong) to extremely efficient (Indonesia and Thailand). Textile industries in South Korea and Taiwan fall in the middle of this range.

Russian consumption fell dramatically in the early 1990's. Estimated consumption of 2.8 million bales in 1992 is about half the level of the late 1980's. The recent drop reflects economic problems associated with the breakup of the Soviet Union and the shift toward a free market economy. Textile mills in Russia have traditionally been supplied with raw cotton from producing countries in Central Asia, primarily Uzbekistan. However, with the recent turmoil, these pipelines have been interrupted because Russia lacks the necessary hard currency to purchase cotton. Furthermore, Russia's cotton textile industry is obsolete, with generally inefficient energy and labor utilization.

Cotton use in Japan and Hong Kong has stagnated over the past two decades, particularly since the late 1980's. Both countries have been hard hit by increased yarn imports from Pakistan and China. In addition, the Japanese cotton industry is being squeezed by increasing labor costs and competition from new synthetic textiles.

In South Korea and Taiwan, cotton consumption increased steadily during the 1970's and most of the 1980's, but has declined since 1987. As in Japan and Hong Kong, increased imports of yarn and textiles are a negative factor. Scarce and expensive labor, along with shrinking export markets, are problems for both South Korea and Taiwan.

In contrast, the cotton textile industries of Indonesia and Thailand are among the healthiest in the world, and their cotton use continues to expand. Over the past two decades, consumption has increased at an average annual rate of about 10 percent in each country. Major factors include very successful export-oriented strategies, relatively inexpensive labor, and improved qualities of textile products.

Cotton consumption in Europe, a major importer over the years, has suffered during the past two decades from increasing imports of yarn, fabric, and textile products. In western Europe, cotton use of about 5.5 million bales in 1992 was down 10 percent from 1970 as textile imports from Pakistan, China, and several other Asian countries displaced domestic products. Germany replaced the United States as the world's largest textile importer for the first time in 1991.

Countries in eastern Europe have suffered during recent years from the restructuring of their economies following independence. Textile industries have been particularly hard hit as evidenced by the fact that 1992 mill use of about 1.4 million bales was only half the 1970 level. Major problems include lack of credit, energy shortages, and outdated technology. These problems are expected to persist for some time.

Trade

World cotton trade has not kept pace with consumption growth over the past two decades. While use has expanded at an average annual rate of 2.5 percent, trade has increased an average of 1.5 percent a year similar to consumption growth in importing countries. As discussed earlier, most of the consumption growth since 1970 has occurred in major producing countries that are largely self-sufficient, such as the United States, China, Pakistan, and India. This has been particularly evident since 1987, resulting in stagnant world import demand.

Major Importers

Most cotton importers are located in Asia and Europe. Nine countries in 1991 each imported more than 1 million bales: Russia, Japan, South Korea, Taiwan, Indonesia, Hong Kong, Thailand, Italy, and China. These countries accounted for over half of global imports (table 3).

Russia remains the world's largest cotton importer despite the near collapse of its textile industry in the early 1990's. Russia imported an estimated 2.8 million bales in 1992. This estimate is about one-half the level of the late 1980's as imports from Uzbekistan, its chief supplier, were cut sharply (table 4). Russia's inability to pay hard currency and problems with barter agreements contributed to the steep decline in trade between these two countries.

Japan is the world's second largest cotton importer. Over the past two decades, imports have generally averaged 3.0-3.5 million bales annually, reflecting relatively stable consumption. However, imports have declined about 40 percent during the past 5 years to the 1992 level of 2.1 million bales. Larger yarn imports, among other factors, have influenced this decline. This does not bode well for Japan, the United States' largest cotton export market. Japan consumed 1.1 million bales of U.S. cotton in 1991/92, accounting for 41 percent of total Japanese imports.

South Korea is the third largest cotton importer and the second largest market for U.S. cotton. In 1991/92, the United States accounted for 57 percent of the 1.8 million bales imported by South Korea. Total Korean imports have tripled since 1970 with the expansion in its textile industry, but have slowed in recent years because of sluggish consumption.

Cotton imports by Taiwan, another significant U.S. market, were 1.5 million bales in 1991/92, double the 1970 total. As in South Korea, Taiwan's imports have leveled off since 1987 as consumption has stagnated.

Indonesian imports have increased dramatically over the past two decades as consumption has exploded. Imports in 1991/92 of 1.8 million bales were nearly 10 times the 1970 quantity. The United States accounted for nearly half of this growing market.

Thailand is another growth market for cotton consumption and imports. Over the past two decades, imports increased from 200,000 bales to 1.6 million bales in 1991/92, nearly a fourth of which was supplied by the United States.

Italy imported 1.5 million bales of cotton in 1991/92, about double the 1970 level, as an expanding cotton textile industry boosted import demand. However, imports have also leveled off in recent years in response to sluggish consumption. The U.S. market share in 1991/92 was 16 percent.

Other significant cotton importers include Hong Kong, Portugal, Germany, and France, where imports ranged from 0.6 to 1.0 million bales in 1991/92. The U.S. share of these markets varied from 1 percent in France to 32 percent in Hong Kong.

Major Exporters

Four major exporters (the United States, Uzbekistan, Pakistan, and Australia) account for more than half the global cotton exports. Each of these countries exported at least 1.2 million bales in 1991/92 (table 5).

The United States is one of the two largest cotton exporters in the world, usually accounting for 20-25

Table 3—World cotton trade flow, 1991/92

Major importers	United States[1]	Uzbekistan2	Egypt	Côte d'Ivoire	Turkey	Paraguay	Argentina
				1,000 480-pound bales			
Russia[2]	0 (0)	2,750	15	0	25	0	0
Japan	1,107 (41)	50	32	22	0	0	10
South Korea	1,024 (57)	35	15	25	0	25	15
Taiwan	380 (26)	50	0	60	1	15	60
Indonesia	739 (41)	15	0	25	0	15	25
Italy	240(16)	400	10	35	60	45	40
Hong Kong	335 (32)	0	0	0	0	0	50
Thailand	368 (22)	1	0	100	0	0	100
Portugal	40 (7)	50	0	0	35	45	70
Germany	101 (11)	225	5	25	50	100	170
France	6 (1)	400	3	10	5	0	0
China	792 (49)	25	0	0	0	85	10
Egypt	294 (86)	0	0	0	0	0	0
Other	1,220 (15)	1,249	25	53	104	540	16
Total	6,646 (24)	5,250	105	355	280	870	566

Major importers	Syria	Pakistan	China	Australia	Other	Foreign total	Import total
				1,000 480-pound bales			
Russia	25	50	25	25	985	3,900	3,900
Japan	20	200	175	750	344	1,598	2,710
South Korea	5	125	60	325	144	774	1,798
Taiwan	40	60	40	150	628	1,104	1,484
Indonesia	0	200	115	475	191	1,061	1,800
Italy	230	40	0	60	259	1,179	1,419
Hong Kong	1	350	35	35	231	702	1,037
Thailand	12	250	50	60	700	1,273	1,641
Portugal	0	25	1	0	334	560	600
Germany	20	0	0	0	249	844	945
France	25	0	0	0	107	550	556
China	0	185	0	10	523	838	1,630
Egypt	0	0	0	0	0	47	341
Other	222	488	126	202	3,631	6,751	7,971
Total	600	1,923	627	2,092	8,373	21,041	27,687

[1]U.S. market share in parentheses. [2]Includes internal trade with the other countries of the former Soviet Union and 3 Baltic States.

percent of the total. Shipments in 1991/92 were 6.75 million bales. Major markets include Japan, South Korea, Indonesia, Taiwan, Thailand, Hong Kong, and China.

Uzbekistan ranks as the second largest shipper with 1991/92 exports of 5.2 million bales. Since the mid-1980's, it has alternated with the United States as the world's leading exporter. Major markets include Russia, Ukraine, Italy, and several other European countries.

Pakistan, usually the third largest exporter, shipped nearly 2 million bales of cotton in 1991/92. Exports vary significantly from year to year depending on the crop size and level of yarn production. Increased emphasis on yarn production in recent years has reduced the availability of cotton for export. Major raw cotton export markets include Hong Kong, Thailand, Japan, and South Korea.

Australia joined the ranks of major cotton producers and exporters in the mid-1980's. Exports jumped from 19,000 bales in 1970 to a record 2.1 million bales in 1991/92. Major markets include Japan, Indonesia, South Korea, and Taiwan.

Other significant cotton exporters include Paraguay, Argentina, Brazil, Syria, Turkey, and the African Franc Zone countries, particularly Côte d'Ivoire. Shipments from these countries ranged from 0.25 million bales in Turkey to 0.87 million in Paraguay during 1991/92.

Table 4—Cotton imports in major countries and the world

Year[1]	Russia	Japan	South Korea	Taiwan	Indonesia	Thailand	Italy	China	World[2]
					Million bales[3]				
1970	NA	3.7	0.6	0.7	0.2	0.2	0.8	0.5	18.8
1975	NA	3.2	1.0	1.0	0.4	0.4	0.9	0.9	19.5
1980	NA	3.2	1.5	1.0	0.5	0.4	0.9	3.5	20.7
1981	NA	3.5	1.5	1.1	0.5	0.2	1.0	2.2	20.1
1982	NA	3.1	1.6	1.0	0.5	0.4	1.1	1.1	19.8
1983	NA	3.3	1.6	1.2	0.6	0.6	1.2	0.7	21.1
1984	NA	3.0	1.6	1.3	0.5	0.6	1.2	0.1	20.6
1985	6.2	3.1	1.7	1.5	0.8	0.7	1.2	[4]	29.1
1986	5.9	3.7	1.9	2.4	0.9	1.3	1.5	[4]	33.2
1987	5.4	3.4	2.0	1.6	0.9	0.9	1.4	0.1	30.6
1988	5.8	3.5	2.1	1.8	1.1	1.3	1.5	1.4	33.7
1989	5.9	3.2	2.0	1.3	1.3	1.2	1.5	1.9	32.8
1990	5.3	2.9	2.1	1.5	1.5	1.6	1.5	2.2	30.7
1991	3.9	2.7	1.8	1.5	1.8	1.6	1.5	1.6	29.1
1992[5]	2.8	2.1	1.7	1.5	1.6	1.5	1.3	0.3	26.0

[1]Marketing year beginning August 1. [2]Includes internal trade among the 12 countries of the former USSR and 3 Baltic States beginning in 1985. [3]480-pound net weight bales. [4]Less than 50,000 bales. [5]Estimated as of June 10, 1993.

Table 5—Cotton exports in major countries and the world

Year[1]	United States	Uzbekistan	Pakistan	Australia	China	World[2]
			Million bales[3]			
1970	3.9	NA	0.5	[4]	0.1	17.7
1975	3.3	NA	0.4	0.1	0.2	19.1
1980	5.9	NA	1.5	0.2	[4]	19.7
1981	6.6	NA	1.1	0.4	[4]	20.3
1982	5.2	NA	1.3	0.6	0.1	19.4
1983	6.8	NA	0.4	0.4	0.8	19.2
1984	6.2	NA	1.3	0.7	0.9	20.3
1985	2.0	6.8	3.1	1.1	2.8	27.9
1986	6.7	6.8	2.9	1.2	3.2	33.4
1987	6.6	6.3	2.4	0.8	2.3	29.9
1988	6.1	7.0	3.8	1.3	1.6	33.1
1989	7.7	6.8	1.4	1.3	0.9	31.3
1990	7.8	5.4	1.4	1.4	0.9	29.8
1991	6.6	5.2	1.9	2.1	0.6	27.7
1992[5]	5.4	5.4	1.2	1.9	0.7	25.8

NA = Not available.

[1]Marketing year beginning August 1. [2]Includes internal trade among the 12 countries of the former Soviet Union and 3 Baltic States beginning in 1985. [3]480-pound net weight bales. [4]Less than 50,000 bales. [5]Estimated as of June 10, 1993.

China: The Changeable Trader

China's trade status has shifted back and forth over the past two decades. China was a net cotton importer during 1970-82, as consumption trended up while production remained relatively stable. However, large crops during 1983-88 put China in the net exporter category, with major markets in Japan, South Korea, and Indonesia. During 1989-91, China shifted back to being a net importer. U.S. exports have benefited in years when large imports were needed, accounting for about half of total Chinese imports since 1979. The United States supplied 49 percent of China's 1991/92 imports. With a larger supply in 1992/93, China once again became a net exporter. Future trade balances are likely to continue to shift back and forth, depending on China's stock levels, crop size, and domestic and export demand.

Stocks

Global cotton stocks nearly doubled during the past two decades, rising from 21 million bales in 1970 to 38 million bales at the end of 1992/93 (table 6). In relation to consumption, stocks increased from 38 percent in 1970/71 to 45 percent in 1992/93. China is by far the world's largest stockholder, accounting for 35 percent of global stocks. Other relatively large stockholders include the United States, Pakistan, Uzbekistan, and India, where stocks range from 2 to 5 million bales. No other country holds more than 2 million bales.

Cotton Textile and Apparel Trade

The origins of world production and trade in cotton textiles are unknown. Primitive man probably fabricated coarse cloth from fibers over 20,000 years ago, though physical evidence is scarce due to their perishability. The evidence available from Egypt and Asia date from about 2700 B.C. and suggests that use of linen (flax) and wool predate the use of cotton as a textile fiber.

While the cotton plant grew wild in virtually all tropical countries, its use as a textile fiber is thought to have originated on the banks of the Indus River in India. Although development of cotton for textile use may have been more rapid in other countries, the use of cotton for textiles in India developed to a finer degree than in other countries. Calicoes and muslin cloths of filmy texture have been woven on hand looms there for over 5,000 years (Mauersberger, 1947). From its origins as a relative latecomer in the evolution of textiles, cotton is the pre-eminent world textile fiber in terms of volume produced and traded.

Table 6—Cotton ending stocks in major countries and the world

Year[1]	China	United States	Pakistan	Uzbekistan	India	World
			Million bales[2]			
1970	2.7	4.2	0.4	NA	1.4	21.5
1975	5.5	3.7	0.3	NA	1.1	25.6
1980	2.4	2.7	0.4	NA	1.3	20.7
1981	2.0	6.6	0.4	NA	2.2	25.7
1982	3.1	7.9	0.5	NA	2.2	25.7
1983	8.3	2.8	0.4	NA	1.3	24.3
1984	21.1	4.1	1.2	0.3	2.4	44.0
1985	17.8	9.3	1.1	0.6	3.9	48.2
1986	10.8	5.0	1.1	0.5	2.2	35.6
1987	7.6	5.8	1.7	0.3	1.5	32.6
1988	6.0	7.1	0.7	0.5	1.7	31.4
1989	4.4	3.0	1.2	0.5	2.6	25.8
1990	6.4	2.3	1.6	1.6	1.8	28.2
1991	14.5	3.7	3.0	2.3	2.7	40.6
1992	12.3	4.7	2.2	1.9	2.9	37.5
1993	9.1	3.5	1.9	0.9	2.2	29.7
1994[3]	8.2	4.5	2.2	0.2	2.0	28.5

NA = Not available.

[1]Marketing year beginning August 1. [2]480-pound net weight bales. [3]Estimated as of August 11, 1994.

The history of cotton textile production in the United States paralleled the development of fibers in earlier countries. Cotton fiber production and commerce was preceded by that of linen and wool. The invention of the cotton gin greatly expanded the U.S. cotton industry. Currently, the United States is both the world's leading exporter of raw cotton fiber and the leading importer of cotton textiles.

Growth in Imports

During 1980-89, the raw cotton content of U.S. imports of cotton-containing textiles in 480-pound-bale equivalents rose from about 1.6 million to over 4.9 million, a 215-percent increase. U.S. imports have risen an additional 36 percent to the equivalent of nearly 6.7 million 480-pound bales of cotton during 1990-92 (table 7). The astounding rise in imports helped satisfy a phenomenal turnaround in U.S. demand for cotton, which saw per capita domestic consumption of cotton rise by 106 percent from 13.5 pounds in 1982 to 27.8 in 1992. This sharp rise followed more than a decade of falling per capita consumption.

The surge in U.S. imports of cotton textiles is directly or indirectly attributable to economic, social, and demographic forces. Demographics played a significant role in helping increase U.S. cotton textile imports. Consumption patterns shifted away from products perceived as artificial or chemical-based, such as polyester, in preference for natural or organic products like cotton. Simultaneously, the baby boom generation moved into their 20's, 30's, and 40's—an age when incomes often rise sharply with employment opportunities and earnings growth is usually strongest.

Contributing Factors

A number of economic factors both within and outside the United States contributed strongly toward creating an environment favoring imports in recent years. Among the contributing factors:

1. an extremely long period of economic growth in the United States,

2. a sharp rise in the value of the U.S. dollar in world trade,

3. comparative labor cost advantages in developing countries, and

4. the desire of developing countries to utilize their textile industry for internal economic development and foreign currency earnings.

From November 1982 to July 1990, the United States enjoyed the longest peacetime expansion since the Civil War. Low unemployment and increasing incomes encouraged consumers to spend freely, raising the demand for goods—many of them imported. Numerous analysts have identified the positive relationship between a strengthening economy and the level of imports. Using the index of leading economic indicators (LEI) as a

Table 7—Raw cotton equivalent of U.S. textile imports

Year	Yarn	Fabric	Household furnishings	Wearing apparel	Floor covering	Total[1]	Number
	Million pounds						*1,000 bales*
1981	24.1	355.0	76.3	504.0	2.6	962.0	2,004.2
1982	28.5	270.5	91.8	510.5	2.4	903.7	1,882.7
1983	42.1	352.3	110.8	622.8	7.5	1,135.5	2,365.6
1984	54.7	473.1	163.3	759.7	14.6	1,465.4	3,052.9
1985	56.4	465.4	193.9	895.5	18.0	1,629.2	3,394.2
1986	105.9	559.2	211.0	1,016.0	18.4	1,910.5	3,980.2
1987	134.5	677.2	237.7	1,265.6	20.7	2,335.7	4,866.0
1988	95.6	498.4	249.1	1,254.6	21.2	2,118.8	4,414.2
1989	94.0	599.4	177.0	1,434.5	32.8	2,337.7	4,870.2
1990	73.0	595.1	195.1	1,506.9	32.4	2,402.5	5,005.2
1991	86.1	679.4	198.4	1,577.3	36.3	2,577.5	5,369.8
1992	115.6	789.1	239.4	1,977.3	47.4	3,168.8	6,601.7
1993	116.0	876.3	260.6	2,244.3	50.6	3,574.4	7,446.7

[1]Includes headgear beginning in 1989.

measure of economic movement, analysts have found that a 1-percent rise in the LEI is associated with a 1.68-percent rise in the level of cotton textile imports (Sanford and Skinner, 1989).

During much of the 1982-90 period of U.S. economic growth, the value of the U.S. dollar versus foreign currencies appreciated rapidly. An increase in the value of the dollar causes a decrease in the price of imports in dollar terms, creating competitive pressure on domestic producers that compete with imports—notably, automobile, steel, and textile industries. By calculating a real trade-weighted index for the value of the U.S. dollar in cotton textile trade, the dollar was found to have increased in value by over 47 percent between 1980 and 1987 versus the currencies of countries shipping cotton textiles to the United States. Further analysis concluded that for every 1-percent rise in the value of the dollar, cotton textile imports rose by 1.03 percent (Sanford and Skinner, 1988 and 1989).

In addition to the strong U.S. dollar making imported textiles relatively less expensive, foreign cotton textile producers can often exploit labor cost advantages in their textile and apparel industries. Unpublished data covering hourly compensation costs for production workers in apparel and other textile products manufacturing illustrate the advantage (U.S. Department of Labor, Bureau of Labor Statistics, 1991). Asian and Pacific Rim textile producers, in particular, can obtain labor more cheaply than their U.S. counterparts (table 8).

For many developing countries with abundant and cheap labor, textiles and apparel industries are viewed by economic planners and policymakers as basic to their growth. In addition to supplying domestic textile needs, these industries often earn much-needed foreign currency through trade. In recent years, Indonesia and Thailand have enjoyed booming textile industries, aided by their ability to employ relatively inexpensive labor. Not surprisingly, U.S. raw cotton fiber exports to these two countries have risen sharply, while cotton exports to more-established textile producers, notably Japan, have stagnated as these countries face stiffer competition in textile production.

While cotton textile imports have added billions of pounds to U.S. cotton consumption, they also represent a tremendous transfer to the coffers of foreign countries. From 1978 to 1986, the nominal value of all textile apparel products imported into the United States tripled, rising from $5.6 billion to $17.7 billion. The compound annual rate of growth in import value during 1978-86 was a relatively constant 16.6 percent (Sanford, 1988). Over the same period, U.S. consumers enjoyed relatively stable apparel prices. This stability was largely due to less expensive apparel imports. In 1992, imports of textile apparel products totaled near $33 billion, while U.S. textile apparel exports totaled $4 billion. With the volume of imports booming, the value of the textile trade deficit has soared (fig. 1).

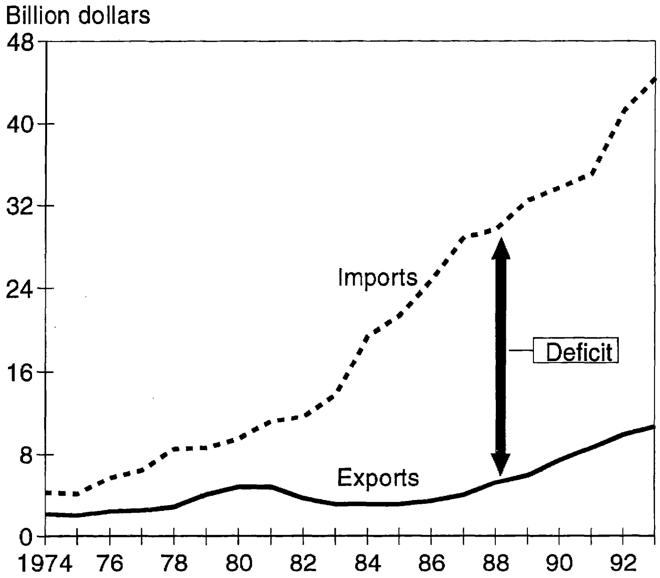
Table 8—Hourly compensation costs for production workers in apparel and other textile products manufacturing

Country	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992
					U.S. dollars					
United States	3.80	5.62	7.29	7.44	7.64	7.88	8.14	8.43	8.70	9.00
Hong Kong	0.75	1.53	1.76	1.86	2.08	2.35	2.69	3.04	3.33	3.57
Japan	1.62	3.00	3.37	4.87	5.64	6.53	6.50	6.67	7.62	8.44
Korea	0.22	0.65	0.84	0.91	1.12	1.53	2.06	2.35	2.77	3.22
Singapore	0.58	1.15	1.68	1.77	1.72	2.09	2.36	2.74	NA	NA
Taiwan	0.30	0.71	1.19	1.42	1.81	2.18	2.68	2.88	3.11	3.48
					Index (U.S.=100)					
United States	100	100	100	100	100	100	100	100	100	100
Hong Kong	20	27	24	25	27	30	33	36	38	40
Japan	43	53	46	65	74	83	80	79	88	94
Korea	6	12	12	12	15	19	25	28	32	36
Singapore	15	20	23	24	23	27	29	33	NA	NA
Taiwan	8	13	16	19	24	28	33	34	36	39

NA = Not available.

Source: U.S. Department of Labor, Bureau of Labor Statistics.

Figure 1
U.S. textile and apparel trade



More Than Volume and Value

Cotton and other fiber textile product imports affect the U.S. economy in more ways than the tally of pounds and dollars. Employment is particularly sensitive to imports. U.S. textile employment declined by 142,113 jobs during 1980-86, compared with a decline of 132,230 jobs in 1970's. The substitution of capital for labor in the industry in the form of automatic chute feeders, robotics, and other equipment innovations contributed to the employment decline. However, the value of domestic output also declined by 15 percent from the 1970's to the early 1980's, indicating that other forces (mainly textile imports) adversely affected employment.

Analysts, using export base theory and a model incorporating employment and measures of output, capital stock, wage rates and output prices, determined that textile imports accounted for 78,125 (or 55 percent) of the 142,113 jobs lost over 1980-86 (Henderson and Sanford, 1991). The estimate represents only the first round employment losses associated with textile imports; secondary indirect losses of employment in sectors linked to the textile sector likely also occurred.

There are also positive indirect effects of the growth in U.S. cotton textile imports. Some of the countries shipping cotton textile products to the U.S. market also purchase U.S. raw cotton for their mills. Thus, some of the cotton in foreign-produced textiles entering the country was produced here. Analysts investigating this relationship determined that approximately 19 percent (about 451 million pounds) of the cotton content of 1987 U.S. textile imports was of U.S. origin. However, this percentage was down from the 25-27 percent of previous years (Glade and Lawler, 1988).

For years, the U.S. cotton industry has invested considerable funds in the generic promotion of cotton in order to expand the U.S. market. Foreign cotton producers benefited from this without cost through the foreign-cotton content of U.S. textile imports. However, in an effort to remedy this inequity, the United States now assesses a levy on the foreign-produced cotton content of textile imports. The basis for the amount of the assessment for an individual country lies in the methodology of the preceding study.

Growth in Exports

The story of U.S. textile trade is overwhelmingly that of imports. Not surprisingly, the recent growth in U.S. textile exports is often overlooked, as most of the growth has occurred in the last few years. The raw cotton share of U.S. cotton textile exports grew from 507 million pounds in 1989 to 845 million pounds in 1992, a 67-percent increase (table 9). This 338-million-pound increase is the equivalent of over 700,000 480-pound bales of raw cotton.

While the percentage increase is large, owing to the relative magnitude of cotton textile imports versus exports, there is little prospect of closing the cotton textile trade deficit in the foreseeable future based on export growth alone (table 10). However, rising cotton textile exports do benefit U.S. cotton textile mills and have undoubtedly played a role in the sharp rise in mill use of cotton in recent years.

Many of the same factors that influence the level of U.S. cotton textile imports also influence the level of exports, specifically general economic conditions, exchange rates, and the strength of the U.S. dollar (Sanford and Skinner, 1989). In some areas of textile production, the United States has remained competitive with low-labor-cost countries by using capital-intensive production processes. Research has shown that the United States is particularly competitive in the production of yarn and fabric, helping account for the growth in U.S. exports of those products in recent years (Glade, 1990).

Trade Agreements

Despite the very strong expansion of U.S. cotton textile imports, import growth has not been unbridled. Regulations dating back to the 1920's placed high tariffs on imported items. With uninterrupted textile and apparel trade regulations dating from the late 1950's, textile trade is perhaps the most heavily regulated area of

Table 9—Raw cotton equivalent of U.S. textile exports

Year	Yarn	Fabric[1]	Household furnishings	Wearing apparel	Floor covering	Total[2]	Number
	Million pounds						*1,000 bales*
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	31.2	73.4	28.9	72.1	14.0	219.6	457.5
1984	20.2	79.8	28.0	68.3	9.8	206.1	429.4
1985	25.8	98.8	24.9	55.5	8.2	213.2	444.2
1986	16.6	147.4	27.2	73.9	9.8	274.9	572.7
1987	19.6	129.0	28.8	108.4	12.1	297.9	620.6
1988	27.2	124.1	35.5	123.2	20.4	330.4	688.3
1989	35.0	205.6	20.6	209.2	37.0	507.4	1,057.1
1990	52.4	278.2	33.3	265.2	35.7	664.8	1,385.0
1991	55.2	282.2	38.6	299.7	47.2	722.9	1,506.0
1992	36.7	302.6	38.5	415.8	51.3	844.9	1,760.2
1993	41.9	323.2	38.7	511.2	42.8	958.4	1,996.7

[1]Fabric includes industrial materials. [2]Includes headgear in 1993.

Table 10—History of the U.S. cotton textile trade deficit

Five-year averages	Textile imports	Textile exports	Trade balance	Share of domestic consumption[1]
	1,000 480-lb. bales[2]			*Percent*
1940-44	40.6	517.6	477.0	NA
1945-49	35.7	944.1	908.4	NA
1950-54	83.1	652.7	569.6	NA
1955-59	239.9	534.1	294.2	NA
1960-64	564.8	464.1	-100.7	1.1
1965-69	947.0	405.0	-542.0	5.6
1970-74	1,096.9	597.4	-499.5	6.0
1975-79	1,446.2	821.5	-624.7	8.6
1980-84	2,199.0	656.0	-1,543.0	21.2
1985-89	4,311.7	676.6	-3,635.1	33.4
1990	5,034.2	1,384.9	-3,649.3	29.9
1991	5,401.9	1,506.0	-3,895.9	30.1
1992	6,652.4	1,760.3	-4,892.1	33.0
1993	7,446.6	1,996.5	-5,450.1	34.6

NA = Not available.

[1]Trade balance calculated for deficit years (negative balance) only. [2]Raw fiber-equivalent bales.

world commerce. The level of U.S. trade has been heavily influenced by the Multi-Fiber Arrangement (MFA), one of the principal trade agreements affecting the cotton industry. In addition, recent agreements, such as the North American Free Trade Agreement (NAFTA) and the Uruguay Round of the General Agreement on Tariffs and Trade (GATT), concerning world and regional trade will likely determine the future of the U.S. textile industry and textile trade.

The Multi-Fiber Arrangement

Since January 1974, U.S. textile and apparel trade has been under the regulation of the MFA, an agreement among most of the major textile exporting and importing countries. The MFA is a system of bilateral trade agreements that allow signatories to place quantitative restraints, or quotas, on textile imports to prevent market disruptions. The MFA calls for gradual annual increases in these quotas, which are negotiated separately with each country. The primary aims of the MFA are to expand textile trade, reduce trade barriers, liberalize world textile trade, and aid developing countries with equitable treatment of all participating countries (Cline, 1990).

A recent study analyzed the quota fill rates in 1987 and 1988 for 18 MFA countries representing 80 percent of U.S. cotton textile imports (Meyer, 1989). In 1987, these countries filled their import quotas 90 percent of the time on 36 percent of their quotas. Thus, the quotas do present binding constraints on the level of imports from some origins. Without them, imports would have been larger. However, the analysis concluded that economic factors, such as exchange rates and prices, also play an important role and that quota levels are not the sole determinants of import levels.

The North American Free Trade Agreement

In August 1992, the United States, Canada, and Mexico concluded negotiations on NAFTA to eliminate many trade barriers between the three countries. NAFTA, which became effective in January 1994, establishes two separate bilateral agreements on cross-border trade in agricultural products, one between the United States and Mexico and the other between Canada and Mexico. In general, the rules of the United States-Canada Free Trade Agreement on tariff and nontariff barriers will continue to apply to agricultural trade between the United States and Canada.

Key NAFTA Provisions

The major agricultural issues addressed in NAFTA are nontariff barriers, tariffs, safeguards for producers, rules of origin, and sanitary and phytosanitary regulations. NAFTA also includes provisions relevant to agriculture for dispute settlement procedures, investments, intellectual property protection, and transportation (USDA, 1993).

With NAFTA's implementation, the United States and Mexico immediately eliminated all nontariff barriers to agricultural trade, generally through their conversion to tariff rate quotas or ordinary tariffs. Also, the two countries eliminated tariffs on a broad range of agricultural products with most tariffs ending by 2005. Duties of a few highly sensitive products, however, will be phased out by 2010.

During the first 10 years that NAFTA is in effect, a special safeguard provision will apply to certain products. A designated quantity of imports will be allowed at a NAFTA preferential tariff rate. Once imports exceed the designated quantity, the importing country may apply the tariff rate in effect at the time NAFTA went into effect or the then current most-favored-nation rate, whichever is lower.

In addition, NAFTA increases incentives for buying within the NAFTA region and ensures that Mexico will not serve as a platform for exports from other countries to the United States. Under NAFTA, only North American producers can obtain the benefits of the tariff preferences. Non-Mexican-origin commodities must be transformed or processed significantly in Mexico so that they become Mexican goods before they can receive the lower NAFTA duties for shipment to the United States.

Overall Effects

The most significant trade expansion from NAFTA will be with Mexico, already U.S. agriculture's third largest market. The U.S.-Canada Free Trade Agreement was implemented in 1989 and has already increased U.S. agricultural exports to Canada. Trade will be enhanced for several reasons. All tariffs, quotas, and licenses that are barriers to agricultural trade between the United States and Mexico will be eliminated. By increasing trade, the overall NAFTA will boost economic growth, especially in Mexico, which will lead to increased demand for food and other agricultural products.

NAFTA will facilitate investments in agriculture by enabling U.S. firms to establish new agricultural enterprises and acquire existing businesses in both Mexico and Canada and give full rights to repatriate all profits and capital flows. NAFTA also provides stronger protection for agricultural inventions, patents, and technologies in addition to maintaining the United States' stringent standards regarding health, safety, and the environment. Overall, provisions affecting agricultural trade between the United States and Mexico will result in a net gain for both countries.

Effects on the Cotton Industry

NAFTA is not expected to significantly change the competitive advantage in cotton production between the United States and Mexico. However, there may be changes in cropping patterns and farming practices that could result in increases in production in Mexico; however, these changes will not be significant because the United States has a much larger share of the world cotton trade.

Mexico maintains a 10-percent tariff on cotton imports, although this tariff will be phased out over a 10-year period. Meanwhile, the United States, under Section 22, has an import quota on raw cotton from Mexico, but the quota has rarely been filled. Under NAFTA, the United States will establish a duty-free quota of about 46,000 bales for Mexico. The quota will grow 3 percent annually, with an over-quota tariff of 26 percent that will be phased out over 10 years.

Of more importance to the cotton industry are changes in textile and apparel trade under the NAFTA. The demand for raw cotton is derived from the demand for textiles, especially apparel. Raw cotton trade will be affected by rules of origin for textiles, which state that only North American goods can receive NAFTA tariff preference. The fiber-forward rule of origin applies to yarns and knit fabrics. This rule requires that cotton yarns must be spun and cotton knit fabrics produced from cotton grown in the NAFTA territory. The yarn-forward rule applies to other cotton fabrics and apparel. It allows the import of raw cotton, but the yarns must originate in a NAFTA country.

The United States is a large importer of textiles and apparel and is competitive with other countries in textile manufacturing because it has become a high-technology, high-capital, low-labor requirement industry. The United States does not, however, have a significant competitive advantage in textile manufacturing, as textiles are produced by many countries. On the other hand, apparel manufacturing remains labor-intensive. Because of much lower labor rates in many parts of the world, the United States is generally not competitive in apparel manufacturing and a large amount of apparel is imported. Currently, there is considerable trade with the Caribbean Basin. Cloth is produced and cut in the United States, sent to the Caribbean for assembly, and then sent back to the United States. With NAFTA, similar arrangements with Mexico could benefit both countries.

Under NAFTA, Mexico is expected to increase production of cotton textiles and apparel for export to the United States or Canada. Most cotton textile products are expected to be traded under the yarn-forward rule. However, transportation costs will limit such raw cotton imports and any increase in Mexican demand for raw cotton will most likely be met by increased imports from the United States or increased cotton production in Mexico.

U.S. exports to Mexico of both raw cotton and cotton textiles and apparel are expected to increase. Larger U.S. exports will be spurred by NAFTA-generated income growth in Mexico that increases consumer demand for textiles and apparel along with greater Mexican access to the U.S. market.

The General Agreement on Tariffs and Trade

In December 1993, the United States reached agreement in concluding the Uruguay Round of Multilateral Trade Negotiations (UR) under the auspices of the GATT. The UR is an effort to open world agricultural markets, prompting increased trade and dynamic growth. The agricultural agreement covers four areas, including export subsidies, market access, internal supports, and sanitary and phytosanitary rules (USDA, 1994).

For agriculture, the agreement will lead to substantially improved access for U.S. exports. Increased exports are expected to lead to more export-related employment. Increased exports are also expected to raise farm prices and income and lower government outlays on price and income support programs. U.S. agriculture is expected to gain from the increase in world income that will arise from the UR agreement. The growth in world income will increase the demand for food and fiber products.

Effects on the Cotton Industry

The principal source of UR impacts on cotton is higher world incomes, which will increase world consumption of cotton textiles and apparel. Liberalization of textile and apparel trade eventually will further increase world cotton demand. Export subsidies are not important in world cotton trade, and support for cotton production is limited among GATT member countries. The United States will increase raw cotton exports by about 500,000 to 1 million bales by 2005, with small increases in U.S. and world cotton prices (table 11).

Table 11—Uruguay Round effects on upland cotton

		2000		2005	
	Units	Uruguay Round	Percent change from baseline	Uruguay Round	Percent change from baseline
World trade[1]	*Million bales*	28.6-28.9	(1)-0	30.4-30.9	(2)-0
United States:					
Planted area	*Million acres*	13.2-13.3	2-2	13.7-14.2	1-4
Production	*Million bales*	18.2-18.3	2-2	19.8-20.5	2-5
Exports	*do.*	6.8-7.0	5-8	7.5-8.0	7-14
Domestic use	*do.*	11.3-11.4	(2)-(1)	12.1-12.3	(3)-(2)
Farm price	*Cents/pound*	2	1-2	2	2-5
Gross farm receipts	*Billion dollars*	5.20-5.27	3-4	5.99-6.35	3-9
Deficiency payments	*do.*	0.77-0.74	0-3	0.54-0.64	(19)-(9)

Note: Numbers in parentheses represent negative numbers.

[1]Includes a small amount of extra-long staple (ELS) cotton. [2]USDA is prohibited from publishing projected prices.

UR effects on cotton depend significantly on liberalization of textile and apparel trade. However, the flexibility of UR provisions for liberalization make the scale and timing of effects uncertain. Most effects will likely be negligible until after 2000. Importers retain discretion over products to be liberalized to minimize effects. Almost half of all textile products can remain under quota until after 2005. Broad transitional safeguards will prevent surges in imports during the transition period.

China, the largest supplier of U.S. cotton textile and apparel imports, is not a GATT member and will receive limited benefits from liberalization. China's membership, expected during the next few years, will increase those benefits. Liberalization of textile and apparel trade will tend to transfer manufacturing from developed to developing countries. The greatest impacts will be on highly labor-intensive apparel trade in which developing countries have a strong advantage.

Higher incomes under the UR will increase world demand for cotton textiles and apparel. The largest income increases will occur in moderate-income developing countries where the propensity to spend additional income on clothing is high. Liberalization of textile and apparel trade will also increase world demand for cotton textiles and apparel as lower manufacturing costs in developing countries reduce apparel prices. The increase in mill use in developing countries will more than offset the decline in developed countries like the United States. World consumption is expected to grow about 1.7 million bales above baseline projections by 2005.

The UR will increase world trade in textiles and apparel but is not expected to significantly change world trade in cotton. High-income countries will reduce cotton imports and expand textile and apparel imports as their textile industries face increased competition from lower wage countries. Korea, Taiwan, Hong Kong, and Japan will reduce cotton imports as textile and apparel exports decline to North America and Europe because UR liberalization of textile and apparel trade eliminates their assured quotas in those markets.

India, China, and Pakistan are major cotton producers that are also major manufacturers of yarn, textiles, and apparel. Under the UR, they will increase textile and apparel exports at the expense of cotton exports. As opportunities for textile and apparel exports open up in developed countries because of trade liberalization or higher average global incomes, these countries will seek to secure the employment gains that expansion of textile exports will provide. Under UR internal support disciplines, these countries have some flexibility in choosing internal support policies to assure adequate raw materials for expanded textile and apparel exports. However, increases in cotton consumption will continue to exceed increases in production, as in baseline projections.

Larger increases in world prices for other crops, especially grains, will keep production in some countries from expanding as rapidly as consumption. In Australia, a major U.S. competitor, cotton production and exports will likely decline. Developing countries that have strong comparative advantages in labor-intensive apparel production, like Indonesia and Thailand, are expected to show large raw cotton import increases. Collectively, the countervailing influences on world cotton trade are largely offsetting.

U.S. Benefits

Higher world consumption of textiles and apparel will require higher world cotton production under the UR. The United States is expected to expand production and will not require significant price increases or other adjustments to do so since 1.4 million acres remain idled under the ARP in baseline projections for 2005. U.S. cotton producers will benefit from the smaller ARP's and higher production as world demand for U.S. cotton increases.

Higher raw cotton exports are expected as the reduction of exports from several major competitors will provide significant export opportunities for the United States. The rise in U.S. cotton exports more than offsets a decline in U.S. mill use caused by increased textile and apparel imports. Higher U.S. prices increase market returns and farm incomes, while deficiency payments decrease them. No changes in domestic commodity programs are required to meet the internal support commitments. In addition, elimination of U.S. Section 22 import quotas for cotton will have virtually no effect on U.S. raw cotton imports because transportation costs are too high for foreign cotton to be competitive in the U.S. market.

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Chapter 7

Environmental Quality Issues

Bengt (Skip) Hyberg*

Changes in agricultural technology have increased food and fiber production to meet growing world demand. However, some modern agricultural practices can adversely affect environmental quality. Cotton offers an example of both increased production and potential environmental costs.

Cotton production is chemical-intensive, requiring the use of fertilizers, insecticides, defoliants, and herbicides (Crutchfield, 1990). Since 1960, improved technology has increased cotton yields 55 percent due to better varieties, mechanical innovations, and increased use of irrigation water and agricultural chemicals (USDA-ERS, 1993). Chemicals applied to cropland can dissolve in runoff or cling to eroded soil particles, polluting lakes, rivers, and streams. Agricultural chemicals may also percolate through the soil, contaminating ground water. Soil loosened and exposed during tillage can move from the field into irrigation ditches, streams, rivers, and lakes. The deposited soil clogs channels, increasing maintenance costs and lowering the wildlife and aesthetic value of waterways.

In recent decades the relationships between agricultural practices and environmental quality have become better understood, and environmental and agricultural policies have changed to sustain environmental quality while enhancing agricultural production. Congress has passed legislation intended to improve air and water resources, protect endangered species, and assure continued agricultural productivity. Agricultural chemicals face greater regulation, with those associated with environmental degradation facing changes in use regulation or prohibition. Constraints have been placed on agricultural practices undertaken on highly erodible cropland receiving program benefits, and farmers with more fragile agricultural land have received incentives to retire this land.

The changes in environmental and agricultural policies have altered and will continue to alter cotton production practices. Restrictions on agricultural chemical use, constraints on agricultural practices, and voluntary retirement of cropland reduce environmental degradation and diminish human health risks, but these changes can also increase production costs or reduce yields, which in turn could affect farm performance.

Chemical Use Issues

Reducing agricultural chemical applications for cotton production is difficult because cotton is a host to many insects, is susceptible to weed infestation during early growth, has high nutrient requirements, and requires defoliants to maximize quality at harvest. Cotton producers face the problem of directing agricultural chemicals to each plant, where they are most effective. Chemicals not used by the crop can move off the farm and adversely affect other crops, livestock, wildlife, or environmental quality. On one hand, this problem could be an opportunity. If farmers can target the full application of fertilizers, herbicides, pesticides, fungicides, and defoliants to the point where it is used or find nonchemical substitutes, the amount of chemicals required will be reduced, production costs lowered, and human exposure to chemicals decreased. On the other hand, attempts to target chemicals can increase delivery costs. Alternatives to

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chemicals pose other challenges, which further complicate the problem.

Use of Chemicals on Cotton

The use of fertilizers, insecticides, defoliants, and herbicides is necessary to produce an economically viable cotton crop (Crutchfield, 1990). The large number of serious pests and diseases that attack cotton helps explain why cotton production is chemical-intensive. The seedling diseases are the most damaging disease complex. These are followed in importance by nematodes (parasitic worms) and weed competition. The most serious weeds are from the pigweed, sorghum, and morning glory genera. Insect pests, in order of damage, include bollworm/budworm, boll weevil, and thrips and aphids (NAPIAP, 1993).

On a national basis, per acre chemical expenditures for cotton production were the highest of all major field crops (table 1). Cotton requires repeated pesticide applications. Crutchfield and others (1992) reported that cotton producers used an average of 4.7 applications of insecticides. In addition, they reported that nearly all cotton acreage in the Southeast and Delta received at least one treatment of herbicides. In 1993, producers in the major cotton-producing States (Arizona, Arkansas, California, Louisiana, Mississippi, and Texas) applied herbicides to 91 percent of the cotton acreage, insecticides to 65 percent of the cotton acreage, and other chemicals to 61 percent of the cotton acreage (NASS, 1994). Most acreage was treated more than once. Fungicides and defoliants were also commonly applied. Per acre expenditures for fertilizer, chemicals, and application of these chemicals totaled $101. Even with this chemical use, cotton losses to pests are high. In 1991, loss of potential cotton yields was estimated at 9 percent to disease (Blasingame, 1992), 5.5 percent to insects (Head, 1992), and 7.7 percent to weeds (Byrd, 1992). Head (1992) estimated losses to insects at $291 million or $33.39 per acre.

Cotton's high nutrient demand results in per acre fertilizer expenditures second only to corn among major field crops (table 1). In 1993, nitrogen was applied to 85 percent of the cotton acreage at an average rate of 89 pounds per acre (NASS, 1994). Among field crops, only corn used more nitrogen per acre (NASS, 1994). Phosphate and potash application rates for cotton were approximately half the nitrogen application rates, and they were less frequently applied. Application rates for fertilizers varied widely across the country.

Environmental Quality and Chemical Use

The pesticide and nitrate content of surface and ground water has become a major issue in the United States. Surface water is contaminated when chemicals, attached to soil particles or dissolved in runoff, wash into rivers, streams, and lakes. Ground water contamination occurs when chemicals move through the soil and reach the water table. Areas with high levels of chemical use, runoff, and erosion tend to be vulnerable to surface water contamination. Areas with high water tables, sandy soils, and high levels of chemical use are most vulnerable to ground water contamination. Water contamination can increase health costs and/or water purification costs, degrade waters reducing recreational value, and have an adverse effect on wildlife populations.

A nationwide study of drinking water wells showed only 1.2 percent of community water systems and 2.4 percent

Table 1—Costs of fertilizers, chemicals, and custom application, 1991[1]

Item	Fertilizer	Chemicals	Custom application	Total
		Dollars/acre		
Cotton:				
United States	35.62	48.19	17.29	101.10
Delta	43.86	89.89	20.58	154.33
Southeast	47.61	70.27	12.62	130.50
Southern Plains	22.28	19.69	8.10	50.07
Southwest	59.90	50.05	57.74	167.69
Corn, United States	44.59	22.46	9.21	76.26
Rice, United States	34.26	46.99	37.19	118.44
Wheat, United States	15.30	5.73	4.25	25.28
Soybeans, United States	9.34	22.51	3.66	35.51

[1]Includes fertilizer, lime, gypsum, chemicals, and custom operations. Most, but not all custom operations are for applying chemicals.

Source: U.S. Department of Agriculture, Economic Research Service, *Cost of Production—Major Field Crops, 1993.*

of rural domestic private wells contained nitrates at levels higher than EPA enforceable levels (EPA, 1990). The study also reported that less than 0.1 percent of community water systems and 0.6 percent of rural domestic private wells had a pesticide level that exceeded EPA enforceable levels.[1] A primary concern with ground water contamination is the health risk from human exposure to dissolved agricultural chemicals in drinking water. While some health risks from nitrate contamination and disorders from pesticide exposure have been well documented, the human health risk from levels below EPA exposure limits is poorly understood (Crutchfield and others, 1992). This uncertainty increases the difficulty of assessing the health costs associated with human exposure to agricultural chemicals.

[1]The statistical distribution around these point estimates provides an upper estimate of 0.8 percent for community water systems and 1.9 percent for the rural domestic wells. EPA set permissible limits for public water systems. These limits are used as a reference for private wells.

Table 2—Share of cotton land vulnerable to pesticide leaching

Region	Potential[1] 1	2	3	4	5
			Percent		
Delta	8	16	46	13	18
Southeast	11	23	36	2	27
Southern Plains	3	28	38	22	9
West	2	5	6	12	75
United States	5	21	36	17	22

[1]Potential 1 is most vulnerable to pesticide leaching, while potential 4 indicates little or no likelihood of pesticide leaching.

Source: Crutchfield and others, 1992.

The intensive use of chemicals in cotton production has led to the examination of changes in environmental quality associated with cotton production. Reliable estimates of ground water contamination from cotton production are not available. The likelihood that pesticides and nitrogen applied to cropland leach into ground water was categorized by Crutchfield and others (1992). The analysis provides only an indication of the *potential* chemical loss *from the root zone* and does not quantify or estimate the actual losses of pesticides or nitrates to ground water. The study found that only 5 percent of U.S. cotton cropland had high potential pesticide leaching. The Southeast had the highest proportion of cotton acreage with high potential pesticide leaching (11 percent) (table 2). Surface water contamination from pesticides was also examined by Crutchfield and others (1992). They found surface water had a higher potential contamination from pesticides attached to eroded sediment and contained in runoff than did ground water from pesticide leaching (table 3).

The amount of cotton land vulnerable to nitrate leaching is generally higher than the amount subject to pesticide leaching (tables 2 and 4). Most of the Western region is classified as having an excessive or high potential vulnerability to nitrate leaching. In some areas where irrigation water is pumped from a depth of several hundred feet, shallow wells yield enough water for domestic needs. Leaching is a more immediate problem in these wells.

Data in tables 2 and 4 are presented only to provide information on the general *potential* for leaching of pesticides and nitrates. Crutchfield and others (1992) cautioned "...both the pesticide and nitrate screening procedures establish only an indication of potential chemical losses from the root zone and do not quantify or estimate the actual losses of pesticides or nitrates to ground water." Nevertheless, since ground water contamination is a serious concern, these data are useful

Table 3—Share of cotton land vulnerable to pesticide runoff

	Potential[1]							
	Attached sediment				Dissolved in runoff			
Region	1	2	3	Unknown	1	2	3	Unknown
				Percent				
Delta	36	19	1	44	39	17	1	44
Southeast	9	22	31	39	9	20	32	39
Southern Plains	75	13	1	11	27	59	3	11
West	13	6	6	75	7	12	6	75
United States	50	14	4	31	26	37	5	31

[1]Potential 1 is most vulnerable to pesticide loss, while potential 3 indicates little or no likelihood of pesticide loss.

Table 4—Share of cotton land vulnerable to nitrate leaching

Region	Potential vulnerability			
	Excessive	High	Moderate	Low
	Percent			
Delta	27	59	14	0
Southeast	54	14	21	0
Southern Plains	4	5	17	74
West	33	40	23	3
United States	18	26	18	37

Source: Crutchfield and others, 1992.

in providing a general indication of potential problems in the cotton-growing areas.

Improving Water Quality

A number of measures have been and are being taken to improve water quality. These include reassessment of agricultural chemicals and their application, development of new production practices, and the use of alternative farm management systems. Criteria used to examine the economic feasibility of these measures attempt to balance the public and private economic costs of the measure versus the gains.

The examination of agricultural chemicals has focused on several basic tasks:

- identification and elimination of herbicides, pesticides, fungicides, and other chemicals that cause environmental damage;
- re-registration of pesticides to re-assess health and environmental risks and ensure that the appropriate safeguards are in place;
- development of pest management systems that are pest-specific, reduce chemical applications, and minimize adverse effects;
- expanded soil testing for nutrients to limit fertilizer applications to economically effective levels; and
- applicator certification regulation.

The re-examination of pesticides has brought new attention to nonchemical methods of pest control and encouraged the development of more specific, shorter lived pesticides. Economic analysis has shown the integration of chemical and nonchemical pest control methods in many cases can improve environmental quality and economic performance. This approach is called integrated pest management (IPM).

IPM is an ecological approach to pest suppression with the goal of reducing losses in crop yield caused by pests and maintaining or increasing net profits to the producer (Henneberry and others, 1991). Experience has shown that adoption of a single control measure for suppression of a target pest or pest complex is destined to fail as pests adapt or conditions change. Integration of multiple pest suppression techniques has the highest probability of sustaining long-term crop protection while still providing environmental protection. Use of insect scouting, crop rotations and other natural controls, and economic threshold concepts allow producers to minimize pesticide applications. The methods are adopted to minimize environmental damage and human health effects.

IPM programs use early detection, selective pesticide use, and cultural practices to control pest damage, not pests. Examples are suppression of Mediterranean fruit fly, pink bollworm, and screwworm populations by release of sterile insects as the main component of IPM. Implementation of IPM systems in agriculture requires more research, development, extension and transfer, and farmer time and effort than use of pesticides. Adoption of IPM systems can require significant modifications in farming practices (Norton and Mullen, 1994).

The U.S. Department of Agriculture has responsibility for several programs that encourage the adoption of IPM. Participants in Integrated Farm Management, or those who are certified as using an Integrated Crop Management Practice in the Water Quality Incentives Program or Agricultural Conservation Program, can receive cost-share payments for developing and adopting a detailed cropping system that includes nutrient and pesticide management strategies. Many of the pesticide management strategies included in these programs involve the use of IPM. However, the number of acres involved in these programs is small. As of July 1994, only 321,000 total acres were enrolled in the Integrated Farm Management program. Integrated Crop Management Practices were certified on 569,000 acres in 1993.

Boll Weevil Eradication Program

Areawide pest suppression involves the coordinated efforts of many parts of an agricultural community to use effective pest management strategies. The Boll Weevil Eradication Program (BWEP) is an example of a suppression program. The BWEP is a Federal, State, and private cooperative program. A boll weevil eradication trial was conducted on 32,500 acres of cotton in North Carolina and Virginia from 1978 to 1980. The trial was successful in eradicating the boll weevil from the area in an economically efficient manner. Since then, eradication programs have been conducted on 350,000 acres in the Southwest and about 500,000 acres in the Southeast. Boll weevil populations have been reduced in large areas of the Southwest and Southeast. Although eradication has not been achieved, it is still a goal.

The successful implementation of the boll weevil eradication has reduced insecticide applications and helped cotton production become more profitable. After eradication, chemical application costs decreased by half in Georgia, Alabama, and South Carolina (Adams, 1994). In North Carolina, the program was credited with a $34 per acre increase in yield and a $30 per acre decrease in pesticide expenditures between 1978 and 1987 (Adams, 1994).

Fertilizer Use

Soil testing can also reduce chemical applications and production costs by making it possible for farmers to apply nutrients more efficiently. A study conducted in Arkansas found a situation where cotton yield increased while the amount of nitrogen applied decreased (Baker and others, 1992). Soil testing for residue nitrogen during the growing season permitted the fertilizer applications to be reduced. This practice actually increased yield because cotton will decrease yield under excess nitrogen conditions due to excess vegetative stalk growth, fruit abortion, shading and subsequent decay of lower position bolls, and harvest loss from delayed maturity.

While the study did not address ground water contamination, situations where nitrogen applications can be reduced and still meet the needs of the plant provide an opportunity to reduce the amount of excess nitrogen available to be leached into ground water. Further, such situations provide opportunities to lower fertilizer expenditures and raise farm net revenue.

Highly Erodible Cropland

Cropping systems resulting in rates of soil erosion that exceed the soil loss-tolerance value are viewed as unsustainable. The soil loss tolerance is a measure of the maximum amount of soil erosion consistent with indefinite maintenance of the productivity of the soil (Soil Conservation Policy Task Force, 1986). Highly erodible land (HEL) has soils that are most vulnerable to soil erosion. Many conservationists believe that for a majority of U.S. soils, the soil loss tolerance is 5 tons of erosion per acre per year. On thin soils with unfavorable subsoils, the soil loss tolerance is lower.

Soil Erosion and Environmental Quality

Cropland erosion can reduce agricultural yields through the loss of topsoil and plant nutrients, lowering farm revenue. Fertilizer costs increase as lost nutrients are replaced. Additional onfarm costs can occur if eroded soil is deposited in irrigation ditches lowering water delivery efficiency. Removal of soil deposits to restore irrigation efficiency will also increase production costs.

Offsite damages from water-related soil erosion have been found to exceed the onsite costs from lost productivity (Clark and others, 1985, and Ribaudo, 1986). The deposition of the soil once it leaves the field can clog irrigation ditches on neighboring farms, obstruct waterways, and elevate nutrient and pesticide levels in rivers, lakes, and streams. Dredging of rivers, streams, and lakes imposes costs on the transportation infrastructure. Nutrients and pesticides in waterways increase water purification costs, reduce suitable water supplies for industrial processes, and lower recreational benefits available from use of the affected waters. Offsite damages from wind erosion include increased interior and exterior cleaning and maintenance costs, reduced recreational opportunities, and impaired health. These costs have been estimated to be less than those from water erosion (Piper and Lee, 1989).

Practices that disturb and expose the soil on HEL to wind and water are more likely to result in high rates of soil erosion. Soils that are likely to erode rapidly after a disturbance are identified by using intrinsic characteristics of the land such as slope length, precipitation, and soil particle size and cohesiveness. These variables or indices of these variables are combined with the rate of soil regeneration to calculate a soil's erodibility index (EI). Land with an EI greater than or equal to 8 has been defined as highly erodible land for program purposes by the Natural Resources Conservation Service.

Reducing Soil Erosion

The annual rate of erosion on land planted to cotton decreased from 21 tons per acre per year in 1982 to 14 tons per acre per year in 1992 (table 5).[2] This re-

[2] Care must be taken when making comparisons across years because land use changes. Some land leaves cotton production, and other land comes into cotton production. However, changes in erosion from changes in land use and crop production practices can be assessed if erosion on all cropland planted to cotton in 1982 is estimated for both 1982 (21 tons per acre per year) and 1992 (12 tons per acre per year) and all land planted to cotton in 1992 is similarly examined. The rate of erosion on land planted to cotton in 1982 decreased by 9 tons per acre per year in 1992, while the rate of erosion on cropland used to produce cotton in 1992 was essentially the same in 1982 and 1992 (table 5). Thus, the rate of erosion clearly declined on land associated with cotton production over the period examined.

Table 5—Soil erosion on cotton cropland

Item	1982 erosion rates			1992 erosion rates			
	USLE	WEQ	Total	USLE	WEQ	Total	Change from 1982 to 1992
				Tons/acre/year			
All cotton land in 1982	3.68	17.57	21.25	2.92	9.23	12.16	-9.09
HEL	4.08	34.61	38.70	3.57	24.21	27.77	-10.93
Non-HEL	3.51	10.34	13.85	2.65	2.89	5.54	-8.31
All cotton land in 1992	4.03	10.08	14.11	4.53	9.92	14.45	0.34
HEL	5.24	28.05	33.29	5.93	27.37	33.30	0.01
Non-HEL	3.55	2.47	6.02	3.97	2.58	6.56	0.54
Cropland in cotton in 1982 and 1992	4.18	15.30	19.48	4.28	14.07	18.35	-1.13
HEL	4.64	36.37	41.01	4.64	33.35	37.99	-3.02
Non-HEL	3.93	3.88	7.81	4.08	3.63	7.71	-0.10
1982 cotton cropland now in CRP	3.35	40.23	43.58	0.34	2.64	2.98	-40.60
Formerly HEL	3.33	53.74	57.07	0.38	3.82	4.20	-52.87
Formerly non-HEL	3.40	10.09	13.49	0.24	0.03	0.27	-13.22

Source: Robert L. Kellogg and Susan Wallace, NRCS-NRI analysis.

duction occurred across both highly erodible and non-highly erodible cropland. The 8-ton-per-acre-per-year reduction in wind erosion generated this decrease, as water related erosion increased nearly 1 ton per acre per year. In 1982, highly erodible soil in cotton averaged nearly 39 tons of wind, sheet, and rill soil erosion per year. In 1992, erosion on HEL land in cotton production was 33 tons per year, a reduction of over 5 tons per acre per year.

Between 1982 and 1992, changes in land use and production practices reduced soil erosion. According to the NRI, over a million acres of HEL cotton land went into the CRP; however, some HEL land also came into cotton production lowering the net change. In addition, adoption of residue management, conservation tillage, or other practices may also have contributed to reduced soil erosion. The reason or reasons for changes in land use and the adoption of production practices that lower the erosion rate are hard to determine. Since 1982, economic conditions have changed and production technology has evolved. U.S. domestic mill consumption of cotton almost doubled between 1982 and 1992, going from 5.5 to 10.25 million bales. By 1992, area planted to cotton increased 1.9 million acres from 1982 levels, totaling 13.2 million acres. Production also increased about 4.3 million bales to 16.2 million in 1992 (ERS, 1994).

Environmental concerns also resulted in changes. The 1985 Food Security Act (FSA) and 1990 Food, Agriculture, Conservation, and Trade Act (FACTA) introduced a number of programs and provisions directed at conserving soil and reducing off-site damage from soil erosion. These programs address erosion by taking highly erodible land out of production (Conservation Reserve Program (CRP)/ Agricultural Resources Conservation Program) and reducing erosion by encouraging conservation management systems that employ cover crops, conservation tillage, and rotations.

The CRP was included in the FSA to remove highly erodible land from agricultural production by providing farmers an annual rental payment for 10 years if they placed the land in a long-term conserving use. About 34 million acres had been enrolled in the CRP by January 1991, including 1.4 million acres of land formerly planted to cotton in 1982 (Osborn, 1994). The Texas High Plains has 1.2 million acres of the cotton land enrolled in the CRP (Osborn, 1994). For all CRP land formerly in cotton, the average soil loss on CRP land had been reduced from an estimated 44 tons per acre per year to about 3 tons per acre per year (table 5) (NRI, 1994, and Kellogg and Wallace, 1995).

The Conservation Titles of the FSA and FACTA include provisions covering highly erodible cropland.

These provisions were included to encourage farmers to remove highly erodible land from crop production and increase the adoption of soil conservation measures on the cropland remaining in production (Glaser, 1986). Under the conservation compliance provisions, farmers had until 1990 to develop a conservation plan approved by USDA and local conservation districts and until 1995 to implement the plan. Farmers failing to comply with the Conservation Compliance Provision could lose their ability to participate in certain other agricultural programs, such as commodity price supports, crop insurance, loans, and farm storage facility loans. The FSA and FACTA also include programs that provide voluntary technical assistance and cost-sharing programs to help farmers adopt soil and water conservation best management practices.

Among the more significant technological changes influencing soil erosion is the adoption of conservation tillage methods. The basic principle of conservation tillage is to leave sufficient crop residue on the soil surface to significantly reduce soil erosion. Conservation tillage includes no-till, ridge-till, and mulch-till practices. Conservation provisions in the FSA and FACTA are associated with increased acreage in conservation tillage. In 1994, 35 percent (99 million acres) of U.S. planted area used some form of conservation tillage, up from 23 percent in 1989 (CTIC, 1989 and 1994). Conservation tillage for cotton is increasing, expanding from only 3 percent of planted acres in 1989 to 11 percent in 1994 (CTIC, 1989 and 1994).

Although conservation tillage is practiced on only 11 percent of planted cotton acres, it is an important practice in parts of the Cotton Belt. In Texas, various forms of conservation tillage have been practiced for many years. The provisions of the FSA have resulted in increased interest in conservation tillage in areas with highly erodible soil. However, overall only 12 percent of land planted to cotton in Texas and Oklahoma used conservation tillage in 1994 (CTIC, 1994). Cotton is grown on nearly level irrigated land in the West. As a result, less than 2 percent of the land in Arizona, California, and New Mexico used conservation tillage. Twenty-five percent of cotton farmers use conservation tillage in the Appalachian States (CTIC, 1994).

Conclusions

Cotton is a chemical- and management-intensive crop. The intensity of chemical use provides both a challenge and an opportunity. Increasing awareness of the movement of chemicals in the environment and the health and environmental consequences of chemical exposure have placed, and will continue to place, increasing pressure on farmers to reduce chemical applications. This will place constraints on agricultural chemical use. However, if a means to effectively and efficiently target fertilizer, pesticide, herbicide, and defoliant applications is developed, then the amount of chemicals applied can be reduced along with production costs and offsite damages.

Conservation and reduced tillage are production practices that can reduce soil erosion but may lead to increased use of herbicides and other chemicals, thereby increasing the potential for water pollution (Schertz, 1991). However, experimental evidence indicates that, with experience, more pest-specific herbicides and insecticides, and newly developed farm management systems, reduced tillage will play an increasing role in conservation efforts.

Environmental and agricultural policy will continue to influence the resources used in cotton production as well as the practices available. Producers will face changing production costs, reflecting technological innovations, policies, and the resources they have available. Because resource constraints and environmental concerns vary widely by region, the policy effects will also vary.

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Chapter 8

Cotton Industry Update

Leslie A. Meyer*

This report provides broad background and understanding for the entire cotton sector. Information and data presented covered a sufficiently long timespan to help explain long-term trends within the industry. Most data in the report cover the past two decades through the 1992/93 season. Since then, a number of significant events have taken place, especially with regard to the production and consumption of cotton and passage of the 1996 farm legislation. Therefore, this section updates the cotton industry situation as it relates to information contained in the preceding chapters.

U.S. Cotton Production, Consumption, and Prices

- U.S. cotton production reached a record 19.7 million bales in 1994/95, up from 16.1 million in 1993/94.
- The national average yield was also a record in 1994/95, at 708 pounds per harvested acre.
- Mill consumption, at 11.2 million bales in 1994/95, was near historic levels not experienced since the early 1940's.
- Exports in 1994/95 surpassed a 15-year high and reached 9.4 million bales, the highest since 1926/27.
- With total cotton use exceeding production, U.S. stocks declined, forcing a zero percent Acreage Reduction Program for the 1995 upland crop.
- Despite the probability of a large increase in acreage, cotton prices moved above the $1 mark for the last several months of 1994/95.
- Although acreage increased sharply in 1995/96, yield reductions forced production to fall below the previous year's record.
- Both mill use and exports in 1995/96 are expected to fall short of their previous year's use levels.
- In calendar year 1994, total U.S. domestic cotton consumption approached the 8-billion pound mark, or more than 30 pounds per capita.

World Cotton Situation

- World cotton production continues its rebound from 77 million bales in 1993/94. In 1994/95, production was estimated at 86 million, and is projected to rise above 89 million in 1995/96 as the previous year's high prices attracted more cotton area.
- World consumption is projected to rebound to near 86 million bales in 1995/96, its highest level since 1991/92.
- China is expected to continue to be a net importer of cotton in the near future, although the quantity is likely to remain well below the 4 million bales imported in 1994/95.

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1996 Farm Legislation—Major Changes

- The new legislation covers the 1996 through 2002 crop years.
- Commodity target prices and ARP's were eliminated.
- Total planting flexibility will make commodity acreage more market-oriented.
- USDA will offer 7-year "market transition" contracts with fixed but declining payments.
- Cotton loan rates cannot exceed the 1995 level and loan extensions are no longer permitted.
- Step 2 payments to domestic cotton mills and exporters are capped at $701 million over the 7 years.
- Haying and grazing are allowed at any time on program acreage.

Industry Associations and Organizations

Cotton industry interests and activities are coordinated through a number of active associations and organizations. These groups work collectively or alone to promote the overall health of the U.S. cotton industry. While some groups may have conflicting short-term goals or objectives, the overriding emphasis is directed toward increasing the production and use of cotton fiber.

Major National Cotton Industry Associations and Organizations

National Cotton Council of America — is the central organization of the U.S. raw cotton industry representing all seven segments: producers, ginners, cottonseed crushers, warehousemen, merchants, cooperatives, and textile manufacturers. U.S. cotton is also promoted in overseas markets by **Cotton Council International**.

National Cotton Council (901) 274-9030
P.O. Box 12285
Memphis, TN 38182

Cotton Council International (202) 745-7805
1521 New Hampshire Ave., NW.
Washington, DC 20036

Cotton Board — was created by the Cotton Research and Promotion Act of 1966 as a quasi-governmental organization for the purpose of developing, maintaining, and expanding the markets for U.S. raw cotton. The Cotton Board is comprised of producers and textile importers appointed by the Secretary of Agriculture to administer cotton research and promotion activities through a contract with **Cotton Incorporated**. Producer assessments on raw cotton production and raw cotton content of textile imports provide funding for the Cotton Board.

Cotton Board (901) 683-2500
871 Ridgeway Loop, Suite 100
Memphis, TN 38120

Cotton Incorporated (919) 782-6330
4505 Creedmore Road
Raleigh, NC 27612

National Cottonseed Products Association — represents U.S. cottonseed crushing industry to promote the use of cottonseed oil and products.

National Cottonseed Products Association (901) 682-0800
P.O. Box 172267
Memphis, TN 38187

National Cotton Ginners Association — is the umbrella organization for the nine State and regional cotton ginner associations that promote the interests and activities of cotton gins through a number of active committees.

National Cotton Ginners Association (901) 274-9030
P.O. Box 12285
Memphis, TN 38182

Cotton Warehouse Association of America — represents the cotton storage and handling industry especially in the areas of new technology, insurance and safety issues, and legislative and government policy affecting cotton warehouses.

Cotton Warehouse Association (202) 331-4337
1150 Connecticut Ave., NW. Suite 507
Washington, DC 20036

American Cotton Shippers Association — is the united voice of the cotton merchandising trade who are members of four federated associations located in 17 cotton-producing States. The primary activities include monitoring and making recommendations concerning legislation and policy issues in all areas of cotton marketing, finance, insurance, and government regulation and farm programs.

American Cotton Shippers Association (202) 296-7116
1725 K Street, NW. Suite 1404
Washington, DC 20006

Supima Association of America — represents the growers of Pima or extra-long staple (ELS) cotton in the States of California, Arizona, Texas, and New Mexico, encouraging the production, consumption, and export of Pima cotton.

Supima Association (602) 437-1364
4141 E. Broadway Road
Phoenix, AZ 85040

International Cotton Advisory Committee — is an association of 45 gobal governments with an interest in cotton production, consumption, or trade. The organization is designed to provide member-countries with a forum for international consultation and discussion and to provide members with a continuous understanding of the factors affecting world cotton supply and use.

International Cotton Advisory Committee (202) 463-6660
1629 K Street, NW. Suite 702
Washington, DC 20006

In addition to these associations and organizations, eight agencies of the **United States Department of Agriculture** are primarily responsible for cotton research, information dissemination, and program administration. These include:

Agricultural Marketing Service — Spot market price reporting, classing and grading, market news, and Cotton Research and Promotion Act oversight.

Agricultural Research Service — Physical science research, both plant and mechanical, and National Program coordination.

Cooperative State Research, Education, and Extension Service — Cotton research and program education and assistance.

Economic Research Service — Cotton production, marketing, and trade research and situation and outlook analysis.

Farm Service Agency (Formerly ASCS) — Cotton program administration and operation, policy analysis, and warehouse inspection and approval.

Foreign Agricultural Service — Foreign market development, country situation and outlook analysis, and foreign production, consumption, and trade estimates.

National Agricultural Statistics Service — State and national estimates of cotton acreage, yield, and production; farm price crop values; and monthly and annual *Cotton Ginnings* reports.

World Agricultural Outlook Board — Coordinates the activities of the Interagency Commodity Estimates Committee involving impacts of alternative cotton policy options, including projections of monthly U.S. and foreign cotton supply and demand published in the *World Agricultural Supply and Demand Estimates* report.

U.S. Department of Agriculture (202) 720-2791
14th and Independence Ave., SW.
Washington, DC 20250

Appendix table 1—U.S. cotton supply and use, 1960/61-95/96

Crop year	Area: Planted	Area: Harvested	Area: Yield	Supply: Beginning stocks[1]	Supply: Production[2]	Supply: Imports	Supply: Total	Disappearance: Mill use[3]	Disappearance: Exports	Disappearance: Total	Unaccounted[4]	Ending stocks	Farm price[5]
	1,000 acres	*1,000 acres*	*Lbs./acre*	*1,000 480-lb. bales*									*Cents/lb.*
1960	16,080	15,309	446	7,501	14,237	129	21,867	8,353	6,857	15,210	399	7,056	31.5
1961	16,588	15,634	438	7,056	14,283	153	21,492	9,017	5,056	14,073	280	7,699	34.4
1962	16,293	15,569	457	7,699	14,827	137	22,663	8,484	3,429	11,913	386	11,136	33.3
1963	14,843	14,212	517	11,136	15,294	135	26,565	8,696	5,775	14,471	257	12,351	33.6
1964	14,836	14,055	517	12,351	15,145	118	27,614	9,261	4,195	13,456	91	14,249	31.1
1965	14,152	13,613	527	14,249	14,938	118	29,305	9,596	3,035	12,631	354	17,028	29.4
1966	10,349	9,553	480	17,028	9,557	105	26,690	9,574	4,832	14,406	60	12,344	21.8
1967	9,450	7,997	447	12,344	7,443	149	19,936	9,077	4,361	13,438	86	6,584	26.7
1968	10,913	10,159	516	6,584	10,926	68	17,578	8,332	2,825	11,157	123	6,544	23.1
1969	11,883	11,051	434	6,544	9,990	52	16,586	8,114	2,878	10,992	249	5,843	22.0
1970	11,945	11,155	438	5,843	10,192	37	16,072	8,204	3,897	12,101	232	4,203	22.9
1971	12,355	11,471	438	4,203	10,477	72	14,752	8,172	3,385	11,557	63	3,258	28.2
1972	14,001	12,984	507	3,258	13,704	34	16,996	7,774	5,311	13,085	310	4,221	27.3
1973	12,480	11,970	520	4,221	12,974	48	17,243	7,472	6,123	13,595	160	3,808	44.6
1974	13,679	12,547	442	3,808	11,540	34	15,382	5,860	3,926	9,786	112	5,708	42.9
1975	9,478	8,796	453	5,708	8,302	92	14,102	7,250	3,311	10,561	140	3,681	51.3
1976	11,636	10,914	465	3,681	10,581	38	14,300	6,674	4,784	11,458	86	2,928	64.1
1977	13,680	13,275	520	2,928	14,389	5	17,322	6,483	5,484	11,967	-8	5,347	52.3
1978	13,375	12,400	420	5,347	10,856	4	16,207	6,352	6,180	12,532	283	3,958	58.4
1979	13,978	12,831	547	3,958	14,629	5	18,592	6,506	9,229	15,735	143	3,000	62.5
1980	14,534	13,215	404	3,000	11,122	28	14,150	5,891	5,926	11,817	335	2,668	72.7
1981	14,330	13,841	542	2,668	15,646	26	18,340	5,264	6,567	11,831	123	6,632	54.3
1982	11,345	9,734	590	6,632	11,963	20	18,615	5,513	5,207	10,720	42	7,937	59.4
1983	7,926	7,348	508	7,937	7,771	12	15,720	5,920	6,786	12,707	-239	2,775	66.4
1984	11,145	10,379	600	2,775	12,982	24	15,781	5,538	6,215	11,753	74	4,102	57.8
1985	10,685	10,229	630	4,102	13,432	33	17,567	6,413	1,960	8,373	154	9,348	56.3
1986	10,045	8,468	552	9,348	9,731	3	19,082	7,452	6,684	14,136	80	5,026	52.4
1987	10,397	10,030	706	5,026	14,760	2	19,788	7,617	6,582	14,199	182	5,771	64.3
1988	12,515	11,948	619	5,771	15,411	5	21,187	7,782	6,148	13,930	-165	7,092	56.6
1989	10,587	9,538	614	7,092	12,196	2	19,290	8,759	7,694	16,453	163	3,000	66.2
1990	12,348	11,732	634	3,000	15,505	4	18,509	8,657	7,793	16,450	285	2,344	68.2
1991	14,052	12,960	652	2,344	17,614	13	19,971	9,613	6,646	16,259	-8	3,704	58.1
1992	13,240	11,143	700	3,704	16,218	1	19,923	10,250	5,201	15,451	190	4,662	54.9
1993	13,438	12,783	606	4,662	16,133	6	20,802	10,418	6,862	17,280	8	3,530	58.4
1994	13,720	13,322	708	3,530	19,662	20	23,212	11,198	9,402	20,600	38	2,650	73.0
1995[6]	16,834	15,949	567	2,650	18,838	15	21,503	11,000	6,800	17,800	-3	3,700	[7]

[1]Economic Research Service compiled from Bureau of the Census data and adjusted to an August 1, 480-lb. net-weight basis. Excludes preseason ginnings. [2]Includes preseason ginnings. [3]Adjusted to August 1-July 31 marketing year. [4]Difference between ending stocks based on Census data and preceding season's supply less disappearance. [5]Marketing-year average price. [6]Estimated. [7]USDA is prohibited by law from publishing cotton price forecasts.

Appendix table 2—U.S. upland cotton supply and use, 1960/61-95/96

Year begin. Aug. 1	Area: Planted	Area: Harvested	Yield	Supply: Beginning stocks[1]	Supply: Production[2]	Supply: Imports	Supply: Total	Disappearance: Mill use[3]	Disappearance: Exports	Disappearance: Total	Unaccounted [4]	Ending stocks	Farm price[5]
	- - 1,000 acres - -		*Lbs./ acre*	*- - - 1,000 480-lb. net weight bales - - -*									*Cents/ lb.*
1960	16,017	15,249	446	7,344	14,170	43	21,557	8,204	6,849	15,053	412	6,916	30.1
1961	16,526	15,575	438	6,916	14,221	69	21,206	8,844	5,049	13,893	291	7,604	32.8
1962	16,197	15,475	456	7,604	14,715	55	22,374	8,322	3,426	11,748	304	10,930	31.7
1963	14,699	14,072	516	10,930	15,130	54	26,114	8,554	5,773	14,327	304	12,091	32.0
1964	14,725	13,948	517	12,091	15,025	35	27,151	9,107	4,174	13,281	110	13,980	30.9
1965	14,075	13,538	527	13,980	14,850	30	28,860	9,454	3,029	12,483	357	16,734	29.3
1966	10,269	9,475	480	16,734	9,484	29	26,247	9,438	4,819	14,257	91	12,081	21.5
1967	9,381	7,931	446	12,081	7,374	58	19,513	8,948	4,345	13,293	159	6,379	26.5
1968	10,845	10,092	516	6,379	10,847	38	17,264	8,204	2,816	11,020	133	6,377	23.0
1969	11,805	10,976	433	6,377	9,913	30	16,320	8,001	2,863	10,864	271	5,727	21.9
1970	11,869	11,081	439	5,727	10,135	11	15,873	8,105	3,885	11,990	251	4,134	22.8
1971	12,253	11,370	438	4,134	10,379	42	14,555	8,076	3,376	11,452	79	3,182	28.1
1972	13,903	12,888	507	3,182	13,608	23	16,813	7,675	5,306	12,981	321	4,153	27.2
1973	12,395	11,887	521	4,153	12,896	27	17,076	7,384	6,111	13,495	172	3,753	44.4
1974	13,596	12,464	441	3,753	11,450	24	15,227	5,797	3,914	9,711	133	5,649	42.7
1975	9,408	8,730	453	5,649	8,247	36	13,932	7,160	3,300	10,460	143	3,615	51.1
1976	11,590	10,869	464	3,615	10,517	19	14,151	6,595	4,779	11,374	102	2,879	63.8
1977	13,604	13,201	519	2,879	14,277	1	17,157	6,416	5,459	11,875	-4	5,278	52.1
1978	13,298	12,324	419	5,278	10,762	2	16,042	6,286	6,150	12,436	299	3,905	58.1
1979	13,887	12,742	547	3,905	14,531	4	18,440	6,439	9,177	15,616	138	2,962	62.3
1980	14,461	13,143	402	2,962	11,018	26	14,006	5,827	5,893	11,720	328	2,614	74.4
1981	14,272	13,783	542	2,614	15,566	18	18,198	5,216	6,555	11,771	140	6,567	54.0
1982	11,275	9,663	589	6,567	11,864	12	18,443	5,457	5,194	10,651	52	7,844	59.5
1983	7,863	7,285	506	7,844	7,676	8	15,528	5,853	6,750	12,603	-232	2,693	65.3
1984	11,065	10,300	599	2,693	12,851	21	15,566	5,490	6,125	11,615	73	4,024	58.7
1985	10,601	10,145	628	4,024	13,277	33	17,334	6,352	1,855	8,207	162	9,289	56.8
1986	9,933	8,357	547	9,289	9,525	3	18,817	7,385	6,570	13,955	80	4,942	51.5
1987	10,259	9,894	702	4,942	14,475	2	19,419	7,565	6,345	13,910	209	5,718	63.7
1988	12,325	11,759	615	5,718	15,077	5	20,800	7,711	5,883	13,594	-180	7,026	55.6
1989	10,210	9,166	602	7,026	11,504	2	18,532	8,686	7,242	15,928	194	2,798	63.6
1990	12,117	11,505	632	2,798	15,147	4	17,949	8,592	7,378	15,970	283	2,262	67.1
1991	13,802	12,716	650	2,262	17,216	13	19,491	9,548	6,348	15,896	-12	3,583	56.8
1992	12,977	10,863	694	3,583	15,710	1	19,294	10,190	4,869	15,059	221	4,456	53.7
1993	13,248	12,594	601	4,456	15,764	6	20,226	10,346	6,555	16,901	-22	3,303	58.1
1994	13,552	13,156	705	3,303	19,324	18	22,645	11,096	8,978	20,074	20	2,591	72.0
1995[6]	16,635	15,753	563	2,591	18,481	10	21,082	10,915	6,500	17,415	-3	3,664	[7]

[1]Economic Research Service compiled from Bureau of the Census data and adjusted to an August 1, 480-lb. net-weight basis. Excludes preseason ginnings. [2]Includes preseason ginnings. [3]Adjusted to August 1-July 31 marketing year. [4]Difference between ending stocks based on Census data and preceding season's supply less disappearance. [5]Marketing-year average price. [6]Estimated. [7]USDA is prohibited by law from publishing cotton price forecasts.

Appendix table 3—U.S. ELS cotton supply and use, 1960/61-95/96

Year begin. Aug. 1	Area			Supply				Disappearance					
	Planted	Harvested	Yield	Beginning stocks[1]	Production[2]	Imports	Total	Mill use[3]	Exports	Total	Unaccounted[4]	Ending stocks	Farm price[5]
	- - 1,000 acres - -		Lbs./acre	- - - - - - - - - - - - - - - - 1,000 480-lb. net weight bales - - - - - - - - - - - - - - - -									Cents/lb.
1960	62.7	60.2	535	157	67.1	86	310	149	8	157	-13	140	55.1
1961	61.9	59.4	503	140	62.3	84	286	173	7	180	-11	95	60.4
1962	96.3	93.6	576	95	112.3	82	289	162	3	165	82	206	53.9
1963	143.8	139.8	562	206	163.8	81	451	142	2	144	-47	260	52.6
1964	110.3	107.0	536	260	119.5	83	463	154	21	175	-19	269	49.1
1965	77.3	74.8	563	269	87.8	88	445	142	6	148	-3	294	48.1
1966	80.1	78.0	447	294	72.7	76	443	136	13	149	-31	263	48.7
1967	68.5	66.4	502	263	69.5	91	423	129	16	145	-73	205	47.9
1968	68.4	67.0	565	205	78.9	30	314	128	9	137	-10	167	40.7
1969	77.6	75.3	493	167	77.4	22	266	112	16	128	-22	116	40.4
1970	75.9	74.5	369	116	57.3	26	199	99	12	111	-19	69	43.3
1971	102.3	101.0	466	69	98.1	30	197	96	9	105	-16	76	44.8
1972	98.0	95.8	480	76	95.8	11	183	99	5	104	-11	68	44.9
1973	84.6	83.1	451	68	78.1	21	167	88	12	100	-12	55	87.2
1974	83.5	82.3	526	55	90.2	10	155	63	12	75	-21	59	64.4
1975	69.2	65.9	397	59	54.5	56	170	90	11	101	-3	66	78.9
1976	45.5	44.4	692	66	64.0	19	149	79	5	84	-16	49	104.0
1977	75.1	74.4	724	49	112.2	4	165	67	25	92	-4	69	87.9
1978	77.5	76.0	590	69	93.4	2	164	66	30	96	-15	53	91.7
1979	90.7	89.1	531	53	98.6	1	153	67	52	119	4	38	101.0
1980	72.5	71.7	698	38	104.2	1	143	64	33	97	8	54	108.0
1981	58.6	58.0	659	54	79.6	8	142	48	12	60	-17	65	96.9
1982	70.9	70.5	672	65	98.7	8	172	56	13	69	-10	93	98.5
1983	63.0	62.7	725	93	94.7	4	192	67	36	103	-7	82	106.0
1984	80.1	79.6	786	82	130.4	3	215	48	90	138	1	78	91.9
1985	84.0	83.6	891	78	155.1	0	233	61	105	166	-8	59	90.9
1986	111.5	111.1	890	59	205.9	0	265	67	114	181	0	84	89.9
1987	137.9	136.6	1,000	84	284.6	0	369	52	237	289	-27	53	104.0
1988	189.6	189.1	848	53	334.2	0	387	71	265	336	15	66	118.0
1989	376.9	371.7	893	66	691.7	0	758	73	452	525	-31	202	97.1
1990	231.3	227.1	758	202	358.5	0	560	65	415	480	2	82	106.0
1991	250.4	244.0	784	82	398.4	0	480	65	298	363	4	121	97.0
1992	263.4	260.2	938	121	508.3	0	629	60	332	392	-31	206	78.8
1993	190.0	188.9	938	206	380.6	0	587	72	307	379	30	227	87.0
1994	168.5	166.4	974	227	337.7	2	567	102	424	526	18	59	102.5
1995[6]	199.0	195.5	877	59	357.0	5	421	85	300	385	0	36	[7]

[1]Economic Research Service compiled from Bureau of the Census data and adjusted to an August 1, 480-lb. net-weight basis. Excludes preseason ginnings. [2]Includes preseason ginnings. [3]Adjusted to August 1-July 31 marketing year. [4]Difference between ending stocks based on Census data and preceding season's supply less disappearance. [5]Marketing-year average price. [6]Estimated. [7]USDA is prohibited by law from publishing cotton price forecasts.

Appendix table 4—Upland cotton: Planted acreage, by State, 1960/61-95/96

Crop year	AL	AZ	AR	CA	FL	GA	IL	KS	KY	LA	MS	MO	NV	NM	NC	OK	SC	TN	TX	VA	U.S.
											1,000 acres										
1960	878	407	1,370	965	26	675	2	0	9	525	1,580	423	4	203	410	655	568	525	6,777	16	16,017
1961	942	374	1,415	834	25	718	2	0	7	595	1,665	398	4	195	418	705	600	557	7,057	15	16,526
1962	917	370	1,403	825	21	710	2	0	7	581	1,635	392	4	193	417	675	590	553	6,886	15	16,197
1963	848	333	1,269	748	25	653	2	0	7	535	1,485	352	3	175	390	620	550	515	6,175	14	14,699
1964	847	333	1,275	758	25	646	3	0	7	534	1,498	354	4	171	395	614	549	512	6,186	15	14,725
1965	830	312	1,250	744	23	593	3	0	6	516	1,471	341	3	166	387	585	501	507	5,822	15	14,075
1966	589	221	930	631	15	403	2	0	5	367	1,032	255	2	126	244	447	355	398	4,236	11	10,269
1967	513	219	830	595	11	335	2	0	4	348	955	245	2	118	191	425	307	336	3,936	9	9,381
1968	555	270	1,045	695	13	410	2	0	5	423	1,155	318	3	147	200	421	354	394	4,426	8	10,845
1969	566	277	1,090	707	14	410	2	0	6	440	1,225	312	2	147	184	500	350	420	5,148	5	11,805
1970	565	243	1,120	665	13	408	1	0	4	465	1,235	310	2	139	173	525	346	425	5,225	5	11,869
1971	579	242	1,180	760	11	426	2	0	5	510	1,355	343	2	135	194	445	381	447	5,230	5	12,253
1972	601	273	1,470	868	13	461	2	0	6	690	1,664	435	2	141	210	553	400	540	5,570	5	13,903
1973	525	276	1,045	950	13	386	0	0	1	530	1,370	241	2	131	186	547	330	460	5,400	3	12,395
1974	600	392	1,200	1,250	13	423	1	0	5	650	1,780	370	2	151	158	570	290	540	5,200	2	13,596
1975	385	269	700	900	4	165	0	0	1	320	1,140	220	1	95	56	360	107	335	4,350	1	9,408
1976	440	341	1,125	1,130	7	255	0	0	2	570	1,530	305	1	68	75	350	170	420	4,800	1	11,590
1977	405	517	950	1,400	6	230	0	0	1	545	1,380	270	1	131	87	535	170	325	6,650	1	13,604
1978	325	540	810	1,480	4	120	0	0	0	515	1,200	210	1	137	45	605	105	250	6,950	0	13,298
1979	310	580	610	1,650	3	155	0	0	0	470	1,090	157	1	154	46	600	110	250	7,700	0	13,887
1980	325	550	700	1,550	6	170	0	0	0	570	1,150	245	1	151	66	715	122	290	7,850	0	14,461
1981	377	600	610	1,540	18	180	0	0	0	700	1,230	242	1	136	83	650	119	325	7,460	0	14,272
1982	287	471	410	1,380	16	163	0	1	0	605	1,000	154	1	79	71	480	97	260	5,800	0	11,275
1983	219	291	320	960	13	120	0	0	0	420	687	108	0	56	60	320	69	220	4,000	0	7,863
1984	309	430	470	1,410	17	175	0	1	0	650	1,045	164	0	77	97	425	104	340	5,350	1	11,065
1985	330	360	465	1,330	25	255	0	1	0	640	1,050	152	0	70	88	370	124	340	5,000	1	10,601
1986	315	250	490	1,000	20	225	0	1	0	580	1,020	178	0	63	82	400	118	340	4,850	1	9,933
1987	335	290	555	1,150	30	250	0	1	0	605	1,020	200	0	66	96	400	120	440	4,700	2	10,259
1988	390	350	695	1,350	33	350	0	1	0	735	1,230	245	0	77	126	460	145	535	5,600	3	12,325
1989	328	240	610	1,050	26	265	0	2	0	645	1,050	214	0	61	112	370	120	465	4,650	3	10,210
1990	380	350	770	1,100	37	355	0	2	0	810	1,230	248	0	69	201	380	155	525	5,500	5	12,117
1991	410	360	1,000	980	50	430	0	2	0	875	1,245	332	0	69	460	440	211	620	6,300	18	13,802
1992	415	325	1,000	1,000	50	460	0	3	0	890	1,350	335	0	55	380	370	197	625	5,500	22	12,977
1993	443	316	990	1,050	54	615	0	2	0	890	1,330	345	0	54	390	370	202	625	5,550	23	13,248
1994	463	313	980	1,100	69	885	0	1	0	900	1,280	352	0	55	486	360	225	590	5,450	42	13,552
1995[1]	600	365	1,170	1,180	110	1,500	0	3	0	1,075	1,500	460	0	55	800	370	340	700	6,300	107	16,635

[1]Economic Research Service compiled from November 1995 Crop Production report.

Appendix table 5—Upland cotton: Harvested acreage, by State, 1960/61-95/96

Crop year	AL	AZ	AR	CA	FL	GA	IL	KS	KY	LA	MS	MO	NV	NM	NC	OK	SC	TN	TX	VA	U.S.
											1,000 acres										
1960	860	400	1,320	946	25	653	2	0	8	510	1,520	412	3	189	390	630	550	512	6,303	15	15,249
1961	905	366	1,360	816	24	693	1	0	6	535	1,580	384	3	185	396	645	585	538	6,539	13	15,575
1962	900	364	1,355	808	21	692	2	0	7	565	1,585	383	3	182	402	612	575	538	6,467	15	15,475
1963	832	325	1,230	729	24	639	2	0	6	519	1,438	343	3	161	375	590	536	504	5,801	14	14,072
1964	831	328	1,242	742	24	632	3	0	6	520	1,460	347	3	161	381	575	538	502	5,638	15	13,948
1965	809	307	1,205	725	19	577	2	0	6	498	1,430	334	3	158	368	555	489	499	5,539	14	13,538
1966	564	218	865	618	14	380	1	0	3	357	993	190	2	119	155	380	305	365	3,940	6	9,475
1967	340	216	715	588	10	267	0	0	1	330	890	90	2	109	75	370	190	236	3,501	1	7,931
1968	525	269	980	687	11	395	0	0	4	410	1,105	190	2	138	189	380	340	360	4,101	6	10,092
1969	540	277	1,055	701	10	385	0	0	5	420	1,185	292	2	132	166	465	287	400	4,648	5	10,976
1970	538	241	1,070	662	8	375	0	0	3	450	1,190	250	2	126	160	450	290	390	4,870	4	11,080
1971	558	241	1,140	741	9	385	1	0	4	500	1,325	313	2	130	175	396	320	425	4,700	4	11,370
1972	580	271	1,410	863	11	430	1	0	5	665	1,606	405	2	131	170	510	340	485	5,000	3	12,888
1973	510	276	975	942	11	375	0	0	0	520	1,340	173	2	127	173	526	294	440	5,200	2	11,887
1974	585	392	1,130	1,238	12	410	1	0	4	635	1,710	330	2	140	145	547	272	510	4,400	1	12,464
1975	370	268	680	875	4	160	0	0	1	310	1,100	210	1	85	53	295	103	315	3,900	1	8,730
1976	420	340	950	1,120	7	240	0	0	1	560	1,470	260	1	64	71	335	159	370	4,500	1	10,869
1977	395	515	930	1,390	6	170	0	0	1	540	1,360	258	1	128	83	520	153	300	6,450	1	13,201
1978	315	538	760	1,455	4	115	0	0	0	510	1,180	182	1	109	42	585	98	230	6,200	0	12,324
1979	305	575	530	1,635	3	150	0	0	0	465	1,050	137	1	126	45	580	109	230	6,800	0	12,742
1980	321	549	645	1,540	6	160	0	0	0	560	1,125	241	1	120	65	565	120	275	6,850	0	13,143
1981	372	599	560	1,530	17	175	0	0	0	695	1,200	183	1	106	82	640	118	305	7,200	0	13,783
1982	285	470	390	1,370	15	158	0	0	0	595	990	151	1	68	70	450	95	255	4,300	0	9,663
1983	215	284	290	950	12	115	0	0	0	410	675	93	0	47	59	300	69	215	3,550	0	7,285
1984	307	429	465	1,400	17	172	0	1	0	645	1,032	162	0	69	96	375	104	325	4,700	1	10,300
1985	329	359	440	1,320	23	245	0	1	0	630	1,040	150	0	54	87	360	122	335	4,650	1	10,145
1986	313	249	480	990	19	195	0	1	0	570	1,000	160	0	50	81	350	113	335	3,450	1	8,357
1987	333	289	550	1,140	29	245	0	1	0	600	1,010	199	0	62	95	385	119	435	4,400	2	9,894
1988	375	349	675	1,335	29	315	0	1	0	645	1,190	242	0	69	124	435	142	530	5,300	3	11,759
1989	322	239	595	1,040	25	260	0	0	0	620	1,020	209	0	55	110	340	118	460	3,750	3	9,166
1990	378	348	750	1,090	36	350	0	1	0	790	1,220	235	0	62	200	370	154	515	5,000	5	11,505
1991	405	359	980	977	49	427	0	2	0	820	1,230	327	0	65	457	380	210	610	5,400	18	12,716
1992	408	323	980	995	50	456	0	1	0	870	1,345	328	0	37	377	315	192	615	3,550	22	10,863
1993	430	315	970	1,045	54	600	0	1	0	875	1,300	335	0	49	385	350	198	615	5,050	23	12,594
1994	455	312	970	1,095	68	875	0	1	0	890	1,270	345	0	50	485	340	223	585	5,150	42	13,156
1995[1]	585	364	1,100	1,175	109	1,490	0	2	0	1,065	1,460	445	0	51	780	325	335	660	5,700	107	15,753

[1]Economic Research Service compiled from November 1995 Crop Production report.

Appendix table 6—Upland cotton: Lint yield per harvested acre, by State, 1960/61-95/96

Crop year	AL	AZ	AR	CA	FL	GA	IL	KS	KY	LA	MS	MO	NV	NM	NC	OK	SC	TN	TX	VA	U.S.
										Lbs./harvested acre											
1960	421	979	485	981	327	371	352	0	565	470	486	548	929	705	284	348	360	545	329	321	446
1961	327	1,045	512	991	279	354	211	0	384	429	493	469	838	746	337	274	337	493	349	363	438
1962	371	1,162	512	1,132	371	369	500	0	551	464	512	582	883	658	327	243	373	494	347	248	456
1963	511	1,120	582	1,125	384	453	469	0	688	628	709	630	841	711	449	273	405	621	360	400	516
1964	512	1,085	605	1,134	325	467	510	0	592	544	732	564	777	697	470	239	496	640	347	444	517
1965	505	1,157	572	1,117	353	467	458	0	619	540	678	559	614	667	287	319	486	611	401	273	527
1966	392	1,053	418	952	336	398	354	0	525	602	653	408	813	679	290	270	442	475	385	180	480
1967	282	928	333	848	336	408	245	0	322	621	567	314	867	651	277	251	449	295	376	138	446
1968	362	1,230	502	1,097	431	322	347	0	574	636	660	495	872	571	310	333	352	432	410	242	516
1969	409	1,033	518	899	464	351	460	0	516	551	534	533	654	529	287	288	342	505	292	201	433
1970	453	920	470	841	436	373	245	0	344	555	658	431	545	504	464	206	349	483	315	384	439
1971	551	928	522	723	602	466	242	0	573	576	613	614	319	493	371	215	412	597	263	247	438
1972	470	1,067	488	982	572	395	256	0	397	509	599	520	607	581	337	313	435	543	408	265	507
1973	423	1,063	513	891	522	499	0	0	486	481	651	501	477	514	455	390	473	472	431	440	521
1974	429	1,218	374	1,006	503	490	288	0	280	423	448	335	586	509	440	272	483	290	269	384	441
1975	405	1,027	485	1,072	346	443	0	0	257	535	454	449	721	382	412	277	454	339	293	344	453
1976	399	1,178	392	1,064	514	398	0	0	258	474	376	305	738	523	489	251	438	295	353	480	464
1977	337	997	534	964	425	232	0	0	420	583	581	437	598	603	305	402	342	407	407	194	519
1978	443	953	417	640	506	463	0	0	0	450	561	496	542	443	515	292	562	490	294	480	419
1979	510	1,069	549	1,000	565	486	0	0	0	712	657	550	655	396	455	432	510	357	389	320	547
1980	411	1,184	330	969	610	258	0	0	0	394	488	353	640	428	381	174	309	349	233	320	402
1981	545	1,247	518	1,109	601	436	0	0	0	512	626	441	800	602	558	330	667	496	376	480	542
1982	775	1,118	657	1,077	627	714	0	120	0	702	853	648	617	551	699	254	783	638	301	640	589
1983	409	1,225	535	996	608	467	0	240	0	623	640	377	0	715	350	232	369	337	322	360	506
1984	699	1,227	632	999	847	784	0	288	0	786	767	554	0	605	600	234	785	498	376	528	599
1985	795	1,241	767	1,132	693	725	0	320	0	565	764	653	0	631	646	380	708	600	404	443	628
1986	506	1,301	602	1,088	707	455	0	336	0	567	571	588	0	595	646	288	370	567	353	554	547
1987	572	1,410	786	1,259	646	662	0	480	0	782	829	796	0	689	495	431	428	700	506	373	702
1988	486	1,190	742	1,015	566	564	0	373	0	705	736	607	0	710	515	334	473	529	472	510	615
1989	571	1,303	687	1,228	557	631	0	240	0	672	732	618	0	698	615	244	626	497	367	498	602
1990	476	1,119	692	1,204	640	555	0	280	0	715	728	641	0	735	631	496	452	461	477	562	632
1991	655	1,201	772	1,252	719	812	0	347	0	828	888	630	0	465	672	303	786	552	419	765	650
1992	731	1,077	823	1,359	701	783	0	120	0	717	761	792	0	616	596	320	565	651	441	621	694
1993	524	1,204	541	1,340	696	586	0	206	0	606	572	539	0	769	535	370	495	425	484	634	601
1994	766	1,203	877	1,191	735	843	0	480	0	815	806	856	0	720	820	349	846	726	458	944	705
1995[1]	361	1,055	624	1,042	691	644	0	408	0	608	605	577	0	762	554	295	645	575	404	700	563

[1]Economic Research Service compiled from November 1995 Crop Production report.

Appendix table 7—Upland cotton: Production by State, 1960/61-95/96

Crop year	AL	AZ	AR	CA	FL	GA	IL	KS	KY	LA	MS	MO	NV	NM	NC	OK	SC	TN	TX	VA	U.S.
										1,000 480-lb. net weight bales											
1960	755	815	1,335	1,933	17	504	1	0	9	500	1,538	470	7	277	231	457	412	581	4,317	10	14,170
1961	616	797	1,452	1,683	14	511	1	0	5	478	1,621	375	6	287	278	368	411	553	4,754	10	14,221
1962	695	882	1,445	1,907	16	533	2	0	8	546	1,692	464	6	249	274	310	447	553	4,679	8	14,715
1963	885	759	1,491	1,708	19	603	2	0	9	679	2,124	450	6	239	350	335	452	652	4,355	12	15,130
1964	887	742	1,565	1,753	16	615	3	0	8	589	2,226	408	5	234	373	287	556	669	4,076	14	15,025
1965	852	740	1,437	1,685	14	561	2	0	8	560	2,020	389	4	219	220	369	495	635	4,632	8	14,850
1966	460	478	753	1,225	10	315	0	0	3	448	1,350	161	4	168	94	214	281	362	3,156	2	9,484
1967	200	418	496	1,038	7	227	0	0	1	427	1,051	59	4	147	43	193	178	145	2,740	0	7,374
1968	396	688	1,025	1,569	10	265	0	0	4	544	1,519	196	4	164	122	264	250	324	3,499	3	10,847
1969	460	595	1,137	1,312	9	282	0	0	6	482	1,319	325	3	145	99	279	205	421	2,831	2	9,913
1970	507	462	1,048	1,160	7	292	0	0	2	521	1,631	224	3	132	155	193	211	392	3,191	3	10,135
1971	640	466	1,240	1,117	12	374	0	0	5	600	1,693	401	2	133	135	177	275	528	2,579	2	10,379
1972	567	603	1,435	1,765	14	354	1	0	4	705	2,007	439	3	158	119	332	308	548	4,246	1	13,608
1973	449	611	1,041	1,749	13	390	0	0	0	521	1,816	180	2	136	164	427	290	432	4,673	2	12,896
1974	522	995	880	2,595	13	419	0	0	3	560	1,595	230	2	148	133	310	274	308	2,462	1	11,450
1975	312	573	687	1,954	3	148	0	0	0	346	1,040	196	2	68	46	170	98	222	2,382	1	8,247
1976	349	834	776	2,482	8	199	0	0	1	553	1,151	165	2	70	72	175	145	228	3,307	1	10,517
1977	277	1,070	1,035	2,790	5	82	0	0	1	656	1,645	235	2	161	53	436	109	255	5,465	0	14,277
1978	291	1,068	660	1,940	4	111	0	0	0	478	1,378	188	2	101	45	355	115	235	3,792	0	10,762
1979	324	1,280	606	3,408	4	152	0	0	0	690	1,437	157	2	104	43	522	116	171	5,515	0	14,531
1980	275	1,354	444	3,109	8	86	0	0	0	460	1,143	177	1	107	52	205	77	200	3,320	0	11,018
1981	422	1,556	604	3,535	21	159	0	0	0	742	1,565	168	2	133	95	440	164	315	5,645	0	15,566
1982	460	1,095	534	3,073	20	235	0	0	0	870	1,760	204	1	78	102	238	155	339	2,700	0	11,864
1983	183	725	323	1,971	15	112	0	0	0	532	900	73	0	70	43	145	53	151	2,380	0	7,677
1984	447	1,097	612	2,913	30	281	0	0	0	1,056	1,650	187	0	87	120	183	170	337	3,680	1	12,851
1985	545	928	703	3,114	33	370	0	0	0	742	1,655	204	0	71	117	285	180	419	3,910	1	13,277
1986	330	675	602	2,245	28	185	0	1	0	673	1,190	196	0	62	109	210	87	396	2,535	2	9,525
1987	397	849	901	2,989	39	338	0	1	0	977	1,745	330	0	89	98	346	106	634	4,635	1	14,475
1988	380	865	1,044	2,824	34	370	0	1	0	948	1,825	306	0	102	133	303	140	584	5,215	3	15,077
1989	383	649	851	2,661	29	342	0	0	0	868	1,555	269	0	80	141	173	154	476	2,870	3	11,504
1990	375	811	1,081	2,734	48	405	0	1	0	1,177	1,850	314	0	95	263	382	145	495	4,965	6	15,147
1991	553	898	1,576	2,548	73	722	0	1	0	1,414	2,275	429	0	63	640	240	344	701	4,710	28	17,216
1992	621	725	1,681	2,817	72	744	0	0	0	1,299	2,131	541	0	48	468	210	226	834	3,265	28	15,710
1993	469	790	1,094	2,918	78	733	0	1	0	1,105	1,550	376	0	78	429	270	204	545	5,095	30	15,764
1994	726	782	1,772	2,717	104	1,537	0	1	0	1,512	2,132	615	0	75	829	247	393	885	4,915	82	19,324
1995[1]	440	800	1,430	2,550	157	2,000	0	2	0	1,350	1,840	535	0	81	900	200	450	790	4,800	156	18,481

[1]Economic Research Service compiled from November 1995 Crop Production report.

Appendix table 8—ELS cotton: Planted and harvested acreage, by State, 1960/61-95/96

Crop year	Planted acreage						Harvested acreage					
	Arizona	California	New Mexico	Texas	Mississippi	United States	Arizona	California	New Mexico	Texas	Mississippi	United States
	1,000 acres											
1960	27	0	13	23	—	63	26	0	12	22	—	60
1961	26	0	13	23	—	62	26	0	12	21	—	59
1962	42	1	20	34	—	96	41	1	19	33	—	94
1963	63	1	29	50	—	144	62	1	29	49	—	140
1964	48	1	23	39	—	110	47	1	22	38	—	107
1965	34	1	16	28	—	77	33	1	15	26	—	75
1966	35	1	16	29	—	80	34	1	15	28	—	78
1967	30	1	14	25	—	69	29	0	13	24	—	66
1968	30	0	14	25	—	68	29	0	13	24	—	67
1969	34	1	16	28	—	78	33	0	15	27	—	75
1970	33	1	16	27	—	76	33	0	15	26	—	75
1971	45	1	22	36	—	102	44	1	21	35	—	101
1972	41	0	21	35	—	98	40	0	21	35	—	96
1973	34	0	19	32	—	85	34	0	18	31	—	83
1974	35	0	15	34	—	84	35	0	15	33	—	82
1975	30	0	13	26	—	69	30	0	13	24	—	66
1976	30	0	7	9	—	46	30	0	6	8	—	44
1977	42	0	9	23	—	75	42	0	9	23	—	74
1978	34	0	14	29	—	78	34	0	14	28	—	76
1979	44	0	16	31	—	91	43	0	15	31	—	89
1980	42	0	7	23	—	73	42	0	7	23	—	72
1981	34	0	7	18	—	59	34	0	7	18	—	58
1982	42	0	10	20	—	71	42	0	9	20	—	71
1983	30	0	11	22	—	63	29	0	11	22	—	63
1984	51	0	10	20	—	80	50	0	10	19	—	80
1985	57	0	8	20	—	84	56	0	8	19	—	84
1986	74	0	11	26	—	112	74	0	11	26	—	111
1987	91	1	14	32	—	138	91	1	14	31	—	137
1988	128	2	18	42	—	190	128	2	18	42	—	189
1989	245	18	30	82	2	377	245	18	30	78	1	372
1990	125	26	19	60	1	231	124	26	19	57	1	227
1991	106	64	20	60	1	250	103	64	19	57	1	244
1992	103	110	13	37	0	263	102	110	13	35	0	260
1993	57	91	11	31	—	190	57	91	11	30	—	189
1994	48	81	11	29	—	169	48	81	11	27	—	166
1995[1]	48	100	15	36	—	199	48	100	15	33	—	196

0 = Less than 500. — = Not available.

[1]Economic Research Service compiled from November 1995 Crop Production report.

Appendix table 9—ELS cotton: Production and yield, by State, 1960/61-95/96

Crop year	Production						Yield					
	Arizona	California	New Mexico	Texas	Mississippi	United States	Arizona	California	New Mexico	Texas	Mississippi	United States
	1,000 480-lb. bales						Lbs./harvested acre					
1960	31	0	13	23	—	67	563	400	507	518	—	535
1961	28	0	11	23	—	62	518	384	455	515	—	503
1962	57	1	18	37	—	112	665	534	450	539	—	576
1963	77	1	31	54	—	164	602	753	520	533	—	562
1964	55	1	23	40	—	120	562	761	507	517	—	536
1965	45	1	13	29	—	88	657	875	408	530	—	563
1966	36	1	13	23	—	73	507	628	408	392	—	447
1967	34	0	10	25	—	70	574	468	359	496	—	502
1968	44	0	11	23	—	79	721	762	411	456	—	565
1969	37	1	12	28	—	77	533	498	404	492	—	493
1970	28	0	11	19	—	57	407	335	334	342	—	369
1971	42	0	20	35	—	98	456	325	473	478	—	466
1972	49	0	15	31	—	96	587	385	349	437	—	480
1973	42	0	10	26	—	78	597	480	265	397	—	451
1974	53	0	13	25	—	90	729	683	417	359	—	526
1975	38	0	5	11	—	55	612	480	195	231	—	397
1976	50	0	6	7	—	64	804	640	476	444	—	692
1977	65	0	12	35	—	112	738	269	621	747	—	724
1978	54	0	13	27	—	93	754	480	454	456	—	590
1979	67	0	8	24	—	99	743	480	246	373	—	531
1980	72	0	7	25	—	104	824	480	464	533	—	698
1981	54	0	8	18	—	80	767	0	558	491	—	659
1982	66	0	10	23	—	99	760	0	511	561	—	672
1983	47	0	16	32	—	95	768	0	683	689	—	725
1984	88	0	12	30	—	130	841	0	595	744	—	786
1985	109	0	11	35	—	155	927	0	687	868	—	891
1986	148	0	17	41	—	206	965	0	718	751	—	890
1987	213	2	19	51	—	285	1,126	1,173	642	787	—	1,000
1988	241	3	24	67	—	334	904	853	634	769	—	848
1989	477	40	44	129	2	692	936	1,078	707	794	436	893
1990	194	57	25	81	2	359	751	1,080	609	682	591	758
1991	184	146	19	48	1	398	860	1,097	470	404	560	784
1992	138	294	20	56	0	508	649	1,282	739	775	480	938
1993	87	215	19	49	—	369	734	1,132	816	784	—	938
1994	80	185	20	53	—	338	806	1,098	875	942	—	974
1995[1]	74	205	23	55	—	357	748	984	736	800	—	877

0 = Less than 500. — = Not available.
[1]Economic Research Service compiled from November 1995 Crop Production report.

Appendix table 10—U.S. cotton supply and disappearance of all kinds, by month, 1989/90-94/95[1]

	Supply							Disappearance				
	Beginning stocks[2]											
Date	At mills	Public storage[3]	Other[4]	Total	Ginnings[5]	Imports	Total supply	Mill use[6]	Exports	Total use	Unaccounted	Ending stocks[7]
	1,000 480-lb. net weight bales											
1989/90:												
Aug	632	6,179	281	7,092	392	0	7,484	831	507	1,338	0	6,146
Sep	626	5,190	330	6,146	613	0	6,759	753	492	1,245	0	5,514
Oct	616	4,658	240	5,514	4,944	0	10,458	792	522	1,314	0	9,144
Nov	575	7,694	875	9,144	4,658	0	13,802	731	520	1,251	0	12,551
Dec	566	10,997	988	12,551	1,224	0	13,775	579	682	1,261	0	12,514
Jan	607	11,187	720	12,514	229	0	12,743	754	875	1,629	0	11,114
Feb	687	9,898	529	11,114	136	0	11,250	690	797	1,487	0	9,763
Mar	717	8,371	675	9,763	0	1	9,764	757	997	1,754	0	8,010
Apr	723	6,822	465	8,010	0	0	8,010	711	734	1,445	0	6,565
May	712	5,662	191	6,565	0	0	6,565	800	590	1,390	0	5,176
Jun	701	4,385	90	5,176	0	1	5,177	721	538	1,259	0	3,918
Jul	694	3,314	(90)	3,918	0	0	3,918	641	440	1,081	163	3,000
Season	632	6,179	281	7,092	12,196	2	19,290	8,759	7,694	16,453	163	3,000
1990/91:												
Aug	697	2,270	33	3,000	597	0	3,597	829	544	1,373	0	2,224
Sep	644	1,679	(99)	2,224	2,087	0	4,311	692	412	1,104	0	3,207
Oct	550	2,541	116	3,207	5,470	0	8,677	802	377	1,179	0	7,498
Nov	539	6,368	591	7,498	4,587	0	12,085	687	718	1,405	0	10,680
Dec	531	9,232	917	10,680	2,134	0	12,814	490	769	1,259	0	11,555
Jan-Mar	600	10,207	748	11,555	630	2	12,187	2,152	3,116	5,268	0	6,919
Apr-Jun	689	5,682	548	6,919	0	1	6,920	2,311	1,648	3,959	0	2,961
Jul	751	2,592	(382)	2,961	0	1	2,962	694	209	903	285	2,344
Season	697	2,270	33	3,000	15,505	4	18,509	8,657	7,793	16,450	285	2,344
1991/92:												
Aug-Sep	603	1,781	(40)	2,344	2,547	9	4,900	1,615	351	1,966	0	2,934
Oct-Dec	593	2,315	26	2,934	13,785	3	16,722	2,285	1,630	3,915	0	12,807
Jan	602	11,497	708	12,807	899	0	13,706	850	875	1,725	0	11,982
Feb	618	10,710	654	11,982	331	0	12,313	761	754	1,515	0	10,797
Mar	604	9,581	612	10,797	52	0	10,849	825	837	1,662	0	9,188
Apr	657	8,007	524	9,188	0	0	9,188	824	710	1,534	0	7,653
May	663	6,534	456	7,653	0	1	7,654	820	567	1,387	0	6,267
Jun	654	5,271	342	6,267	0	0	6,267	811	576	1,387	0	4,880
Jul	667	3,872	341	4,880	0	0	4,880	822	347	1,169	(8)	3,704
Season	603	1,781	(40)	2,344	17,614	13	19,971	9,613	6,646	16,259	(8)	3,704
1992/93:												
Aug	691	2,924	89	3,704	463	0	4,167	849	301	1,149	0	3,017
Sep	663	2,320	34	3,017	1,255	0	4,272	871	267	1,137	0	3,135
Oct	579	2,496	60	3,135	6,080	0	9,215	911	272	1,183	0	8,032
Nov	536	6,804	692	8,032	5,136	0	13,168	825	403	1,228	0	11,940
Dec	540	10,421	979	11,940	2,408	1	14,349	752	581	1,332	0	13,017
Jan	623	11,710	684	13,017	617	0	13,634	853	545	1,397	0	12,237
Feb	652	10,531	1,054	12,237	259	0	12,496	828	491	1,319	0	11,177
Mar	665	9,477	1,035	11,177	0	0	11,177	934	633	1,567	0	9,610
Apr	709	8,031	870	9,610	0	0	9,610	890	537	1,427	0	8,183
May	726	6,834	623	8,183	0	0	8,183	865	423	1,288	0	6,895
Jun	730	5,795	370	6,895	0	0	6,895	870	377	1,246	0	5,648
Jul	719	4,660	269	5,648	0	0	5,648	803	373	1,176	190	4,662
Season	691	2,924	89	3,704	16,218	1	19,923	10,250	5,201	15,451	190	4,662

Continued—

Appendix table 10—U.S. cotton supply and disappearance of all kinds, by month, 1989/90-94/95[1]—Cont'd

	Supply							Disappearance				
	Beginning stocks[2]											
Date	At mills	Public storage[3]	Other[4]	Total	Ginnings[5]	Imports	Total supply	Mill use[6]	Exports	Total use	Unaccounted	Ending stocks[7]
	1,000 480-lb. net weight bales											
1993/94:												
Aug	724	3,740	198	4,662	447	0	5,109	919	287	1,205	0	3,903
Sep	655	3,161	87	3,903	1,442	0	5,345	881	248	1,129	0	4,216
Oct	658	3,276	282	4,216	6,356	0	10,572	864	346	1,210	0	9,362
Nov	603	7,495	1,264	9,362	5,335	1	14,698	836	405	1,241	0	13,457
Dec	598	11,491	1,368	13,457	2,134	0	15,591	744	571	1,316	0	14,276
Jan	645	12,367	1,264	14,276	261	0	14,537	811	738	1,549	0	12,987
Feb	678	11,260	1,049	12,987	170	1	13,158	818	512	1,330	0	11,828
Mar	687	9,817	1,324	11,828	0	1	11,829	955	743	1,699	0	10,131
Apr	710	8,352	1,069	10,131	0	1	10,132	880	761	1,640	0	8,491
May	709	6,895	887	8,491	0	0	8,491	949	854	1,803	0	6,689
Jun	687	5,399	603	6,689	0	1	6,690	945	770	1,715	0	4,975
Jul	680	3,772	523	4,975	0	1	4,976	817	626	1,443	(3)	3,530
Season	724	3,740	198	4,662	16,145	6	20,813	10,418	6,862	17,280	(3)	3,530
1994/95:												
Aug	676	2,581	273	3,530	699	3	4,232	1,042	531	1,574	0	2,658
Sep	665	1,802	191	2,658	1,700	0	4,358	978	333	1,310	0	3,048
Oct	610	2,089	349	3,048	6,824	1	9,873	952	341	1,293	0	8,581
Nov	599	6,735	1,247	8,581	6,826	1	15,408	954	710	1,664	0	13,744
Dec	606	11,451	1,687	13,744	2,904	2	16,650	798	1,099	1,896	0	14,754
Jan	675	12,261	1,818	14,754	588	1	15,343	978	1,115	2,093	0	13,250
Feb	663	10,508	2,079	13,250	121	1	13,372	912	1,383	2,295	0	11,077
Mar	691	8,322	2,064	11,077	0	2	11,079	1,048	1,392	2,439	0	8,640
Apr	736	6,258	1,646	8,640	0	1	8,641	879	1,104	1,983	0	6,658
May	794	4,883	981	6,658	0	3	6,661	1,006	684	1,690	0	4,971
Jun	787	3,625	559	4,971	0	4	4,975	909	410	1,319	0	3,655
Jul	759	2,586	310	3,655	0	1	3,656	743	300	1,044	38	2,650
Season	676	2,581	273	3,530	19,662	20	23,212	11,198	9,402	20,600	38	2,650

[1]Economic Research Service compiled from Bureau of the Census data and adjusted to 480-lb. net-weight bales. [2]August stocks adjusted to August 1 basis, excluding preseason ginnings. [3]Adjusted to 480-lb. bales by use of monthly conversion factors for mill stocks. [4]Primarily cotton on farms and in transit. Estimated by subtracting public storage and mill stocks from total stocks. [5]August data include preseason ginnnings. [6]Adjusted to a calendar month. [7]Supply less disappearance. End-of-season stocks adjusted by Bureau of the Census data. Differences primarily reflect varying bale weights. Monthly data are rounded.

Appendix table 11—Program payments to cotton farmers, 1976/77-94/95

Crop year	Deficiency payments	Diversion payments	Disaster payments	PIK entitlements	Total
			Million dollars		
1976	0	0	98	0	98
1977	0	0	69	0	69
1978	0	41	188	0	228
1979	0	0	107	0	107
1980	0	0	302	0	302
1981	468	0	81	0	550
1982	523	0	131	0	654
1983	431	3	0[1]	1,094	1,528
1984	654	0	0	0	654
1985	858	196	0	0	1,054
1986	1,258	0	0[2]	127	1,386
1987	953	0	0	0	954
1988	1,144	0	151[2]	42	1,337
1989	655	0	171	0	826
1990	410	0	43	0	453
1991	552	0	93[2]	154	800
1992	1,017	0	134[2]	268	1,420
1993	1,056	1	163[2]	304	1,522
1994	266	0	0	0	266

[1]Includes 4.3 million bales valued at average loan redemption rate of 53 cents per pound. [2]Includes $126 million in loan deficiency payments. [3]Includes $42 million in loan deficiency payments. [4]Preliminary, includes $140 million in loan deficiency payments.

Source: Economic Research Service compiled from data in *ASCS Commodity Fact Sheet: Upland Cotton*, Agricultural Stabilization and Conservation Service, USDA, annual issues.

Appendix table 12—Support levels and season-average prices for upland cotton, 1974/75-95/96

Crop year	Loan rate[1]	Target price	Season-average price received by farmers (net-weight basis)[2]
		Cents/lb.	
1974	27.06	38.00	42.7
1975	36.12	38.00	51.1
1976	38.92	43.20	63.8
1977	44.63	47.80	52.1
1978	48.00	52.00	58.1
1979	50.23	57.70	62.3
1980	48.00	58.40	75.8
1981	52.46	70.87	55.4
1982	57.08	71.00	59.5
1983	55.00	76.00	65.3
1984	55.00	81.00	58.7
1985	57.30	81.00	56.8
1986	55.00	81.00	51.5
1987	52.25	79.40	63.7
1988	51.80	75.90	55.6
1989	50.00	73.40	63.6
1990	50.27	72.90	67.1
1991	50.77	72.90	56.8
1992	52.35	72.90	53.7
1993	52.35	72.90	58.1
1994	50.00	72.90	72.0
1995	51.92	72.90	[3]

[1]Base loan rates for SLM 1-1/16-inch cotton (micronaire 3.5-4.9) at average location, net weight. [2]Beginning 1980, marketing-year average price with no allowance for unredeemed loans. [3]USDA is prohibited by law from publishing cotton price forecasts.

Source: Economic Research Service compiled from USDA, Farm Service Agency data.

Appendix table 13—Number of active cotton gins, by State, 1984/85-93/94

State	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
Alabama	91	84	82	82	82	75	72	70	68	61
Arizona	100	91	85	84	89	89	90	85	81	69
Arkansas	143	132	129	128	129	125	122	138	121	127
California	169	163	146	144	146	148	138	126	121	117
Georgia	53	61	57	60	64	63	59	58	59	61
Louisiana	93	89	86	84	82	81	80	85	77	75
Mississippi	247	237	223	217	210	201	192	181	181	163
Missouri	54	50	50	50	49	48	48	45	41	41
New Mexico	33	31	30	28	28	28	26	22	20	19
North Carolina	37	36	36	36	37	36	39	45	42	41
Oklahoma	76	71	69	69	64	65	63	61	64	61
South Carolina	53	49	48	47	43	41	40	43	41	46
Tennessee	79	74	73	70	76	74	70	69	62	53
Texas	629	601	545	551	543	507	494	472	405	423
United States	1,857	1,772	1,662	1,653	1,645	1,581	1,533	1,500	1,383	1,357

Source: Economic Research Service compiled from U.S. Department of Commerce, Bureau of the Census, Agriculture Division.

Appendix table 14—Raw-fiber-equivalent of textile manufactures, 1960-95

Year	Cotton		Wool		Manmade	
	Imports	Exports	Imports	Exports	Imports	Exports
	1,000 lbs.					
1960	252,256	233,272	132,132	4,695	31,338	90,772
1961	188,896	239,181	127,458	4,538	23,491	86,351
1962	309,848	220,307	145,637	4,369	30,557	90,467
1963	304,312	207,807	152,549	5,589	36,207	97,078
1964	300,165	213,235	141,147	6,998	50,005	108,471
1965	360,710	173,732	156,689	12,662	79,032	129,056
1966	510,297	189,526	144,272	10,119	123,065	139,976
1967	443,385	188,399	123,434	8,641	138,818	132,978
1968	473,846	188,200	145,967	9,339	193,325	128,994
1969	487,897	232,063	129,670	8,893	257,460	146,230
1970	463,177	199,186	116,560	7,424	329,258	147,052
1971	492,576	226,311	89,705	12,046	451,072	146,677
1972	610,703	290,444	95,377	33,332	480,453	177,584
1973	563,501	325,197	89,962	33,363	465,319	288,227
1974	502,679	392,493	74,225	25,975	371,252	390,734
1975	501,252	353,663	68,422	21,386	400,376	322,388
1976	708,601	413,154	98,579	15,082	479,487	352,176
1977	669,407	369,461	116,606	13,038	531,130	367,076
1978	845,424	355,745	129,369	12,467	642,587	441,700
1979	746,096	477,968	109,543	15,590	524,973	596,580
1980	810,930	523,096	103,288	24,264	771,544	540,644
1981	961,900	367,300	113,626	12,332	637,733	639,076
1982	903,791	253,342	112,240	11,945	807,096	438,551
1983	1,135,502	219,614	149,781	11,579	1,069,490	460,713
1984	1,465,475	206,081	210,165	12,028	1,342,569	487,870
1985	1,629,166	213,224	264,822	17,761	1,491,026	449,152
1986	1,910,474	274,828	275,626	16,027	1,702,957	519,307
1987	2,335,696	298,004	276,092	23,455	1,805,443	591,869
1988	2,118,775	330,266	242,384	30,594	1,735,700	684,751
1989	2,353,918	507,422	222,343	66,289	1,715,707	1,060,466
1990	2,416,410	664,752	205,800	59,645	1,750,390	1,339,314
1991	2,592,913	722,885	210,905	63,302	1,768,993	1,400,116
1992	3,193,165	844,928	237,391	72,171	2,126,540	1,418,784
1993	3,574,383	958,309	260,465	77,628	2,221,192	1,388,118
1994	3,795,927	1,107,446	309,559	91,648	2,529,968	1,448,132
1995[1]	1,997,976	658,912	145,974	53,349	1,279,372	753,679

[1]Data for the first 6 months.

Source: Economic Research Service compiled from U.S. Bureau of the Census data.

Appendix table 15—U.S. fiber consumption: Total and per capita, by type of fiber, 1989-95

Fiber and year	U.S. mill use	Share of fibers	Textile trade[1] Exports	Textile trade[1] Imports	Total domestic consumption[2]	Share of fibers	Per capita[3] Mill use	Per capita[3] Domestic consumption
	Million lbs.	*Percent*	*Million lbs.*			*Percent*	*Pounds*	
Cotton:								
1989	4,046.0	29.8	507.4	2,353.9	5,892.5	35.1	16.4	23.8
1990	4,115.3	30.6	664.8	2,416.4	5,866.9	35.9	16.5	23.5
1991	4,347.5	31.7	722.9	2,592.9	6,217.5	37.3	17.2	24.6
1992	4,761.6	32.3	844.9	3,193.2	7,109.9	38.1	18.6	27.8
1993	4,937.7	32.1	958.3	3,574.4	7,553.8	38.5	19.1	29.3
1994	5,230.6	32.2	1,107.4	3,795.9	7,919.1	38.0	20.1	30.4
1995[4]	2,750.9	33.3	658.9	1,998.0	4,090.0	38.8	—	—
Wool:								
1989	134.7	1.0	66.3	222.3	290.7	1.7	0.5	1.2
1990	132.7	1.0	59.6	205.8	278.9	1.7	0.5	1.1
1991	151.5	1.1	63.3	210.9	299.1	1.8	0.6	1.2
1992	150.8	1.0	72.2	237.4	316.0	1.7	0.6	1.2
1993	156.8	1.0	77.6	260.5	339.7	1.7	0.6	1.2
1994	153.3	0.9	91.6	309.6	371.3	1.8	0.6	1.4
1995[4]	80.0	1.0	53.3	146.0	172.7	1.6	—	—
Manmade fibers:								
1989	9,217.6	68.0	1,060.5	1,715.7	9,872.8	58.7	37.3	39.9
1990	9,047.0	67.3	1,339.3	1,750.4	9,458.1	57.9	36.2	37.8
1991	9,092.2	66.3	1,400.1	1,769.0	9,461.1	56.8	36.0	37.5
1992	9,730.9	66.0	1,418.8	2,126.5	10,438.6	56.3	38.1	40.9
1993	10,160.6	66.1	1,388.1	2,221.2	10,993.7	56.1	39.4	42.6
1994	10,732.3	66.1	1,448.1	2,530.0	11,814.2	56.6	41.2	45.3
1995[4]	5,371.9	65.0	753.7	1,279.4	5,897.6	55.9	—	—
Flax and silk:								
1989	160.5	1.2	74.5	665.5	751.5	4.4	0.6	3.0
1990	149.9	1.1	91.5	667.7	726.1	4.4	0.6	2.9
1991	122.3	0.9	93.4	647.9	676.8	4.1	0.5	2.7
1992	107.2	0.7	90.8	653.4	669.8	3.6	0.4	2.6
1993	104.9	0.7	98.3	711.2	717.8	3.7	0.4	2.8
1994	122.2	0.8	109.7	749.9	762.4	3.7	0.5	2.9
1995[4]	65.4	0.8	58.2	384.3	391.5	3.7	—	—
All fibers:								
1989	13,558.8	100.0	1,708.7	4,957.4	16,807.5	100.0	54.8	68.0
1990	13,444.9	100.0	2,155.2	5,040.3	16,330.0	100.0	53.8	65.3
1991	13,713.5	100.0	2,279.7	5,220.7	16,654.5	100.0	54.3	65.9
1992	14,750.5	100.0	2,426.7	6,210.5	18,534.3	100.0	57.8	72.6
1993	15,360.0	100.0	2,522.3	6,767.3	19,605.0	100.0	59.5	76.0
1994	16,238.4	100.0	2,756.8	7,385.4	20,867.0	100.0	62.3	80.0
1995[4]	8,268.2	100.0	1,524.1	3,807.6	10,551.8	100.0	—	—

— = Not available.

[1]Raw-fiber-equivalent of imports and exports of textile products. [2]Total domestic consumption is U.S. mill consumption plus net textile product trade balance. [3]July 1 population for 1989 = 247.3 million, 1990 = 249.9 million 1991 = 252.6 million, 1992 = 255.5 million, 1993 = 258.2 million, and 1994 = 260.9 million. [4]Data for the first 6 months.

Source: Economic Research Service compiled from U.S. Bureau of the Census data.

Appendix table 16—Cotton and manmade staple fibers: Mill consumption on the cotton spinning system, 1960-94

Year beginning August 1	Cotton	Manmade: Rayon and acetate staple	Manmade: Non-cellulosic staple	Manmade: Total	Total fibers	Cotton's share of total
	480-lb. bale equivalents					*Percent*
1960	8,352,560	755,077	220,590	975,667	9,328,227	89.5
1961	9,017,265	980,065	304,556	1,284,621	10,301,886	87.5
1962	8,483,810	1,166,006	466,158	1,632,164	10,115,974	83.9
1963	8,696,429	1,330,546	553,485	1,884,031	10,580,460	82.2
1964	9,260,665	1,351,581	707,290	2,058,871	11,319,536	81.8
1965	9,595,725	1,312,531	955,354	2,267,885	11,863,610	80.9
1966	9,573,850	1,180,877	1,055,329	2,236,206	11,810,056	81.1
1967	9,076,933	1,276,856	1,433,392	2,710,248	11,787,181	77.0
1968	8,331,508	1,467,946	1,687,473	3,155,419	11,486,927	72.5
1969	8,113,873	1,220,717	1,807,658	3,028,375	11,142,248	72.8
1970	8,204,292	1,054,587	1,899,029	2,953,616	11,157,908	73.5
1971	8,172,469	1,110,853	2,209,329	3,320,182	11,492,651	71.1
1972	7,773,717	1,125,236	2,685,733	3,810,969	11,584,686	67.1
1973	7,471,979	1,133,571	2,839,505	3,973,076	11,445,055	65.3
1974	5,860,176	638,133	2,409,627	3,047,760	8,907,936	65.8
1975	7,249,667	812,782	2,949,785	3,762,567	11,012,234	65.8
1976	6,674,400	805,140	3,180,658	3,985,798	10,660,198	62.6
1977	6,482,520	805,305	3,427,730	4,233,035	10,715,555	60.5
1978	6,351,854	714,399	3,379,174	4,093,573	10,445,427	60.8
1979	6,505,539	638,135	3,544,583	4,182,718	10,688,257	60.9
1980	5,890,818	588,075	3,509,028	4,097,103	9,987,921	59.0
1981	5,263,813	488,169	3,021,594	3,509,763	8,773,576	60.0
1982	5,512,767	453,981	3,078,848	3,532,829	9,045,596	60.9
1983	5,920,516	543,738	3,343,978	3,887,716	9,808,232	60.4
1984	5,538,324	483,613	2,791,142	3,274,755	8,813,079	62.8
1985	6,412,861	520,911	3,013,899	3,534,810	9,947,671	64.5
1986	7,452,180	536,880	3,097,466	3,634,346	11,086,526	67.2
1987	7,617,492	559,221	3,092,435	3,651,656	11,269,148	67.6
1988	7,782,099	597,105	2,921,251	3,518,356	11,300,455	68.9
1989	8,758,781	589,220	2,810,702	3,399,922	12,158,703	72.0
1990	8,657,130	532,224	2,557,286	3,089,510	11,746,640	73.7
1991	9,613,316	506,646	2,831,974	3,338,620	12,951,936	74.2
1992	10,249,521	495,183	2,816,507	3,311,690	13,561,211	75.6
1993	10,418,171	483,867	2,799,762	3,283,629	13,701,800	76.0
1994	11,197,569	465,967	2,889,418	3,355,385	14,552,954	77.0

Source: Economic Research Service compiled from reports of the U.S. Bureau of the Census.

Appendix table 17—Cotton: SLM spot market prices in designated U.S. markets, 1960/61-94/95

Crop year	Average spot market prices per pound (net weight)[1]					
	15/16"	1"	1-1/32"	1-1/16"	1-3/32"	1-1/8"
	Cents/lb.					
1960	—	—	—	31.29	—	—
1961	—	—	—	34.83	—	—
1962	—	—	—	34.47	—	—
1963	—	—	—	34.25	—	—
1964	—	—	—	31.94	—	—
1965	—	—	—	30.73	—	—
1966	19.53	21.09	—	23.76	—	—
1967	19.90	23.93	—	29.95	—	—
1968	19.50	21.58	—	25.54	—	—
1969	20.14	21.22	—	24.08	—	—
1970	22.71	23.38	—	25.33	—	—
1971	30.00	30.80	—	32.95	—	33.60
1972	28.57	31.25	—	35.59	—	36.14
1973	49.95	55.86	64.59	67.10	67.31	67.82
1974	34.88	37.41	40.02	41.69	41.89	42.53
1975	51.29	53.49	56.44	57.99	58.18	58.91
1976	63.87	65.99	69.34	70.88	71.08	71.83
1977	46.80	48.26	51.27	52.74	52.96	54.55
1978	53.43	55.24	59.92	61.58	61.89	64.43
1979	60.51	63.39	69.53	71.48	71.87	73.86
1980	69.74	75.70	80.95	82.99	83.39	84.47
1981	49.92	54.13	58.28	60.48	60.89	62.07
1982	52.39	56.41	61.17	63.08	63.47	64.63
1983	62.54	66.32	70.71	73.11	73.55	75.37
1984	52.39	55.98	58.30	60.51	60.29	60.64
1985	52.16	55.81	57.87	60.02	59.62	59.77
1986	44.80	47.71	50.78	53.16	53.81	55.89
1987	57.38	59.33	60.81	63.13	63.63	64.45
1988	49.02	52.32	53.99	57.67	58.14	59.51
1989	60.73	64.89	66.62	69.78	70.23	71.69
1990	62.49	69.15	71.52	74.80	75.38	77.31
1991	50.10	53.23	54.15	56.68	57.07	57.38
1992	48.63	52.46	52.42	54.10	54.76	55.78
1993	61.12	63.91	64.28	66.12	66.71	67.69
1994	82.13	84.47	85.13	88.14	88.53	90.15

— = Not available.

[1]Spot market prices are for cotton with micronaire readings of 3.5-4.9.

Source: Economic Research Service compiled from reports of the Agricultural Marketing Service.

Appendix table 18—Fiber prices: Landed Group B mill points, cotton prices, and manmade staple fiber prices at f.o.b. producing plants, actual and estimated raw-fiber-equivalent, 1960-95

	Cotton[1]		Rayon[2]		Polyester[3]		Price ratios[4]	
Calendar year	Actual	Raw-fiber-equivalent[5]	Actual	Raw-fiber-equivalent[5]	Actual	Raw-fiber-equivalent[5]	Cotton/ rayon	Cotton/ polyester
	Cents/lb.							
1960	32.04	35.60	28.33	29.51	126.00	131.25	1.21	0.27
1961	34.58	38.42	26.17	27.26	118.00	122.92	1.41	0.31
1962	34.15	37.94	26.00	27.08	114.00	118.75	1.40	0.32
1963	33.63	37.37	27.08	28.21	114.00	118.75	1.32	0.31
1964	25.43	28.26	28.00	29.17	99.33	103.47	0.97	0.27
1965	25.11	27.90	27.38	28.52	85.17	88.72	0.98	0.31
1966	22.39	24.88	25.63	26.70	79.50	82.81	0.93	0.30
1967	23.63	26.26	24.42	25.44	62.17	64.76	1.03	0.41
1968	23.59	26.21	25.00	26.04	56.00	58.33	1.01	0.45
1969	22.96	25.51	25.50	26.56	45.33	47.22	0.96	0.54
1970	27.20	30.22	25.00	26.04	40.67	42.36	1.16	0.71
1971	30.64	34.04	26.92	28.04	37.00	38.54	1.21	0.88
1972	36.21	40.23	31.00	32.29	34.50	35.94	1.25	1.12
1973	57.99	64.44	33.13	34.51	36.75	38.28	1.87	1.68
1974	59.94	66.59	50.83	52.95	46.00	47.92	1.26	1.39
1975	49.18	54.64	51.00	53.13	47.83	49.83	1.03	1.10
1976	72.18	80.20	53.50	55.73	53.00	55.21	1.44	1.45
1977	65.81	73.12	58.00	60.42	55.83	58.16	1.21	1.26
1978	64.34	71.48	58.25	60.68	54.33	56.60	1.18	1.27
1979	68.95	76.61	65.25	67.97	60.33	62.85	1.13	1.22
1980	87.98	97.76	74.50	77.60	74.33	77.43	1.26	1.26
1981	80.41	89.35	86.50	90.10	84.75	88.28	1.00	1.01
1982	68.00	75.55	84.50	88.02	76.75	79.95	0.86	0.95
1983	77.72	86.36	80.25	83.59	73.00	76.04	1.03	1.14
1984	76.06	84.51	84.00	87.50	78.83	82.12	0.97	1.03
1985	65.83	73.15	78.83	82.12	66.33	69.10	0.89	1.06
1986	60.99	67.77	75.75	78.91	62.33	64.93	0.86	1.04
1987	72.71	80.79	81.00	84.38	65.75	68.49	0.96	1.18
1988	64.89	72.10	90.67	94.44	73.83	76.91	0.77	0.94
1989	71.99	79.99	109.75	114.32	85.67	89.24	0.70	0.90
1990	79.29	88.10	119.92	124.91	82.58	86.02	0.71	1.03
1991	79.05	87.83	122.00	127.08	73.50	76.56	0.69	1.15
1992	61.92	68.80	114.08	118.84	73.50	76.56	0.58	0.90
1993	62.43	69.37	111.42	116.06	72.50	75.52	0.60	0.92
1994	78.69	87.43	103.00	107.29	74.92	78.04	0.82	1.12
1995[6]	102.88	114.31	117.40	122.29	88.60	92.29	0.94	1.24

[1]1960-69, middling 15/16" at Group B mill points, net weight; 1970 to date, SLM 1-1/16". [2]1.5 and 3.0 denier, regular rayon staple. [3]Reported average market price for 1.5 denier polyester staple for cotton blending. [4]Raw-fiber-equivalent. [5]Actual prices converted to estimated raw-fiber-equivalent as follows: cotton, divided by 0.90; rayon and polyester, divided by 0.96. [6]Average for January-October.

Source: Economic Research Service compiled from Agricultural Marketing Service and trade reports.

Appendix table 19—Index of prices of selected cotton growths and qualities of U.S. cotton, c.i.f. Northern Europe monthly, 1987/88-95/96[1]

Year beginning August 1	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Average
							Cents/pound						
A Index:[2]													
1987	86.60	83.61	76.19	75.83	75.29	72.19	67.49	66.34	65.75	65.58	68.78	63.43	72.26
1988	57.74	56.75	57.64	58.61	61.26	63.13	62.96	66.02	73.75	77.34	78.82	83.01	66.42
1989	82.97	81.45	82.10	82.13	77.30	74.92	76.92	79.21	83.01	86.85	90.30	90.88	82.34
1990	80.97	81.41	81.51	82.72	83.60	83.36	85.16	83.65	83.24	84.37	83.76	80.70	82.87
1991	72.90	69.94	67.62	63.00	61.77	59.31	56.34	55.28	58.18	60.99	64.35	65.15	62.90
1992	59.20	56.28	52.94	52.63	54.33	57.44	60.76	61.41	60.90	60.03	58.53	57.99	56.87
1993	55.53	55.09	54.68	55.11	59.84	69.34	80.54	82.06	83.94	86.09	85.10	81.68	70.75
1994	76.73	75.03	74.09	77.28	87.06	95.63	100.51	110.63	114.55	115.13	NQ	NQ	92.66
1995	85.44	91.20	91.15	89.27	87.50	86.04	84.99	83.18	N/A	N/A	N/A	N/A	N/A
Memphis:[3]													
1987	87.38	83.06	76.75	76.44	74.95	72.75	69.81	70.75	72.38	75.31	79.95	76.56	76.34
1988	60.75	60.45	62.13	63.94	65.81	67.19	68.06	69.95	74.06	76.88	77.85	82.75	69.15
1989	85.15	82.56	83.31	82.10	76.34	75.19	77.12	80.15	84.56	88.90	92.69	95.88	83.57
1990	80.50	81.69	82.44	83.20	84.00	85.50	93.75	94.69	96.75	99.30	NQ	NQ	88.18
1991	75.50	73.13	70.30	65.38	64.33	61.50	60.31	59.81	62.65	63.56	67.69	71.30	66.29
1992	62.88	60.31	58.00	60.56	61.85	63.38	66.13	66.56	66.30	65.13	63.00	62.90	62.46
1993	57.31	56.95	56.94	58.56	64.55	73.19	82.50	83.75	86.81	90.63	86.10	79.94	73.10
1994	77.25	77.60	76.88	80.94	92.15	100.31	103.94	116.65	120.25	121.75	129.00	NQ	99.70
1995	86.90	98.13	97.69	96.95	93.38	94.13	94.70	94.13	N/A	N/A	N/A	N/A	N/A
California/Arizona:[3]													
1987	91.81	87.81	80.95	79.19	78.25	76.25	73.50	74.80	76.13	78.63	81.80	76.75	79.66
1988	64.19	64.10	65.94	66.13	67.31	69.13	69.94	72.10	76.56	80.50	82.40	86.19	72.04
1989	87.00	84.38	85.31	84.10	79.42	79.50	81.12	84.10	88.19	92.20	95.38	95.13	86.25
1990	85.45	87.31	88.00	88.30	89.00	90.15	97.13	96.75	97.75	NQ	NQ	NQ	91.09
1991	78.50	75.94	72.45	67.56	66.75	64.25	63.06	63.75	67.31	NQ	NQ	NQ	68.84
1992	65.50	62.56	58.45	57.88	59.60	62.19	65.06	64.31	63.80	63.13	60.50	60.40	61.94
1993	57.44	57.10	56.94	57.94	63.25	72.56	82.25	83.60	86.69	89.75	86.00	79.94	72.79
1994	77.00	78.10	77.56	82.94	96.65	105.06	108.69	121.30	124.63	124.17	NQ	NQ	99.61
1995	91.90	103.13	102.69	102.35	99.63	100.56	100.20	98.31	N/A	N/A	N/A	N/A	N/A
B Index:[4]													
1987	81.55	78.44	70.77	71.73	71.08	68.15	64.21	62.69	61.30	59.50	62.73	57.88	67.50
1988	52.76	51.75	53.24	53.28	56.18	58.45	57.55	61.64	67.56	71.89	74.56	77.15	61.33
1989	78.64	76.70	77.08	77.19	73.49	71.20	73.01	74.98	77.14	80.55	83.21	84.39	77.30
1990	77.58	77.44	76.98	77.70	78.25	76.72	78.56	78.24	77.86	79.13	77.05	75.65	77.60
1991	70.72	68.28	64.58	60.24	59.05	55.24	52.14	51.04	52.95	54.75	55.88	55.80	58.39
1992	53.93	51.50	48.90	48.71	50.15	53.08	56.04	57.41	57.50	56.73	55.34	55.22	53.71
1993	51.93	50.80	50.88	51.99	57.27	64.42	78.42	79.01	81.00	83.73	83.42	80.30	67.76
1994	74.38	72.93	72.31	75.98	NQ	96.60	98.39	108.67	111.41	108.96	101.53	92.79	92.18
1995	82.12	89.21	88.48	85.83	82.96	81.03	78.98	77.76	N/A	N/A	N/A	N/A	N/A

Continued—

Appendix table 19—Index of prices of selected cotton growths and qualities of U.S. cotton, c.i.f. Northern Europe monthly, 1987/88-95/96[1]—Cont'd

Year beginning August 1	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Average
							Cents/pound						
Orleans/Texas:[5]													
1987	80.94	77.44	71.40	70.69	69.65	68.19	65.56	66.95	67.38	69.88	72.30	66.25	70.55
1988	54.56	53.30	54.50	55.56	57.88	59.94	60.81	62.40	67.19	71.31	73.35	76.63	62.29
1989	79.15	76.31	76.88	75.90	72.92	72.19	73.62	75.50	78.87	82.65	84.50	84.69	77.68
1990	76.20	77.56	77.75	77.50	75.83	76.40	82.19	81.25	81.13	81.70	76.75	78.58	78.58
1991	70.15	68.31	64.80	61.75	61.50	59.30	56.31	55.50	57.55	58.13	62.31	64.30	61.66
1992	58.25	56.19	53.20	54.56	55.05	56.75	61.38	61.50	60.95	59.44	56.75	56.60	57.55
1993	50.94	50.70	50.94	52.81	57.70	66.38	78.81	81.15	84.38	87.63	85.05	79.38	68.82
1994	73.06	73.80	73.81	78.31	90.10	97.56	101.13	113.30	116.88	116.13	121.00	NQ	95.92
1995	83.05	94.13	93.31	91.50	88.38	89.38	90.40	89.88	N/A	N/A	N/A	N/A	N/A

[1]All prices are based on Thursday quotes. [2]The A Index is an average of the five lowest priced types of 1-3/32 inch staple length cotton offered on the European market. [3]The Memphis and California/Arizona territories are based on middling 1-3/32inch. [4]The B Index is based on coarse grades of cotton varying in staple length from 1 to 1-3/32 inch. [5]Based on SLM 1-1/32 inch cotton.

Source: Economic Research Service compiled from *Cotton Outlook*, Cotlook Limited.

Appendix table 20—Index of prices of selected growths and qualities of U.S. cotton, c.i.f. Northern Europe, annual, 1960/61-1994/95

Year beginning August 1	A Index[1]	U.S. Memphis territory[2]	U.S. CA/AZ territory[2]	B index[3]	U.S. Orleans/TX territory[4]
			Cents/lb.		
1960	—	29.46	—	—	—
1961	—	30.23	—	—	—
1962	—	29.75	—	—	—
1963	29.18	29.12	—	—	—
1964	29.03	29.49	—	—	—
1965	28.13	28.47	—	—	—
1966	28.35	28.35	—	—	—
1967	31.30	33.32	—	—	—
1968	28.75	29.97	—	—	—
1969	28.00	28.82	—	—	—
1970	31.10	31.67	—	—	—
1971	37.15	37.43	—	—	—
1972	41.95	43.54	—	—	—
1973	76.50	78.31	—	—	—
1974	52.50	56.41	—	—	—
1975	65.26	71.41	—	—	—
1976	81.75	82.47	83.05	72.91	75.64
1977	65.01	65.25	66.52	57.02	56.85
1978	75.99	75.99	70.69	67.97	66.88
1979	85.46	87.76	87.68	74.55	74.54
1980	93.30	101.22	99.52	84.11	87.74
1981	73.76	75.87	76.01	64.39	64.09
1982	76.65	77.95	78.61	66.65	66.38
1983	87.61	87.09	90.04	80.37	76.67
1984	69.18	73.90	73.75	59.55	64.21
1985	48.90	64.79	64.13	40.93	56.44
1986	61.99	61.84	64.62	54.95	54.33
1987	72.26	76.34	79.66	67.50	70.55
1988	66.42	69.15	72.04	61.33	62.29
1989	82.34	83.57	86.25	77.30	77.68
1990	82.87	88.18	91.09	77.60	78.58
1991	62.90	66.29	68.84	58.39	61.66
1992	56.87	62.46	61.94	53.71	57.55
1993	70.75	73.10	72.79	67.76	68.82
1994	92.66	99.70	99.61	92.18	95.92

— = Not available.

[1]The A index is an average of the cheapest five types of SLM 1-1/16" staple length cotton offered on the European market. The staple length used to calculate the index was changed to middling 1-3/32" in July 1981. Calculations for 1963-72 were made using data published in "Statistics on Cotton and Related Data, 1960-78." [2]The Memphis and California/Arizona territories were based on SLM 1-1/16" staple length cotton until July 1981, when they were changed to Middling 1-3/32". [3]The B index is based on coarse grades of cotton varying in staple length from 1" to 1-3/32". [4]Based on SLM 1" cotton.

Appendix table 21—World cotton supply and use, 1960/61-95/96

Year beginning August 1	Harvested area	Yield	Beginning stocks	Production	Consumption	Exports
	Million hectares	Kg/ha	Million 480-lb. bales			
1960	32.1	305	19.6	45.1	46.2	17.1
1961	32.4	299	18.9	44.5	45.2	15.6
1962	31.8	322	18.7	47.0	44.0	15.9
1963	32.9	336	22.5	50.8	47.8	17.9
1964	33.6	349	25.5	53.8	51.2	16.9
1965	33.3	372	28.6	56.9	53.8	17.0
1966	31.2	365	32.1	52.3	56.0	18.2
1967	31.0	362	28.1	51.5	56.2	17.5
1968	31.9	388	23.2	56.9	56.4	17.0
1969	32.5	367	23.6	54.7	56.0	17.7
1970	31.8	377	22.4	55.1	57.1	23.5
1971	33.0	390	21.5	59.1	58.4	24.8
1972	33.5	401	22.0	61.8	59.5	27.7
1973	32.8	415	24.0	62.6	60.3	26.2
1974	33.5	413	26.8	63.7	57.0	24.2
1975	29.9	393	33.0	53.9	61.6	25.9
1976	30.6	401	25.6	56.4	60.2	24.5
1977	33.6	414	22.1	63.9	61.1	26.3
1978	32.9	395	25.4	59.7	63.3	27.1
1979	32.2	443	21.7	65.5	66.0	30.6
1980	32.3	428	21.3	63.5	65.0	26.2
1981	33.0	453	20.7	68.7	63.2	25.8
1982	31.4	462	25.7	66.6	67.0	25.7
1983	30.9	463	25.5	65.7	68.7	25.3
1984	33.7	572	23.8	88.7	70.7	27.2
1985	31.6	553	41.7	80.3	75.3	28.1
1986	29.4	523	47.4	70.6	82.2	33.4
1987	30.6	577	35.3	81.0	84.2	30.0
1988	33.8	544	32.2	84.4	85.2	33.4
1989	31.6	550	30.9	79.7	86.9	31.3
1990	33.2	571	24.9	87.0	85.6	29.7
1991	34.8	600	27.0	96.0	86.0	28.2
1992	32.6	552	37.4	82.8	85.7	25.6
1993	30.6	548	35.1	77.0	85.3	27.3
1994[2]	32.0	582	27.2	85.5	84.4	28.8
1995[3]	34.8	558	29.9	89.3	86.0	27.5

[1]Beginning with 1970/71, world exports include trade between the republics of the former Soviet Union. [2]Estimated. [3]Forecast.

Source: Economic Research Service based on official statistics of foreign governments, other foreign source materials, reports of U.S. agricultural attaches and Foreign Service officers, results of office research, and related information.

Appendix table 22—Foreign cotton supply and use, 1960/61-95/96

Year beginning August 1	Harvested area	Yield	Beginning stocks	Production	Consumption	Exports
	Million hectares	*Kg/ha*	*Million 480-lb. bales*			
1960	25.9	259	12.1	30.8	37.8	10.3
1961	26.1	252	11.8	30.2	36.2	10.6
1962	25.5	273	11.0	32.1	35.5	12.5
1963	27.1	385	11.4	35.5	39.1	12.1
1964	27.9	302	13.1	38.6	42.0	12.7
1965	27.8	328	14.3	41.9	44.2	13.9
1966	27.3	340	15.0	42.7	46.5	13.4
1967	27.7	346	15.7	44.1	47.1	13.2
1968	27.8	360	16.7	45.9	48.0	14.2
1969	28.0	347	17.1	44.7	47.9	14.8
1970	27.3	358	16.6	44.9	48.9	19.6
1971	28.4	373	17.3	48.6	50.2	21.4
1972	28.3	370	18.7	48.1	51.7	22.4
1973	28.0	386	19.8	49.7	52.8	20.1
1974	28.4	399	23.0	52.1	51.1	20.3
1975	26.3	377	27.3	45.6	54.3	22.6
1976	26.2	381	21.9	45.8	53.5	19.7
1977	28.2	382	19.2	49.5	54.6	20.8
1978	27.9	381	20.0	48.8	57.0	21.0
1979	27.0	410	17.8	50.8	59.5	21.3
1980	26.9	423	18.3	52.4	59.1	20.3
1981	27.4	422	18.0	53.0	58.0	19.3
1982	27.4	434	19.1	54.7	61.4	20.5
1983	27.9	452	17.5	58.0	62.8	18.5
1984	29.5	558	21.0	75.7	65.2	21.0
1985	27.4	530	27.6	66.9	68.9	26.1
1986	25.9	511	38.0	60.8	74.7	26.7
1987	26.5	544	30.3	66.3	76.5	23.4
1988	28.9	519	26.4	69.0	77.4	27.2
1989	27.7	531	23.8	67.5	78.1	23.6
1990	28.4	547	21.9	71.5	76.9	21.9
1991	29.6	577	24.7	78.4	76.4	21.5
1992	28.1	515	33.7	66.6	75.4	20.4
1993	25.4	521	30.4	60.9	74.9	20.4
1994[2]	26.6	539	23.6	65.9	73.2	19.4
1995[3]	28.4	541	27.2	70.5	75.0	20.7

[1]Beginning with 1970/71, world exports include trade between the republics of the former Soviet Union. [2]Estimated. [3]Forecast.

Source: Economic Research Service based on official statistics of foreign governments, other foreign source materials, reports of U.S. agricultural attaches and Foreign Service officers, results of office research, and related information.

Appendix table 23—Cotton exports, major foreign exporters, 1960/61-95/96

Year	Uzbekistan[1]	Africa[2]	Australia	Pakistan	Paraguay	India	China	Turkey	Sudan	Brazil	Mexico	Egypt
						1,000 480-lb. bales						
1960	0	193	0	243	18	239	101	285	436	694	1,612	1,580
1961	0	207	0	299	28	271	0	459	638	845	1,484	1,121
1962	0	230	0	684	32	271	0	570	785	1,144	1,897	1,360
1963	0	285	0	689	46	225	0	611	721	1,024	1,424	1,373
1964	0	303	0	487	41	197	0	804	473	1,038	1,617	1,557
1965	0	367	0	491	37	152	0	960	570	937	2,127	1,575
1966	0	441	0	556	23	202	0	1,093	680	1,015	1,520	1,428
1967	0	519	0	886	23	193	0	1,084	795	836	1,327	1,171
1968	0	620	18	606	28	156	101	992	850	1,764	1,640	1,089
1969	0	661	64	395	55	170	101	1,185	1,079	1,934	1,268	1,465
1970	0	519	18	473	28	138	101	1,125	1,047	1,010	804	1,396
1971	0	625	14	1,153	18	170	101	1,539	992	1,410	946	1,364
1972	0	643	101	822	73	193	101	1,488	1,089	1,332	942	1,387
1973	0	592	14	197	73	193	101	1,001	730	661	767	1,199
1974	0	606	46	1,061	83	69	202	583	570	271	891	877
1975	0	762	69	418	152	317	248	2,163	1,098	358	537	776
1976	0	785	23	64	193	9	202	579	606	55	542	606
1977	0	680	46	473	294	14	101	1,217	689	193	597	684
1978	0	808	110	248	390	211	14	960	813	142	965	689
1979	0	795	280	1,176	303	413	14	615	804	0	914	877
1980	0	845	243	1,488	326	542	5	1,029	427	41	818	749
1981	0	758	372	1,098	602	312	0	955	271	138	758	900
1982	0	928	615	1,272	340	519	73	652	638	1,020	395	919
1983	0	937	372	377	367	280	758	501	1,006	78	473	781
1984	0	1,075	689	1,258	551	138	946	684	588	354	574	560
1985	6,834	1,548	1,139	3,146	602	354	2,797	322	501	358	381	836
1986	6,784	1,534	1,180	2,871	340	1,079	3,169	510	822	303	220	588
1987	6,283	1,676	818	2,356	726	32	2,324	197	726	597	377	436
1988	7,004	1,975	1,318	3,780	1,006	78	1,635	666	776	464	560	294
1989	6,811	2,093	1,318	1,371	918	1,070	863	207	749	661	211	211
1990	5,393	2,055	1,372	1,357	895	928	928	753	400	716	225	92
1991	5,200	2,247	2,334	2,059	817	60	602	289	400	133	248	92
1992	5,500	2,048	1,695	1,175	597	1,075	684	270	200	110	23	87
1993	6,100	2,026	1,682	318	505	305	749	500	200	5	34	525
1994[3]	5,400	2,532	1,250	150	625	150	183	5	350	230	185	250
1995[4]	5,200	2,677	1,200	1,200	665	500	300	120	500	200	250	150

[1]Data unavailable before 1985/86. [2]Includes: Benin, Burkina, Cameroon, Chad, Ivory Coast, Mali, Senegal, Togo, and Central African Republic. [3]Estimated. [4]Forecast.

Appendix table 24—Cotton imports, major importers, 1960/61-95/96

Year	EU-15	Russia[1]	Japan	Indonesia	South Korea	Thailand	Taiwan	Eastern Europe	Hong Kong	China
					1,000 480-lb. bales					
1960	7,344	0	3,537	32	216	28	202	2,099	501	299
1961	6,724	0	2,843	37	253	41	262	2,140	455	202
1962	6,549	0	3,068	46	326	41	248	2,131	556	400
1963	7,059	0	3,169	46	271	46	294	2,301	629	799
1964	6,301	0	3,417	51	317	83	289	2,393	551	698
1965	6,632	0	3,077	0	326	106	303	2,471	643	501
1966	6,453	0	3,555	161	363	106	358	2,609	730	501
1967	6,297	0	3,500	60	404	129	473	2,420	758	299
1968	6,132	0	3,132	106	450	78	464	2,604	776	299
1969	6,058	0	3,449	161	468	133	505	2,352	721	400
1970	5,704	0	3,670	179	556	211	735	2,747	831	501
1971	5,851	0	3,555	230	524	230	583	2,462	602	698
1972	6,375	0	3,881	280	482	299	657	2,747	716	1,998
1973	5,429	0	3,729	248	790	390	909	2,751	831	1,800
1974	5,144	0	3,229	156	721	262	652	2,673	785	698
1975	5,557	0	3,220	349	1,015	390	1,024	2,779	1,323	900
1976	5,043	0	3,036	285	909	409	799	2,728	992	652
1977	5,117	0	3,151	395	1,314	331	1,052	3,063	1,001	1,598
1978	4,882	0	3,380	404	1,364	459	854	2,889	827	2,127
1979	5,328	0	3,334	473	1,626	377	1,249	2,958	1,199	4,101
1980	4,510	0	3,206	491	1,525	404	965	3,031	707	3,550
1981	4,887	0	3,504	491	1,497	243	1,134	2,999	698	2,200
1982	5,300	0	3,137	491	1,562	395	1,043	3,045	781	1,084
1983	5,443	0	3,339	602	1,603	556	1,171	2,825	997	666
1984	5,553	0	3,123	537	1,603	615	1,295	3,197	850	87
1985	5,502	6,196	3,054	808	1,681	703	1,534	3,031	1,098	0
1986	6,655	5,874	3,688	919	1,901	1,291	2,356	2,866	1,506	14
1987	6,233	5,397	3,431	882	1,957	873	1,608	3,041	1,208	87
1988	5,842	5,828	3,491	1,111	2,145	1,254	1,782	2,889	1,378	1,447
1989	5,828	5,879	3,165	1,291	2,039	1,208	1,300	2,480	1,199	1,874
1990	5,046	5,290	2,949	1,488	2,052	1,626	1,479	1,580	1,024	2,205
1991	4,768	3,900	2,705	1,874	1,801	1,640	1,484	1,295	1,038	1,630
1992	4,748	2,650	2,228	1,988	1,711	1,520	1,264	1,645	1,804	242
1993	5,194	3,000	1,993	2,039	1,689	1,613	1,236	1,285	869	808
1994[2]	4,796	2,100	1,800	2,200	1,700	1,330	1,125	1,295	965	4,060
1995[3]	5,095	1,800	1,650	2,325	1,500	1,600	1,125	1,420	950	2,200

[1]Data unavailable before 1985/86. [2]Estimated. [3]Forecast.

Appendix table 25—CCC loan premiums and discounts for grade and staple length of 1994-crop American upland cotton, basis grade 41, leaf 4, staple 34, (SLM 1-1/16 inch), net weight

Grade		Staple length (inches)								
Color[1]	Leaf content[2]	13/16 (26)-29/32 (29)	15/16 (30)	31/32 (31)	1 (32)	1-1/32 (33)	1-1/16 (34)	1/1/32 (35)	1/1/8 (36)	1-5/32 (37) & longer
						Points/pound				
White:										
SM & better (11 & 21)	Leaf 1-2	-690	-490	-310	-230	-80	105	170	175	180
	Leaf 3	-695	-495	-315	-235	-85	95	160	165	175
	Leaf 4	-720	-525	-345	-265	-115	60	125	130	135
	Leaf 5	-800	-595	-410	-370	-220	-85	-15	-15	-15
	Leaf 6	-970	-790	-665	-665	-515	-495	-455	-455	-450
	Leaf 7	-1,250	-1,210	-1,210	-1,210	-1,060	-1,060	-1,060	-1,060	-1,060
MID (31)	Leaf 1-2	-700	-490	-310	-230	-80	100	160	165	170
	Leaf 3	-705	-495	-315	-235	-85	95	160	165	170
	Leaf 4	-730	-525	-345	-270	-120	40	105	110	115
	Leaf 5	-800	-595	-410	-370	-220	-85	-25	-20	-15
	Leaf 6	-970	-790	-665	-665	-515	-495	-455	-455	-455
	Leaf 7	-1,250	-1,210	-1,210	-1,210	-1,060	-1,060	-1,060	-1,060	-1,060
SLM (41)	Leaf 1-2	-710	-515	-320	-270	-120	0	60	70	75
	Leaf 3	-720	-525	-330	-280	-130	0	60	70	75
	Leaf 4	-740	-550	-355	-300	-150	Base	60	70	75
	Leaf 5	-890	-700	-515	-495	-345	-270	-230	-230	-225
	Leaf 6	-970	-790	-665	-665	-515	-500	-465	-460	-455
	Leaf 7	-1,255	-1,220	-1,220	-1,220	-1,070	-1,070	-1,070	-1,070	-1,070
LM (51)	Leaf 1-2	-890	-705	-550	-550	-400	-345	-310	-305	-300
	Leaf 3	-895	-710	-555	-555	-405	-350	-315	-310	-305
	Leaf 4	-920	-730	-575	-575	-425	-375	-335	-335	-330
	Leaf 5	-955	-785	-620	-615	-465	-400	-360	-355	-355
	Leaf 6	-1,185	-1,120	-1,110	-1,110	-960	-960	-960	-960	-960
	Leaf 7	-1,260	-1,235	-1,235	-1,235	-1,085	-1,085	-1,085	-1,085	-1,085
SGO (61)	Leaf 1-4	-1,265	-1,215	-1,215	-1,215	-1,065	-1,065	-1,065	-1,065	-1,065
	Leaf 5-6	-1,280	-1,230	-1,230	-1,230	-1,080	-1,080	-1,080	-1,080	-1,080
	Leaf 7	-1,560	-1,505	-1,480	-1,480	-1,330	-1,330	-1,330	-1,330	-1,330
GO (71)	Leaf 1-7	-1,565	-1,515	-1,500	-1,500	-1,350	-1,350	-1,350	-1,350	-1,350
Light spotted:										
SM & better (12 & 22)	Leaf 1-2	-730	-530	-375	-280	-130	25	70	75	85
	Leaf 3	-735	-535	-380	-290	-140	-10	50	55	60
	Leaf 4	-820	-600	-445	-350	-200	-75	-35	-30	0
	Leaf 5	-875	-695	-560	-530	-380	-290	-255	-255	-255
	Leaf 6	-1,095	-970	-895	-895	-745	-745	-745	-745	-745
	Leaf 7	-1,375	-1,355	-1,355	-1,350	-1,200	-1,200	-1,200	-1,200	-1,200
MID (32)	Leaf 1-2	-750	-555	-390	-310	-160	-10	50	55	55
	Leaf 3	-755	-560	-395	-315	-165	-10	50	55	55
	Leaf 4	-835	-655	-500	-470	-320	-275	-235	-230	-225
	Leaf 5	-890	-730	-570	-560	-410	-330	-290	-280	-275
	Leaf 6	-1095	-975	-900	-900	-750	-750	-750	-750	-750
	Leaf 7	-1,375	-1,355	-1,355	-1,350	-1,200	-1,200	-1,200	-1,200	-1,200
SLM (42)	Leaf 1-2	-830	-640	-475	-405	-255	-110	-55	-50	-45
	Leaf 3	-845	-665	-510	-485	-335	-290	-260	-255	-255
	Leaf 4	-865	-680	-530	-505	-355	-315	-280	-275	-270
	Leaf 5	-1010	-885	-770	-770	-620	-620	-620	-620	-620
	Leaf 6	-1095	-980	-905	-905	-755	-755	-755	-755	-755
	Leaf 7	-1,375	-1,355	-1,355	-1,355	-1,205	-1,205	-1,205	-1,205	-1,205
LM (52)	Leaf 1-2	-900	-755	-595	-595	-445	-430	-395	-390	-390
	Leaf 3	-905	-760	-600	-600	-450	-440	-400	-395	-395
	Leaf 4	-1,070	-945	-880	-880	-730	-730	-730	-730	-730
	Leaf 5	-1,075	-960	-885	-885	-735	-735	-735	-735	-735
	Leaf 6-7	-1,375	-1,370	-1,370	-1,370	-1,220	-1,220	-1,220	-1,220	-1,220
SGO (62)	Leaf 1-4	-1,365	-1,330	-1,310	-1,310	-1,160	-1,160	-1,160	-1,160	-1,160
	Leaf 5-6	-1,400	-1,380	-1,380	-1,380	-1,230	-1,230	-1,230	-1,230	-1,230
	Leaf 7	x	x	x	x	x	x	x	x	x

Continued—

Appendix table 25—CCC loan premiums and discounts for grade and staple length of 1994-crop American upland cotton, basis grade 41, leaf 4, staple 34, (SLM 1-1/16 inch), net weight—Cont'd

Grade		Staple length (inches)								
Color[1]	Leaf content[2]	13/16 (26)- 29/32 (29)	15/16 (30)	31/32 (31)	1 (32)	1-1/32 (33)	1-1/16 (34)	1/1/32 (35)	1/1/8 (36)	1-5/32 (37) & longer
		Points/pound								
Spotted:										
SM & better (13 & 23)	Leaf 1-2	-1,000	-850	-740	-710	-560	-560	-560	-560	-560
	Leaf 3	-1,050	-930	-820	-820	-670	-670	-670	-670	-670
	Leaf 4	-1,060	-940	-830	-830	-680	-680	-680	-680	-680
	Leaf 5	-1,200	-1,185	-1,150	-1,135	-985	-985	-985	-985	-985
	Leaf 6	-1,460	-1,420	-1,410	-1,410	-1,260	-1,260	-1,260	-1,260	-1,260
	Leaf 7	-1,660	-1,625	-1,595	-1,595	-1,445	-1,445	-1,445	-1,445	-1,445
MID (33)	Leaf 1-3	-1,050	-930	-820	-820	-670	-670	-670	-670	-670
	Leaf 4	-1,195	-1,175	-1,135	-1,130	-980	-980	-980	-980	-980
	Leaf 5	-1,200	-1,185	-1,150	-1,135	-985	-985	-985	-985	-985
	Leaf 6	-1,460	-1,420	-1,410	-1,410	-1,260	-1,260	-1,260	-1,260	-1,260
	Leaf 7	-1,660	-1,625	-1,595	-1,595	-1,445	-1,445	-1,445	-1,445	-1,445
SLM (43)	Leaf 1-2	-1,060	-940	-905	-905	-755	-755	-755	-755	-755
	Leaf 3	-1,195	-1,190	-1,190	-1,190	-1,040	-1,040	-1,040	-1,040	-1,040
	Leaf 4	-1,200	-1,190	-1,190	-1,190	-1,040	-1,040	-1,040	-1,040	-1,040
	Leaf 5	-1,460	-1,455	-1,455	-1,455	-1,305	-1,305	-1,305	-1,305	-1,305
	Leaf 6	-1,465	-1,460	-1,460	-1,460	-1,310	-1,310	-1,310	-1,310	-1,310
	Leaf 7	-1,670	-1,630	-1,620	-1,620	-1,470	-1,470	-1,470	-1,470	-1,470
LM (53)	Leaf 1-3	-1,210	-1,210	-1,210	-1,210	-1,060	-1,060	-1,060	-1,060	-1,060
	Leaf 4-5	-1,470	-1,470	-1,470	-1,470	-1,320	-1,320	-1,320	-1,320	-1,320
	Leaf 6	-1,495	-1,495	-1,495	-1,495	-1,345	-1,345	-1,345	-1,345	-1,345
	Leaf 7	-1,670	-1,630	-1,630	-1,630	-1,480	-1,480	-1,480	-1,480	-1,480
SGO (63)	Leaf 1-4	-1,490	-1,490	-1,490	-1,490	-1,340	-1,340	-1,340	-1,340	-1,340
	Leaf 5	-1,630	-1,630	-1,630	-1,630	-1,480	-1,480	-1,480	-1,480	-1,480
	Leaf 6	-1,670	-1,670	-1,670	-1,670	-1,520	-1,520	-1,520	-1,520	-1,520
	Leaf 7	x	x	x	x	x	x	x	x	x
Tinged:[3]										
SM (24)	Leaf 1-2	-1,630	-1,540	-1,485	-1,485	-1,335	-1,335	-1,335	-1,335	-1,335
	Leaf 3	-1,680	-1,540	-1,485	-1,485	-1,335	-1,335	-1,335	-1,335	-1,335
	Leaf 4-5	-1,730	-1,630	-1,605	-1,605	-1,455	-1,455	-1,455	-1,455	-1,455
	Leaf 6	-1,895	-1,805	-1,755	-1,755	-1,605	-1,605	-1,605	-1,605	-1,605
	Leaf 7	x	x	x	x	x	x	x	x	x
MID (34)	Leaf 1-3	-1,680	-1,590	-1,555	-1,535	-1,385	-1,385	-1,385	-1,385	-1,385
	Leaf 4-5	-1,730	-1,680	-1,655	-1,655	-1,505	-1,505	-1,505	-1,505	-1,505
	Leaf 6	-1,895	-1,855	-1,805	-1,805	-1,655	-1,655	-1,655	-1,655	-1,655
	Leaf 7	x	x	x	x	x	x	x	x	x
SLM (44)	Leaf 1-2	-1,680	-1,590	-1,555	-1,535	-1,385	-1,385	-1,385	-1,385	-1,385
	Leaf 3-4	-1,730	-1,680	-1,655	-1,655	-1,505	-1,505	-1,505	-1,505	-1,505
	Leaf 5-6	-1,895	-1,855	-1,805	-1,805	-1,655	-1,655	-1,655	-1,655	-1,655
	Leaf 7	x	x	x	x	x	x	x	x	x
LM (54)	Leaf 1-3	-1,730	-1,680	-1,655	-1,655	-1,505	-1,505	-1,505	-1,505	-1,505
	Leaf 4-5	-1,895	-1,855	-1,805	-1,805	-1,655	-1,655	-1,655	-1,655	-1,655
	Leaf 6-7	x	x	x	x	x	x	x	x	x

x = Not eligible for loan.

[1]Grade symbols: SM-Strict Middling; MID-Middling; SLM-Strict Low Middling; LM-Low Middling; SGO-Strict Good Ordinary; GO-Good Ordinary. [2]Leaf content: Combined leaf levels have identical values. Leaf level 8 is Below Grade and not eligible for loan. [3]Cotton classed as "Yellow Stained" (middling and better) grades will be eligible at a discount 200 points greater than the discount for comparable quality in the colorgroup "Tinged."

Appendix table 26—CCC loan schedule of micronaire and strength premiums and discounts and bark discounts for 1994-crop upland cotton

	Points/pound					Points/pound	
Micronaire reading	Staple 32 & shorter	Staple 33 & longer	Strength reading	Points/ pound	Bark reading	TX/NM/OK	Other[1]
			18.5-19.4	-270			
5.3 and above	-490	-405	19.5-20.4	-235	Level 1	-235	-405
5.0 through 5.2	-330	-260	20.5-21.4	-140	Level 2	-600	-790
4.3 through 4.9	0	0	21.5-22.4	-100			
3.7 through 4.2	+5	+10	22.5-23.4	-50			
3.5 through 3.6	0	0	23.5-25.4	0			
3.3 through 3.4	-145	-220	25.5-26.4	5			
3.0 through 3.2	-300	-450	26.5-27.4	25			
2.7 through 2.9	-750	-900	27.5-28.4	40			
2.5 through 2.6	-1,150	-1,215	28.5-29.4	60			
2.4 and below	-1,540	-1,540	29.5-30.4	85			
			30.5 & above	105			

[1]Bark in locations other than Texas, New Mexico and Oklahoma. Extraneous matter, other than bark, in all locations.

Source: Economic Research Service compiled from Farm Service Agency, USDA, data.

Appendix table 27—CCC schedule of loan rates and micronaire differences for eligible qualities of 1994-crop ELS cotton stored in approved warehouses at all locations[1]

Grade	Staple (inches) 1-3/8 (44)	Staple (inches) 1-7/16 (46) & longer	Micronaire reading	Points/ pounds
01	94.20	97.45	3.5 and above	0
02	93.95	97.15	3.3 through 3.4	-245
03	90.90	94.10	3.0 through 3.2	-1,345
04	71.85	72.80	2.7 through 2.9	-2,310
05	59.05	59.05		
06	46.30	46.30		

[1]A micronaire premium of 122 points (1.22 cents) per pound is reflected in the loan rates for the eligible qualities; thus, the national average loan rate reflected in the above schedule is 85.03 cents per pound. Cotton with micronaire readings below the micronaire range "3.5 and above" will be subject to the discounts as indicated.

Source: Economic Research Service compiled from Farm Service Agency, USDA, data.

Glossary

Acreage allotment. The individual farm's share, based on its production history, of the national acreage considered desirable as a means of adjusting supplies of a particular crop to national needs. Allotments were historically used with marketing quotas, which ended with the establishment of voluntary cotton programs in the early 1970's. The Food and Agriculture Act of 1977 ended the historical allotments and bases that dated back to the 1950's and 1960's. The program acreage used for payment purposes since 1978 have been based on recent plantings.

Bale. A package of compressed cotton lint as it comes from the gin. A bale weighs about 500 pounds including bagging and ties, and its dimensions vary from 12 to 32 pounds per cubic foot depending on the degree of compression. Cotton is domestically and internationally traded in bales. However, cotton is bought and sold on a net weight (pound or kilogram) basis. For statistical purposes, cotton is reported in terms of running bales, in 480-pound net weight bales, or in pounds. A running bale is any bale of varying lint weight as it comes from the gin. To maintain comparability, bale weights are commonly converted to 480-pound net weight equivalents.

Basic commodities. Agricultural products, including corn, cotton, peanuts, rice, tobacco, and wheat that are designed by legislation as price-supported commodities.

Blending. The mixing of other fibers with cotton. The resulting textile product is a compromise of unique properties of characteristics of the fibers in the blend, often providing a superior end product in some uses.

Boll. The seed pod of the cotton plant.

Bonded warehouse. A warehouse owned by persons approved by the U.S. Treasury Department and under bond or guarantee for the strict observance of the revenue laws; used for storing goods until duties are paid or goods are otherwise released.

Carding. A process in yarn manufacturing by which fibers are sorted, separated, partially aligned, and cleaned of foreign matter.

Cargo Preference Act. A U.S. law that states: "whenever the United States contracts for, or otherwise obtains for its own account, or furnishes to or for the account of any foreign nation without provision for reimbursement, any equipment, materials or commodities," the United States shall ship in U.S. flag vessels, to the extent that they are available at fair and reasonable rates, at least 50 percent of the gross tonnage involved.

Carryover stocks. The quantity of a commodity that is available for marketing at the beginning of a marketing year or crop year. Beginning stocks of cotton are frequently reported for the marketing year beginning August 1. Ending stocks reflect supply less disappearance, adjusted for any unaccounted cotton, for the year ending July 31.

Cellulosic fibers. All fiber of plant or vegetable origin. These fibers include natural fibers such as cotton, linen, and jute, and manmade fibers of wood pulp origin, such as rayon and acetate.

Cloth. A textile product obtained by weaving, knitting, braiding, felling, bonding, or fusing of fibers. Cloth is synonymous with fabric.

Commodity Credit Corporation (CCC). The USDA agency responsible for directing and financing major USDA "action programs," including price support, production stabilization, commodity distribution, and related programs. CCC also directs and finances certain agricultural export activities. CCC activities are implemented by the Farm Service Agency.

Conserving use. An approved cultural practice or use of land authorized by the county Agricultural Stabilization and Conservation Service on cropland required to be diverted under production adjustment or conservation programs.

Corduroy. A pile-filling fabric with ridges of pile running lengthwise, creating a ribbed surface.

Cost, insurance, and freight (c.i.f.). A term usually used in reference to ocean shipping that defines the seller's price to include the cost of goods, marine insurance, and transportation (freight) charges to the point of destination.

Cotton. A soft white vegetable (cellulosic) fiber obtained from the seed pod of the cotton plant, a member of the mallow family (*Gossypium*). Cotton is produced in about 75 countries. The two principal types of cotton grown in the United States are upland cotton (*Gossypium hirsutum*) and American Pima cotton (*Gossypium barbadense*). Upland cotton is grown throughout the Cotton Belt, accounting for about 99 percent of U.S. cotton production. The types of cotton grown, or once grown, in the United States are as follows:

Upland cotton. The predominant type of cotton grown in the United States and in most major cotton-producing countries of the world. The staple length of these fibers ranges from about 3/4 inch to 1-1/4 inch, averaging nearly 1-3/32 inches.

Extra-long staple cotton (ELS). ELS has staple length of 1-3/8 inches or more, according to the classification used by the International Cotton Advisory Committee. Also characterized by fineness and high fiber strength, contributing to finer and stronger yarns, needed for certain end uses such as thread and high-value fabrics. American growths include American Pima and, formerly, Sea Island cotton.

- **American-Pima cotton.** An extra-long staple cotton, formerly known as American-Egyptian cotton in the United States, grown chiefly in the irrigated valleys of Arizona, New Mexico, and West Texas. American-Pima cotton represents only 2 percent of the U.S. cotton crop and is used chiefly for thread and high-value fabrics and apparel. This type of cotton came into existence as Sea Island cotton was becoming extinct in the United States.

- **Sea Island cotton.** An extra-long staple cotton first grown in the United States about 1786 from seed received from the Bahama Islands. Sea Island cotton was relatively unimportant as a commercial crop until the 19th century. Produced in the coastal areas of South Carolina, Georgia, and Florida until the early 1920's, when U.S. production virtually ceased because of increasing competition from foreign growths of ELS cotton, the growing American-Egyptian cotton industry in the Western States, and production problems associated with Sea Island cotton. Commonly about 1-1/2 inches in length but ranged up to 2 inches.

Cotton compress. The equipment that shapes ginned raw cotton into a bale. The first compression, primarily to modified flat or universal bale dimensions, is performed at the gin. Further compression of flat or modified flat bales in performed at cotton warehouses.

Cotton count. (1) For yarn, a numbering system based on the number of 840-yard lengths in a pound. The higher the number the finer the yarn. A single strand of #10 yarn is expressed as 10s or 10/1. A 10s yarn has 8,400 yards to the pound; a pound of 20s yarn is 16,900 yards long. (2) For woven cloth, the number of warp ends and filling picks per inch. If a cloth is 68 x 72, there are 68 ends and 72 picks per inch in the fabric. An end is a warp yarn or thread that runs lengthwise or vertically in cloth. The ends interlace at right angles with filling yarn (picks) to make woven fabric. (3) For knitted fabric count indicates the number of courses and wales per inch. A course is a crosswise row of loops or stitches, similar to the filling of woven fabric. A wale is a lengthwise series of loops in a knitted fabric.

Cotton Exchange. A membership organization that provides facilities where cotton futures contracts are bought and sold. As of 1986, there were two such exchanges: the New York Cotton Exchange and the Chicago Rice and Cotton Exchange. The basis grade for the New York contract is Strict Low Middling 1-1/16-inch cotton; the basis grade of that of the Chicago contract is Strict Low Middling Light Spotted 31/32-inch cotton, largely produced in Texas and Oklahoma.

Cotton quality. Three major components of cotton quality (grade, staple, and micronaire) are included in official USDA cotton quality classifications. Added fiber properties, including length uniformity and strength, are also recognized as important and are increasingly being measured by instrument testing. Instruments are gradually replacing sight and touch methods in measuring cotton quality. Grade depends on the color, trash, content, and preparation (smoothness) of the cotton sample. There are 44 upland cotton grades and 10 grades of extra-long staple cotton. The Official Cotton Standards of the United States for American upland cotton, also called Universal Standards, are periodically renewed and approved by major foreign cotton-consuming countries. Thirty-one official standards exist for U.S. cotton staple, ranging from less than 13/16 inch to 1-3/4 inches. Micronaire is an airflow measurement that indicates fiber fineness and maturity.

Cottonseed. The seed of cotton from which the lint has been removed. Cottonseed oil is extracted from the seed through a crushing process. Cottonseed meal and cottonseed hulls, coproducts from the seed-crushing operation, are used as livestock feed.

Cotton system. A process originally used to manufacture cotton fiber into yarn and used now also for producing spun yarns of manmade fibers, including blends. The major manufacturing steps in the cotton system include opening of the fiber bales, picking, carding, combing (for combed yarns), drawing, roving, and spinning.

Crop year. The year in which a crop is planted. Also called the cotton marketing year, which begins on August 1 and ends on July 31.

Cross-compliance programs. When a full cross-compliance program is in effect, a producer participating in one commodity program (wheat, feed grains, cotton, or rice) on a farm must also participate on that farm in any of the other commodity programs. When a limited cross-compliance program is in effect, a producer participating in one commodity program must not plant in excess of the crop acreage based on that farm for any of the other program commodities for which an acreage reduction program is in effect.

Deficiency payment. A direct government payment to participating producers if farm average prices fall below specified target price levels during the calendar year. Payment rates cannot exceed the difference between target prices and price support loans.

Delinting. The process of separating the very short fibers (linters) remaining on the seed after the longer fibers have been removed in the ginning process.

Denier. A metric system method of measuring fibers. It is the weight in grams of 9,000 meters of the fiber.

Denim. A relatively heavy, yarn-dyed twill fabric traditionally made of cotton with color warp yarns and undyed fill yarns. Most denim fabric is used to make trousers.

Disappearance. U.S. textile mill raw fiber consumption plus raw fiber exports.

Disaster payments. Government payments to participating producers who are prevented from planting any portion of their permitted acreage under a program, or who suffer low yields, due to weather-related conditions. Starting in 1982, disaster payments were available only to those producers who had no access to Federal crop insurance.

Diversion payments. Government payments made to farmers in some years for not planting a specified portion of crop-acreage based on permitted acreage. A specified acreage is usually diverted to soil-conserving uses.

Domestic consumption. U.S. mill raw fiber consumption plus raw fiber equivalent of imported textiles less raw fiber equivalent of exported textiles.

Durable press. Performance characteristics (such as shape retention, machine washability, tumble dry, and little or no ironing) of treated textile products, mostly apparel. Often referred to as permanent press or wash and wear.

End. A warp yarn or thread that runs lengthwise or vertically in the fabric. Ends interlace at right angles with filling yarn (picks) to make woven fabric.

End use. The final product form in which fibers are consumed, including apparel, household products, and industrial items.

Extra-long staple. *See* Cotton.

Fabric. *See* Cloth.

Fiber. A slender strand of natural or manmade material usually having a length at least 100 times its diameter and characterized by flexibility, cohesiveness, and strength. Several strands may be combined for spinning, weaving, and knitting purposes. Cotton fibers are known as sample fibers since their length varies within a relatively narrow range from about 7/8 inch to 1-3/4 inches. Manmade fiber filaments are often cut to blend or mix with cotton for further processing on the cotton system.

Filament. An individual strand of fiber indefinite in length. Manmade fibers are indefinite in length. Silk may run several hundred yards in length.

Filling. An individual yarn that interlaces with warp yarn at right angles in woven fabric. Also known as pick or filling pick. Filling has less twist than warp yarn, which runs lengthwise in the fabric.

Finishing. Those processes through which a fabric passes after being taken from the loom, such as bleaching, dyeing, sizing, lacquering, waterproofing, and defect removing.

Forward contract. Sale of a commodity from a future crop for future delivery. The sale could involve all of the crop from a given contract acreage or, more commonly, a given quantity of specified quality.

General Agreement on Tariffs and Trade (GATT). An agreement originally negotiated in Geneva, Switzerland, in 1947 among 23 countries, including the United States, to increase international trade by reducing tariffs and other trade barriers. This multilateral trade agreement provides a code of conduct for international commerce. GATT also provides a framework for periodic multilateral negotiations on trade liberalization and expansion.

Gin. A machine that separates cotton lint from seed and removes most of the trash and foreign matter from the lint. The lint is cleaned, dried, and compressed into bales weighing approximately 500 pounds, including wrapping and ties. There are about 2,000 gins located throughout the Cotton Belt.

Grade. *See* Cotton quality.

Gray or greige fabric. Woven or knitted goods direct from the loom or knitting machine before they have been given any finishing treatment.

Group "B" mill price. *See* Price, raw cotton.

Hand. A subjective measurement of the reaction obtained from touching fabric, reflecting the many factors that lend individuality and character to a material.

Hard fibers. Comparatively stiff, elongated, woody fibers from the leaves or leaf stems of certain perennial plants. These fibers are generally too coarse and stiff to be woven and are chiefly manufactured into twine, netting, and ropes. Examples are abaca, sisal, and henequen. *See* Soft fibers.

Hedging. The practice of buying or selling futures contracts to offset an existing position in the cash or spot market, thus reducing the risk of an unforeseen major price change.

High density. The compression of a flat, modified flat, or gin-standard bale of cotton to a density of about 32 pounds per cubic foot. Previously used for most exported cotton, but currently replaced by universal density compression of about 28 pounds per cubic foot.

Import quota. The maximum amount of a commodity that can be imported in a specified time period. The United States imposes an annual import quota on raw cotton totaling 14.5 million pounds (about 30,000 bales) of short-staple cotton having a length of less than 1-1/8 inches and a quota of 45.7 million pounds (about 95,000 bales) of long-staple cotton having a length of 1-1/8 inches or more.

Industrial fabrics. A broad term for fabrics used for nonapparel and nondecorative uses. These uses fall into several classes: (1) a broad group of fabric employed in industrial processes such as filtering, polishing, and absorption; (2) fabrics combined with other materials to produce a different type of product such as tires, hose, and electrical machinery parts; and (3) fabrics directly incorporated in a finished product such as tarpaulins, tents, and awnings.

Inventory (CCC). The quantity of a commodity owned by CCC at any specified time. For example, about 123,000 bales of upland cotton were in CCC inventory (owned by CCC) on July 31, 1985.

Knitting. A method of constructing fabric by interlocking a series of loops of one or more yarns. The two major classes of knitting are warp knitting and weft knitting. In warp knitting, yarns run lengthwise in the fabric; in weft knitting, the thread runs back and forth crosswise in a fabric. Warp knit fabrics are flatter, closer, and less elastic than the weft knit. Tricot and milanese are typical warp knit fabrics, while jersey is a typical weft knit.

Lint. Raw cotton that has been separated from the cottonseed by ginning. Lint is the primary product of the cotton plant, while cottonseed and linters are byproducts.

Linters. The fuzz or short fibers that remain attached to the seed after ginning. Linters are usually less than 1/8 inch in length and are removed from the seed in a delinting process.

Loan rate (price support rate). The price per unit (bushel, bale, pound, or hundredweight) at which the CCC will provide loans to farmers enabling them to hold their crops for later sale.

Long-staple cotton. Refers to cotton fibers whose length ranges from 1-1/8 inches to 1-3/8 inches. Fibers whose length are 1-3/8 inches or more are known as extra-long staple (ELS).

Loom. A machine that weaves fabrics, using such natural fibers as cotton, wool, and silk. Examples are nylon, rayon, acetate, acrylics, polyester, and olefin.

Marketing quota. Quotas authorized by the Agricultural Adjustment Act of 1938 to regulate the marketing of some commodities when supplies are or could become excessive. A quota represents the quantity the Secretary estimates to be required for domestic use and exports during the year. Marketing quotas are binding upon all producers if two-thirds or more of the producers holding allotments for the production of a crop vote for quotas in a referendum. When marketing quotas are in effect, growers, who produce more of a commodity than their farm acreage allotments, are subject to marketing penalties on the excess production and are ineligible for government price support loans.

Marketing year. The U.S. cotton marketing year that begins August 1 each year and ends on July 31 of the following year.

Micronaire reading (mike). The results of an airflow instrument used to measure cotton fiber fineness and maturity (*see* Cotton quality).

Middling. The designation of a specific grade of cotton (*see* Cotton quality). Graders are determined by the amount of leaf, color, and the ginning preparation of cotton, based on samples from each bale of cotton. Middling is high-quality white cotton.

Mill (textile). A business concern or factory that manufactures textile products by spinning, weaving, or knitting.

Moduled seed cotton. A mechanical module builder compresses cotton into large modules in the field after harvest so that cotton may be temporarily held on the farm or at the gin while awaiting ginning. About 75 percent of U.S. cotton is moduled.

Motes. Cotton waste material from the cotton ginning process, primarily resulting from the lint cleaning operation. Motes can be reclaimed and sold for use in padding and upholstery filling, nonwovens, and some open-end yarns.

Multi-Fiber Arrangement (MFA). The MFA, negotiated under the auspices of the General Agreement on Tariffs and Trade (GATT), provides a set of complex rules that signatory nations agree to abide by when negotiating bilateral agreements to control trade in cotton, wool, and manmade fiber textiles and apparel. In 1985, the United States had bilateral textile agreements with 36 exporting countries, most of which were negotiated under the rules of the MFA.

Naps. Large tangled masses of fibers that often result from ginning wet cotton. Naps, however, are not as detrimental to quality as neps.

Natural fibers. Fibers of animal (such as wool, hair, or silk), vegetable (such as cotton, flax, or jute), or mineral origin (such as asbestos or glass).

Neps. Very small, snarled masses or clusters of fibers that look like dots or specks in the cotton lint and are difficult to remove. If not removed, they will appear as defects in the yarn and fabric.

Noncellulosic fibers. Fibers made from petroleum-derived chemicals. The major types are polyester, nylon, acrylic, and polypropylene.

Nonrecourse loan. Delivery to the CCC of the pledged and eligible commodity or warehouse receipts representing stocks acceptable as to quantity and quality, constituting repayment of the price support loan in full, regardless of the current market value of the commodity.

Nonwoven fabrics. Material made primarily of randomly arranged textile fibers held together by an applied bonding agent or by fusion.

Offsetting compliance. When an offsetting compliance program is in effect, a producer participating in a diversion or acreage reduction program must not offset that reduction by overplanting the acreage based for that crop on another farm.

Oilseed crops. Major U.S. oilseed crops are soybeans, cottonseed, flaxseed, peanuts, sunflowerseed, rapeseed, and sesame seed. Other oils include palm, olive, coconut, tung, and caster.

Open-end spinning. Processing fibers directly from a fiber supply, such as a roving silver, to the finished yarn, in contrast to ring spinning. Three basic open-end methods are mechanical, electrostatic, and fluid or air. Advantages over ring-spun yarns include increased speed, less labor, and less floor space for equipment.

Paid land diversion. A program that offers payments to producers for reduction of planted acreage of a program crop if the Secretary determines that acreage planted should be further reduced. Farmers are given a specific payment per acre to idle a percentage of their crop acreage base. The idled acreage is in addition to an acreage reduction program.

Parity price. The price that will give agricultural commodities the same relative purchasing power in terms of goods and services farmers buy that prevailed in a specified base period. This concept was first defined by the Agricultural Adjustment Act of 1993. The parity price formula is not a comprehensive measure of the economic well-being of farmers, nor does it measure cost of production, standards of living, or income parity. The parity price formula is based on price relationships and reflects only one component of cost of production and income.

Pick. A filling yarn or thread that runs crosswise in woven goods.

Pile. The cut or uncut loops that make the surface of a pile fabric. Some common pile fabrics include velvet, corduroy, terry toweling, furniture covering, and rugs and carpets.

Ply. The number of single yarns twisted together to make a composite yarn. When applied to cloth, it means the number of layers of fabric combined to give the composite fabric.

Point. A term used in quoting the price of raw cotton. One point is equal to 1/100 of a cent.

Price, raw cotton. There are several different cotton price series, each of which represents a different time and space dimension in the market. All price series, ranging from U.S. farm prices to international prices, are linked by common fundamental demand and supply factors.

Farm price. The season-average price received by farmers for cotton is a sale-weighted average of prices received by farmers during the market season at the point of first sale, usually on the farm or at a local delivery point. This USDA series is available for upland cotton by month and State and for ELS cotton by marketing year and State. The series is reported in *Agricultural Prices*, published by USDA's National Agricultural Statistics Service. An important use of upland cotton farm prices on a calendar year basis is to determine government deficiency payments.

Futures price. The current price of cotton established at a futures exchange to be delivered at a future date. Futures contracts are primarily traded by merchants to hedge the risk of adverse price movements. The No. 2 contract, covering SLM white 1-1/16-inch cotton, is traded daily on the New York Cotton Exchange. The Chicago Rice and Cotton Exchange's short staple cotton futures contract covers SLM Light Spotted 31/32-inch cotton.

International price. There is no statistically valid, single estimate of a world price. Two popular measures are reported by Liverpool Cotton Services, Ltd., publishers of Cotton Outlook. The Outlook "A" index is a simple arithmetic average of the five lowest priced growths of Middling 1-3/32-inch cotton delivered to northern Europe from various exporting countries. The "B" index is a simple average of the three lowest northern European prices quoted for shorter staple coarse cotton varying in staple length from 1 inch to 1-3/32 inches. These prices are used to compare export competitiveness of American and foreign growths.

Mill price. The price for cotton delivered to mills in western North Carolina and South Carolina is commonly referred to as Group B mill price. These prices, including landing and brokerage costs, are quoted for cotton of given grades and staples from given regions. The SLM 1-1/16 inch price is often compared with polyester staple and rayon staple prices to indicate cotton's competitive position in the raw fiber market.

Spot price. A spot or cash market price represents the price for which cotton of various qualities was sold at warehouse locations in seven market areas designated by the Secretary of Agriculture. Spot market quotations are issued by committees made up of local members of a voluntary trade organization known as the Cotton Exchange. These exchanges provide a mean of establishing premiums and discounts for government cotton loans and for setting futures contracts. The spot market price also represents the market value of cotton in the early stages of the wholesale marketing chain.

Price support. Government price support programs for cotton and other farm commodities are administered by USDA's Farm Service Agency. Various methods of supporting producer prices have been used over the years. Support has commonly been achieved through nonrecourse loans, purchases, and payments at announced levels. Recent legislation is designed to make export commodities competitive in world markets though market price support at or near world price levels. At the same time, producers' incomes are enhanced through deficiency payments. Export competitiveness, if further enhanced by issuing marketing certificates to first handlers, would allow world prices to fall below producers' loan repayment levels.

Producer. A person who, as owner, landlord, tenant, or sharecropper, is entitled to a share of the crops available for marketing from the farm or a share of the proceeds.

Program (agricultural). Government activities aimed at accomplishing a certain result. Such activities include agricultural price support loans, purchases and payments, commodity storage, transportation, exports, and acreage reduction.

Program costs. No single definition is applicable to all uses. Program costs may be gross or net expenditures of the CCC on a commodity during a fiscal year or other period. Program costs may be the realized loss on disposition of a commodity, plus other related net costs during a fiscal year or other period. Program costs may be the net costs attributed to a particular year's crop of a commodity during the marketing year for that commodity.

Public Law 480 (P.L. 480). The principal legislative authority for channeling U.S. food and fiber to needy countries. First enacted in 1954, P.L. 480 was extended by the Food for Peace Act of 1966 and subsequent legislation.

Quality. *See* Cotton quality.

Raw fibers. Textile fibers in their natural state before any manufacturing activity has taken place; for example, cotton as it comes from the bale.

Referendum. The referral of a question of voters to be resolved by balloting; for example, marketing quotas, acreage reduction, or marketing agreements.

Residual supplier. A country that furnishes supplies to another country only after the latter has obtained all it can from other preferred sources.

Roving. An intermediate stage of yarnmaking between sliver and yarn and the last operation before spinning into yarn.

Running bale. Any bale of varying lint weight as it comes from the gin.

Sea Island. *See* Cotton.

Seed cotton. Raw cotton that has been harvested but not ginned, containing the lint, seed, and foreign matter.

Skip-row planting. The practice of planting one or more rows in uniform space then skipping one or more rows to conserve moisture in dryland areas and/or to increase yields on planted acreage.

Sliver. A strand or rope of fibers without twist. In yarn manufacture, a sliver is formed by the carding machine and is of greater diameter than the strand created during roving.

Soft fibers. Flexible fibers of soft texture obtained from the inner bark of dicotyledonous plants. Soft fibers are fine enough to be made into fabrics and cordage. Examples are flax, hemp, jute, kenaf, and ramie. *See* Hard fibers.

Spinning. The process of drawing fibers that may be in roving or rope form, twisting the appropriate number of turns per inch, and winding the yarn on a bobbin or other suitable holder.

Spinning quality. The ease with which fibers lend themselves to yarn-manufacturing processes.

Spot price. *See* Price, raw cotton.

Staple fibers. (1) Natural fibers whose length usually ranges from about 1 inch to 1-1/2 inches, such as cotton. (2) Manmade fibers that have been cut to the length of the various natural fibers to facilitate blending and further processing with other fibers.

Strict Low Middling 1-1/16-inch cotton. The grade and staple length used as the basis on which the CCC establishes its loan rates. Higher qualities receive loan premiums and generally higher market prices, while lower qualities receive lower loan rates and lower prices (*see* Cotton quality).

Supima. Trademark of an ELS cotton, commonly referred to as American Pima cotton, produced in California, Arizona, New Mexico, and west Texas. The Supima Association of America is a producer association headquartered in Phoenix.

Synthetic fibers. Fibers made from petroleum-derived chemicals that were never fibrous in form. They are categorized as noncellulosic fibers.

Tare. The weight of the ties (or bands) and wrapping materials that contain the bale of cotton. The quoted net weight of a bale excludes the tare, whereas the gross weight includes tare.

Target price. A price level established by law for wheat, corn, sorghum, barley, oats, rice, and upland and extra-long staple cotton. Farmers participating in

CCC commodity programs receive the difference between the target price and either the market price during a period prescribed by law or the price support (loan) rate, whichever is higher.

Tex. A system of yarn numbering that measures the weight in grams of 1,000 meters of yarn. A 30-tex yarn weighs 30 grams per 1,000 meters.

Texture. The number of warp threads (ends) and filling yarn (picks) per square inch in a woven fabric. For example, 88 x 72 means there are 88 ends and 72 picks per square inch in the fabric.

Textile. Any product made from fibers, including yarns, fabrics, and end-use products such as apparel, home furnishings, and industrial applications.

Twist. The number of turns per unit of length of the fiber, strand, roving, or yarn. In the United States, twist is measured in terms of the number of turns per inch.

Universal density bale. A bale of cotton compressed to a density weighing 28 pounds per cubic foot.

Upland cotton. *See* Cotton.

Warp. The yarns that run lengthwise in a woven or warp-knit fabric.

Wash and wear. A term applied to any garment that can be washed, dried, and then worn again with little or no ironing. Also called "durable press" or "permanent press."

Weft. The filling yarns than run crosswise in woven fabric or weft-knit fabric.

Weight of fabric. Three methods are used to measure fabric weight: (1) linear yards per pound (2) ounces per linear yard, and (3) ounces per square yard.

World price. Often refers to the price of an imported agricultural commodity at the principal port of importation of a major importing country or area (*see* Prices, raw cotton).

Woven fabric. Fabric made by interlacing two sets of yarn at right angles. The warp yarns run lengthwise in the fabric; the filling (weft) yarns are passed over and under the warp yarns.

Yarn. A continuous strand of twisted (spun) fibers of any kind and of varying staple length, usually used in the weaving or knitting of fabric.

Yarn size. Yarns, or threads, are numbered according to weight. The higher numbers denote fiber fineness. A "1s" cotton yarn has 840 yards in a pound; a "30s" cotton yarn has 25,200 yards in a pound. A "30/2" is a two-ply yarn containing two strands of 30s. *Also see* Cotton count.