

where it is bleached, pre-shrunk, dyed, printed and given a special finish before being made into clothing or products for the home. Other machines make knits for use in shirts, sweaters or blankets.

This, then, is the story of cotton – where and how it is grown, marketed, processed and manufactured into the many useful products that have served the world so well for so long. It is a never-ending story, as scientists continue to develop better ways to produce and use one of the world's oldest fibers – cotton.

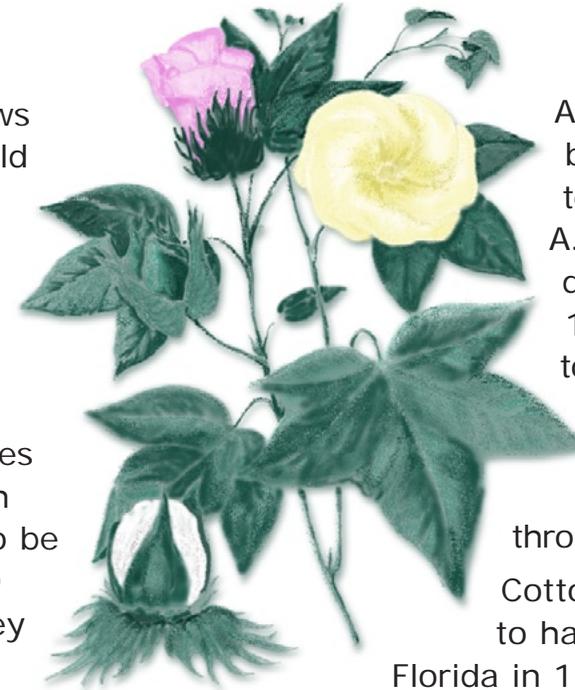


The Story of Cotton

History of Cotton

No one knows exactly how old cotton is. Scientists searching caves in Mexico found bits of cotton bolls and pieces of cotton cloth that proved to be at least 7,000 years old. They also found that the cotton itself was much like that grown in America today.

In the Indus River Valley in Pakistan, cotton was being grown, spun and woven into cloth 3,000 years BC. At about the same time, natives of Egypt's Nile valley were making and wearing cotton clothing.

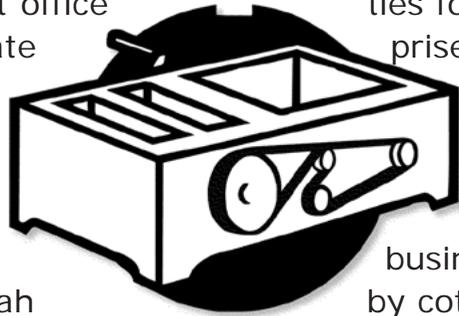


Arab merchants brought cotton cloth to Europe about 800 A.D. When Columbus discovered America in 1492, he found cotton growing in the Bahama Islands. By 1500, cotton was known generally throughout the world.

Cotton seed are believed to have been planted in Florida in 1556 and in Virginia in 1607. By 1616, colonists were growing cotton along the James River in Virginia.

Cotton was first spun by machinery in England in 1730. The industrial revolution in England and the invention of the cotton gin in the U.S. paved the way for the important place cotton holds in the world today.

Eli Whitney, a native of Massachusetts, secured a patent on the cotton gin in 1793, though patent office records indicate that the first cotton gin may have been built by a machinist named Noah Homes two years before Whitney's patent was filed. The gin, short for engine, could do the work 10 times faster than by hand.



The gin made it possible to supply large quantities of cotton fiber to the fast-growing textile industry. Within 10 years, the value of the U.S. cotton crop rose from \$150,000 to more than \$8 million.

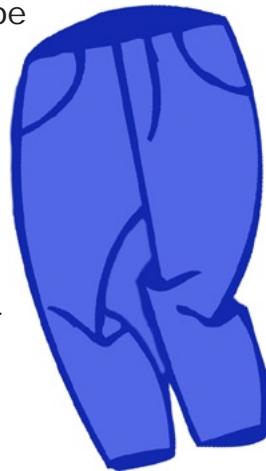
The Importance of Cotton

Today, the world uses more cotton than any other fiber, and cotton is a leading cash crop in the U.S. At the farm level alone, the production of each year's crop involves the pur-



chase of more than \$5.3 billion worth of supplies and services. This stimulates business activities for factories and enterprises throughout the country. Processing and handling of cotton after it leaves the farm generates even more business activity. Annual business revenue stimulated by cotton in the U.S. economy exceeds \$120 billion, making cotton America's number one value-added crop.

Cotton is a part of our daily lives from the time we dry our faces on a soft cotton towel in the morning until we slide between fresh cotton sheets at night. It has hundreds of uses, from blue jeans to shoe strings. Clothing and household items are the largest uses, but industrial products account from many thousands of bales.

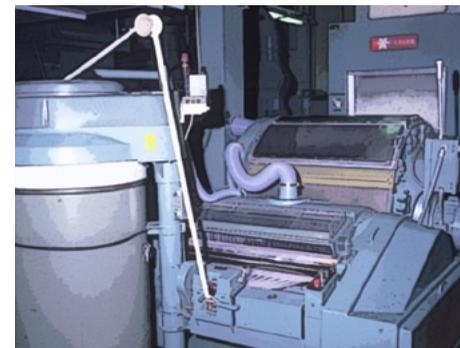


their cotton to a local buyer or merchant who, in turn, sells it to a textile mill either in the United States or a foreign country.

The seed usually is sold by the producer to the gin. The ginner either sells for feed or to an oil mill where the linters (downy fuzz) are removed in an operation very much like ginning. Linters are baled and sold to the paper, batting and plastics industries, while the seed is processed into cottonseed oil, meal and hulls.

How Cotton is Spun and Woven

At the textile mill, the bales are opened by machines, and the lint is mixed and cleaned further by blowing and beating. The short lint that comes out usually is separated and sold for use in other industries. The best part of the lint consists of fibers about 1 inch to 1 3/4 inches long.



The mixed and fluffed-up cotton goes into a carding machine which cleans the fibers some more and makes them lie side by side. The combing action of the carding machine finishes the job of cleaning and straightening the fibers, and makes them into a soft, untwisted rope called a sliver (pronounced sly-ver).

On modern spinning frames, yarn is made directly from the sliver. The spinning devices take fibers from the sliver and rotate it up to 2,500 revolutions in a second twist that makes fibers into a yarn for weaving or knitting into fabrics.

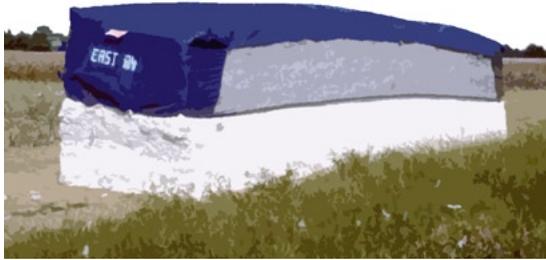
Machines called looms weave cotton yarns into fabrics the same way the first hand-weaving frames did.



Modern looms work at great speeds, interlacing the length-wise yarns (warp) and the crosswise yarns (filling). The woven fabric, called gray goods, is sent to a finishing plant

How Cotton is Ginned and Marketed

Today, nearly all cotton is stored in modules, which look like giant loaves of bread. Modules allow the cotton to be stored



without losing yield or quality prior to ginning. Specially designed trucks pick up modules of seed cotton from the field and move them to the gin. Modern gins place modules in front of machines called module feeders. Some module feeders have stationary heads, in which case, giant conveyors move the modules into the module feeder. Other module feeders are self-propelled and move down a track that runs alongside the modules. The module feeders literally break the modules apart and “feed” the seed cotton into the gin. Other gins use powerful pipes to suck the cotton into the gin building. Once in the cotton gin, the seed cotton moves through dryers and



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through cleaning machines that remove the gin waste such as burs, dirt, stems and leaf material from the cotton. Then it goes

to the gin stand where circular saws with small, sharp teeth pluck the fiber from the seed.

From the gin, fiber and seed go different ways.

The ginned fiber, now called lint, is pressed together and made into dense bales weighing about 500 pounds. To determine the value of cotton, samples are taken from each bale and classed according to fiber length (staple), strength, micronaire, color and cleanness. Producers usually sell



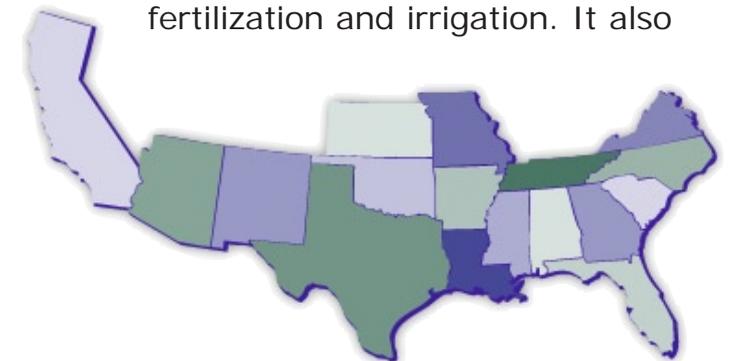
All parts of the cotton plant are useful. The most important is the fiber or lint, which is used in making cotton cloth. Linters – the short fuzz on the seed – provide cellulose for making plastics, explosives and other products. Linters also are incorporated into high quality paper products and processed into batting for padding mattresses, furniture and automobile cushions. The cottonseed is crushed in order to separate its three products – oil, meal and hulls. Cottonseed oil is used primarily for shortening, cooking oil and salad dressing. The meal and hulls that remain are used either separately or in combination as livestock, poultry and fish feed and as fertilizer. The stalks and leaves of the cotton plant are plowed under to enrich the soil. Some cottonseed also is used as high-protein concentrate in baked goods and other food products.

Where Cotton Grows

Cotton grows in warm climates and most of the world’s cotton is grown in the U.S., Uzbekistan, the People’s Republic of China and India. Other leading cotton-growing countries are Brazil, Pakistan and Turkey.

In this country, the major cotton-producing states are: Alabama, Arizona, Arkansas, California, Georgia, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee and Texas, Florida, Kansas and Virginia.

The yield in the U.S. averages approximately 1 1/3 bales per acre and about 1,078 pounds of seed. A U.S. bale weighs around 500 pounds. This yield is about twice as much as in 1950 and is due to better land use, improved plant varieties, mechanization, fertilization and irrigation. It also



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is a result of much better control of disease, weeds and insects. A major part of the credit for this progress goes to scientists working at experiment stations and in laboratories, and to agricultural extension workers who bring the findings to farmers.

How Cotton is Grown

After cotton has been harvested, producers who use conventional tillage practices cut down and chop the cotton stalks. The next step is to turn the remaining residue underneath the soil surface. Producers who practice a style of farming called conservation tillage often choose to leave their stalks standing and leave the plant residue on the surface of the soil.

In the spring, farmers prepare for planting in several ways. Producers who plant using no-till or conservation tillage methods, use special equipment designed to plant the seed through the litter that covers the soil surface.



Producers who employ conventional tillage practices, plow or "list" the land into rows forming firm seed-beds for planting. Producers in south Texas plant cotton as early as February. In Missouri and other northern parts of the Cotton Belt, they plant as late as June.



Seeding is done with mechanical planters which cover as many as 10 to 24 rows at a time. The planter opens a small trench or furrow in each row, drops in the right amount of seed, covers them and packs the earth on top of them. The seed is planted at uniform intervals in either small clumps ("hill-dropped") or singularly ("drilled").

Machines called cultivators are used to uproot weeds and grass, which compete with the cotton plant for soil nutrients, sunlight and water. About two months after planting, flower buds called squares appear on the cotton plants. In another three

weeks, the blossoms open. Their petals change from creamy white to yellow, then pink and finally, dark red. After three days, they wither and fall, leaving green pods which are called cotton bolls.

Inside the boll, which is shaped like a tiny football, moist fibers grow and push out from the newly formed seeds.



As the boll ripens, it turns brown. The fibers continue to expand under the warm sun. Finally, they split the boll apart and the fluffy cotton bursts forth. It looks like white cotton candy.

Since hand labor is no longer used in the U.S. to harvest cotton, the crop is harvested by machines, either a picker or a stripper. Cotton picking machines have spindles that pick (twist) the seed cotton from the burs that are attached to plants' stems. Doffers then remove the seed cotton from the spindles and knock the seed cotton into the conveying system.

Conventional cotton stripping machines use rollers equipped with alternating bats and brushes to knock the open bolls from the plants into a conveyor.

A second kind of stripper harvester uses a broadcast attachment that looks similar to a grain header on a combine. All harvesting systems use air to convey and elevate the seed cotton into a storage bin referred to as a basket. Once the basket is full, the stored seed cotton is dumped into a boll buggy, trailer or module builder.



(For a detailed description of picker operation, go to <http://www.aces.edu/departments/ipm/cottonpicker.htm> or http://www.csr1.ars.usda.gov/cpru/harv_g.htm#harv.)