



# Cotton is a Miracle of Nature

**It's North Carolina's  
Fiber, Feed & Food Crop**



## Cotton: A Miraculous Fiber



A 480 pound bale of cotton can produce:  
1,200 men's T-shirts,  
3,000 baby diapers,  
1,300 pairs of pillowcases,  
690 terrycloth bath towels,  
more than 730 shirts or  
blouses, or 215 pairs of  
men's denim jeans.

Even after 8,000 years, cotton remains the most miraculous fiber under the sun. No other single fiber comes close to duplicating all the desirable characteristics combined in cotton.

Cotton is noted for its versatility, appearance, performance, and above all else, its natural comfort. Cotton in today's fast-moving world is still nature's wonder fiber, providing thousands of useful products and supporting millions of jobs.



### Why we love Cotton

Cotton is the most used fiber in the world. It's popular because it's versatile. It's used in apparel, home furnishings, and industrial and other consumer products. There isn't a part of your day that you didn't use something made from cotton. The towel after your shower, the shirt and pants you put on, the seats in your car. The money you used to buy a biscuit for breakfast. All made from cotton.



*Cottonseed oil is used in many products we eat every day.*



*Quality, 100% cotton products are easily identified by the distinctive Seal of Cotton.*

*Denim trousers and pants are the favorite in clothing.*

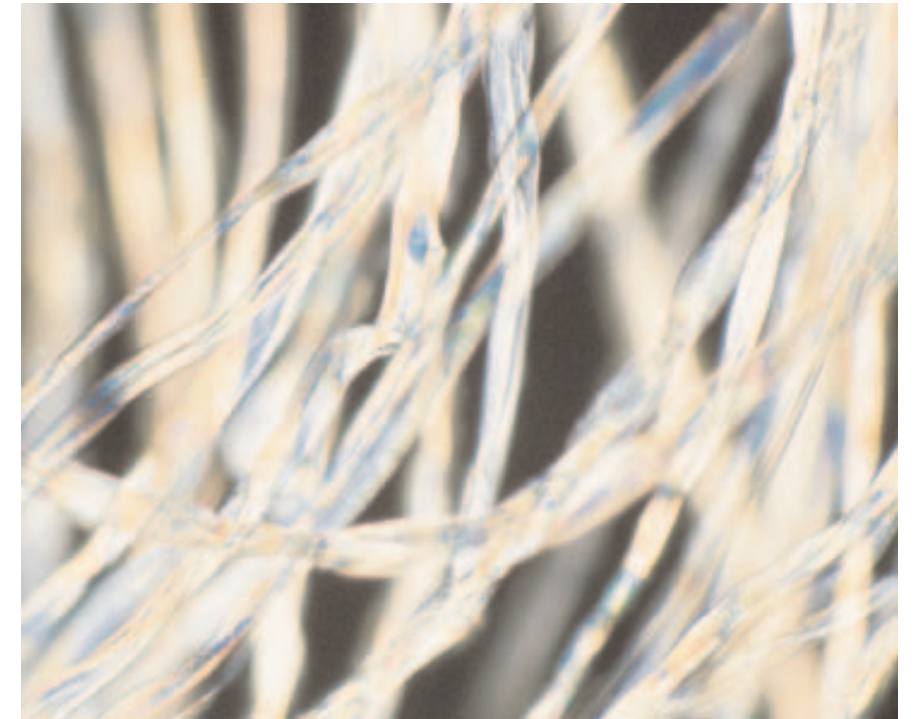


### A Unique, Natural Fiber

Cotton is a natural fiber with layers of highly organized cellulose surrounding a hollow core. The pitch, or angle, of the cell layers alternate, first one way then the other, which accounts for cotton's extraordinary strength.

Recently, a science museum in Newark, NJ, lifted a 3,500-pound car with seven pairs of denim jeans attached to the crane.

The hollowness and the layering of the cells also contribute to cotton's ability readily to absorb water and to "wick" moisture away from the body.



## 100% Cotton, 100% Usable, 100% Environmentally Friendly

### All Parts of Cotton are Used

The most important is the fiber or lint, which is used for making a myriad of textile products. The cottonseed is crushed to make oil, which is used in shortening, margarine, cooking oil, and salad dressing. Some cottonseed is also used as a high-protein concentrate in baked goods and other food products. Cottonseed meal and hulls are used to make livestock feed. Cellulose from cottonseed linters is used to make ice cream, paper currency, photography papers, plastics, and mattress and auto cushion coverings.

Cotton takes few nutrients from the soil because it is grown primarily for the fiber found in the boll part of the plant. Farmers have also adopted tillage practices that minimize soil erosion.

### Recycling Cotton

- Cotton stems and leaves are plowed back into the soil
- Cotton's deep-rooting pattern makes it very efficient at utilizing moisture from the soil and makes it possible to produce top yields with half the water required by many other crops
- Even the meal produced from cottonseed as feed for livestock finds its way back to the soil as fertilizer



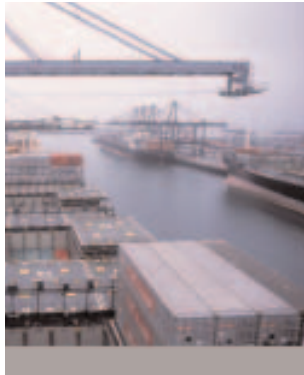
*Some non-fabric uses of cotton fiber include tissues, cotton balls, and cotton swabs.*



*The cotton plant produces more food for man and animals than it does fiber for cloth.*



## Cotton's Importance to our State and Nation's Economy



The U.S.A. produces more cotton than its mills need. In fact, approximately 65% of the American cotton crop is exported to other countries.

Cotton is the leading cash crop in the United States. The annual average cotton crop accounts for 5 million tons of lint and 7.5 million tons of cottonseed. The gross dollar value of cotton lint and its extensive system of production, harvesting, and ginning provides countless jobs for mechanics, farm machinery dealers, crop consultants, processors, and people in other support services.

### America's Cotton Industry

Today, the world uses more cotton than any other fiber. At the farm level alone, the production of each year's crop involves the purchase 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 revenues stimulated by cotton in the U.S.

economy exceeds \$120 billion, making cotton America's number one value-added crop. The average annual value of U.S. cotton and cotton products sold overseas is more than \$8 billion. That's a lot of money coming back to the U.S.

Other allied industries such as banking, transportation, warehousing, and merchandising also benefit from a viable U.S. cotton production system.



### North Carolina's Cotton Industry

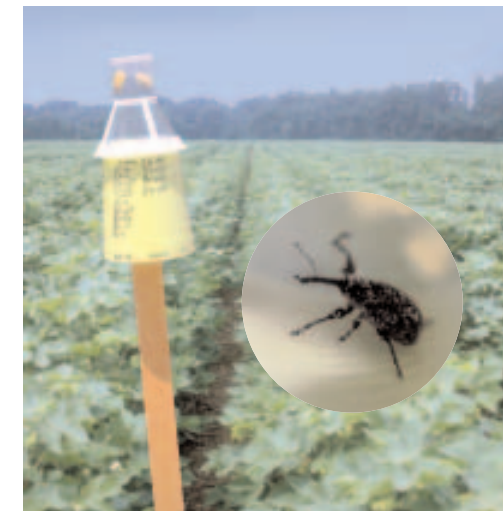
Back in the roaring '20s, cotton was king in North Carolina and the Cotton Belt. In 1926, growers in the Tar Heel State grew an all-time high 1,802,000 acres of cotton. Even into the early 1950s, North Carolina was home to a textile industry using 2 million bales of cotton yearly.

About that same time, however, cotton growers faced a serious threat—a little gray beetle with a long snout. The boll weevil fed on newly developed cotton bolls, destroying its growth. The dreaded boll weevil was responsible for millions of dollars worth of damage to the cotton crop and was a major factor in the beginning of the economic depression in the South. In 1978, North Carolina producers grew an all-time low of 42,000 acres of cotton.

If it weren't for the successful Boll Weevil Eradication Program initiated in North Carolina, farmers wouldn't be growing the crop across the Cotton Belt today. The program has been so successful that many states, all the way to Texas and New Mexico, have adopted its practices.

In 2004, cotton provided almost 75,000 jobs and over 7 billion dollars to North Carolina's economy.

*Cotton's comeback in North Carolina has been dramatic.*



Sometimes called "white gold," cotton is grown in 55 counties in North Carolina.

*The boll weevil has been stopped, but is still monitored should any come back Carolina's way.*



*U.S. cotton production stretches from California to Virginia, covering more than 14 million acres of about 22,000 square miles.*





Marco Polo reported cotton flourishing in India as early as 6,000 B.C.

## A Richly Textured History

The cotton plant grows wild in many places on the earth, but it has been known about, cultivated, and put to use by people of many lands for centuries. Archaeologists have found cloth fragments, proof that cotton was being grown in the Indus Valley of India (Pakistan) dating around 3000 B.C.

About the same time, natives of Egypt's Nile Valley were making and wearing cotton clothing. Arab merchants brought cotton cloth to Europe around 800 A.D.

Currently, there are five prominent types of cotton being grown commercially around the world: Egyptian, Sea Island, American Pima, Asiatic, and Upland. The largest producers of cotton include the USA, People's Republic of China, India, and Pakistan.



### Cotton's Beginnings in America

When Columbus came to America in 1492, he found cotton growing in the Bahamian Islands. By 1500, cotton was known generally throughout the world. Later, the Coronado expedition sighted cotton crops grown by American Indians in the early 1500s.

In 1616, American colonists were growing cotton along the James River in



*Before the industrial revolution, slave laborers performed the arduous task of harvesting and separating the cotton lint from the seed.*

Virginia. Americans loved their "home-spun" fabric made from cotton and wore it as a symbol of American independence. Alexander Hamilton, the nation's first Secretary of the Treasury, believed in cotton's promise as a major crop. He recognized that the southern states were especially suited for cotton cultivation and predicted in 1775 that the U.S. would one day "produce enough fiber to clothe the entire continent."

In 1793, Massachusetts teacher and inventor, Eli Whitney, revolutionized the cotton industry when he invented the labor-saving cotton gin. He called it a "gin" — short for engine — and claimed it replaced the work of 50 men, mostly slave laborers. The gin revolutionized the process of separating the seeds from the cotton fiber or lint.

The invention was considered so significant to America's economy that the president of the United States, George Washington, signed the patent issued to Whitney. The gin made it possible to sup-

ply large quantities of cotton fiber to the fast-growing textile industry

By 1860, America's cotton crop reached almost a billion pounds or about 2/3 of the world's supply. Cotton exports were financing 60 percent of total U.S. expenditures for imports of manufactured goods, including sugar, coffee, railroad iron, and other products.

Today, the U.S. is the 2nd leading producer of cotton in the world.



### Civil War Nearly Wiped Out Cotton

The Civil War severely impaired cotton production in the South. When the war ended in 1865, the scramble was on to begin production again. After the war, cotton fabric once again became America's favorite. Part of cotton's comeback can be attributed to the demand for denim jeans, or "Levis", which were created for miners during the 1849-1869 California Gold Rush.



### The Industrial Revolution

Cotton was used in some of the most important inventions of the 19th century. For instance, Samuel Morse invented the telegraph and a language called Morse Code to send messages over long distances. The messages were sent over electrical wires similar to today's telephone wires. Cotton was used to insulate the metal wires.

When the famous inventor Thomas Edison was trying to develop the first practical electric light bulb, he needed a special material for the filament, which is part of the light bulb that heats up and glows. He tried platinum, silicon, and boron. Then he tried a strip of charred cotton—it was perfect for the light bulb because, unlike other materials, it glowed rather than melted when subjected to the electric charge.



*The Wright brothers stretched cotton muslin over the wings of their airplanes that made the first sustained flights.*

### Everyday Inventions – Today and Tomorrow

As the twentieth century took off, so did cotton. In 1905, Wilbur and Orville Wright covered the wings of their first airplane with cotton.

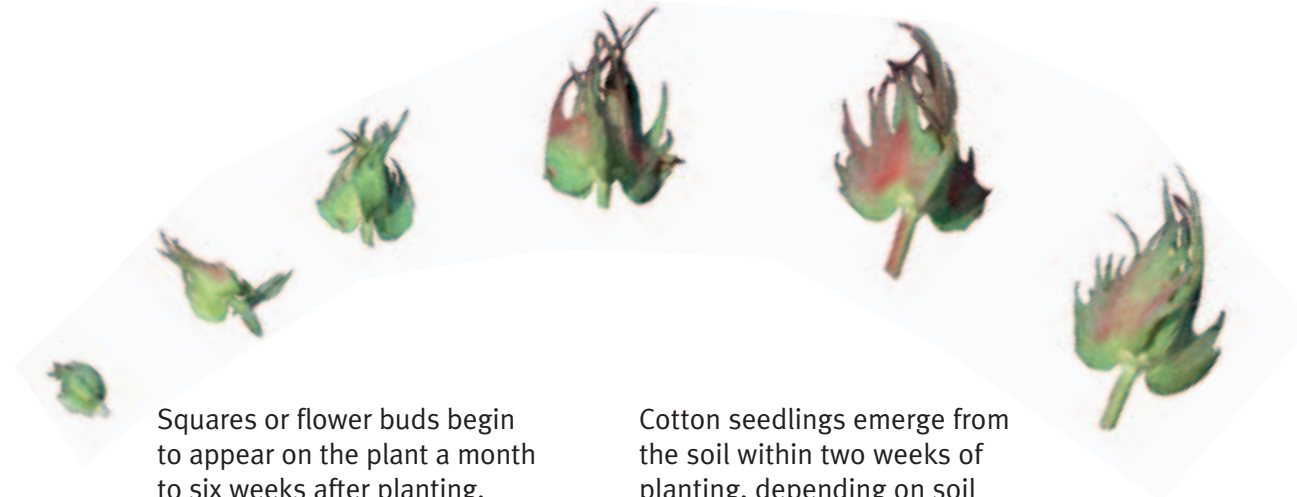
When World War I broke out, fine cotton fibers were used to make a smokeless gunpowder.

21st century inventors found more and more uses for cotton. It is now used to make everything from photographic film to margarine.

We can only wonder what new uses twenty-first century inventors will find for cotton, this miracle of nature!

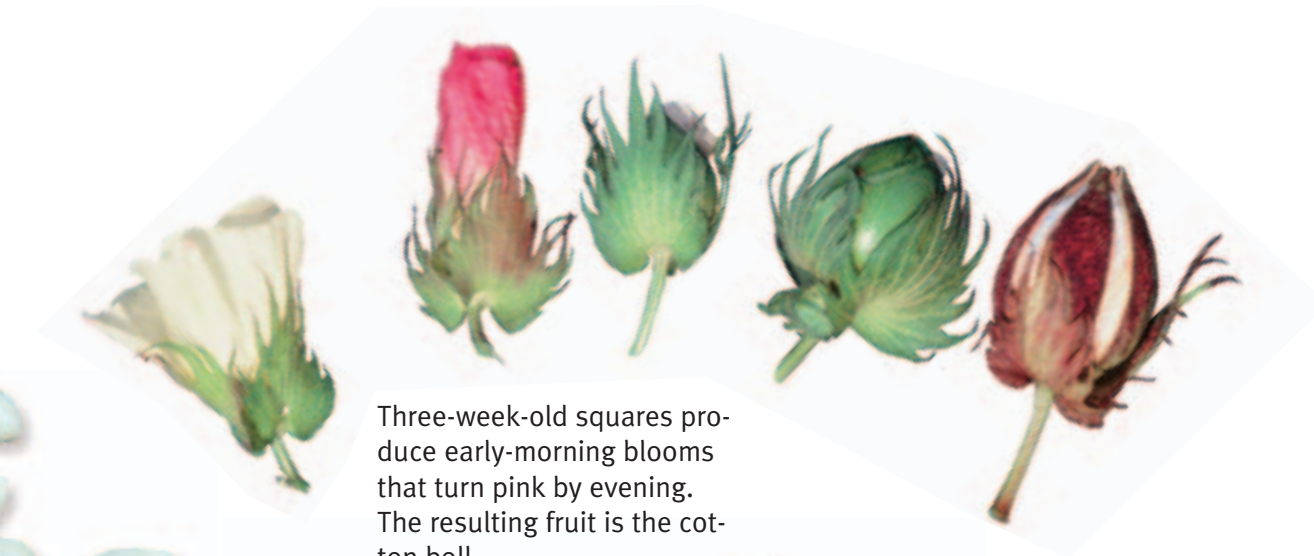


# How Cotton is Grown in North Carolina



Squares or flower buds begin to appear on the plant a month to six weeks after planting. The plant will continue blooming for six to eight weeks.

Cotton seedlings emerge from the soil within two weeks of planting, depending on soil temperature and moisture.



Three-week-old squares produce early-morning blooms that turn pink by evening. The resulting fruit is the cotton boll.



Cotton is considered a fruit because the boll contains seeds from which the cotton fiber grows.



Bolls open 50 to 70 days after bloom. White, fluffy fibers are dried by the sun. Plants are defoliated to prepare for harvest.

## Production steps in growing a cotton crop



In the spring, North Carolina producers prepare their land either by plowing or use conservation tillage for planting in late April and May.

Healthy, fast-growing seedlings are the best defense against crop damage and poor yield, so producers must be aggressive in reducing environmental stresses and managing crop growth to ensure progress.



Seeding is done with mechanical planters, which cover as many as 6 to 8 rows at a time.

## Crop Protection

Fertilizers and crop protection products, which help weeds and early season insects from damaging the newly developing plant, can be applied before, during, or after planting. Growers often cultivate or hand rogue their young crop to clean out weeds and grass between rows.



Cotton fields are inspected regularly during the growing season by "cotton scouts", who are specially trained to identify and count harmful insects.

Timely and technically correct application of insecticides and biological controls is essential to preventing crop damage and profit loss. To reduce pesticide use and cost, farmers are using integrated pest management (IPM) practices on a limited basis. IPM coordinates the use of insecticides and the dispersal of beneficial insects to aid in suppressing unwanted insects.



An average boll will contain nearly 500,000 fibers of cotton.

## Prepare for Harvest

Open bolls are very vulnerable to adverse weather conditions, and a timely harvest will maintain the integrity of the fiber to ensure yield and profit. The use of harvest aids maintains lint quality, reduces trash content, and expedites a once-over-harvest.



insect damage can lower yields by 25 – 85%.





Cotton provides absorbency in towels, yet provides water repellancy in tents.

## How Cotton is Harvested, Ginned & Marketed

While harvesting is one of the final steps in the production of a cotton crop, it is also one of the most important. It is essential that cotton is harvested before weather and rain can damage or ruin its quality and reduce yield.

When enough bolls have opened naturally, defoliation aids are applied to the plant to help speed up the maturation process. By helping the leaves to dry and fall off, the cotton bolls open faster and the crop is ready to be harvested.

Since cotton was first grown in America, the crop was picked by hand. An



*Cotton is usually harvested in North Carolina from early October to mid-December.*

experienced laborer could pick approximately 450 pounds of seed cotton by hand per day. But, by the mid-1930s, mechanical cotton harvesters were being used widely across the Cotton Belt.

One of the first mechanical harvesters, a one-row picker, could gather 8,000 pounds of seed cotton in one day. It replaced the output of more than 20 people.

Today's modern cotton harvesters can cover up to 6 to 8 rows at a time and can harvest up to 190,000 pounds of seed cotton a day.



*Large trucks move modules from the field to the gin.*

### Seed Cotton Storage

Once harvested, seed cotton must be removed from the harvester and stored before it is delivered to the gin. In the early 1970s, module builders came on the market, greatly improving storage capabilities.

This implement allows cotton to be dumped from the picker onto the ground and hydraulically compressed to form a module, a tightly pressed stack of cotton. This module can be left in the field for storage and later be hauled directly in a module mover to the gin's storage yard. The use of these builders allows the pickers to continue harvesting, unimpeded by ginning problems or delays.



*Module builders make modules that hold 12 to 14 bales of cotton.*

### Ginning, Classing and Marketing Cotton

From the fields, seed cotton moves to nearby gins for separation of lint and seed. The cotton first goes through dryers to reduce moisture content and then through cleaning equipment to remove foreign matter. These operations facilitate processing and improve fiber quality.

Cotton is then conveyed to gin stands, where revolving circular saws pull the lint through closely-spaced ribs that prevent the seed from passing through. After the lint is removed by air blasts or rotating brushes, it is then compressed into bales weighing approximately 500 pounds.



*Lint from cotton is compressed into 500-pound bales.*



*A gin typical can produce about 12 bales per hour, while some of today's "super" gins turn out as many as 60 bales per hour.*

After the cotton is ginned, the lint cotton bales are moved to a warehouse for storage until it is shipped to a textile mill for use. The separated seed goes to an oil mill where the linters (downy fuzz) are removed, baled, and sold to the batting and plastics industries, while the seed is processed into cottonseed oil and meal or used as whole seed as feed for cattle.

Samples are taken from each bale of lint cotton and classed according to fiber strength, staple length, length uniformity, color, non-fiber content and fineness.



*An average bale is 55" tall, 28" wide and 21" thick.*



*Human evaluation is also used in the classing process. Once classed, cotton is ready for sale.*



# How Cotton is Spun, Woven, Dyed, Printed and Finished in Textile Mills



A large, modern mill can produce enough yarn or thread in 30 days to wrap around the earth 2,300 times or go to and return from the moon 235 times.



Cotton bales at textile mills are combined to form a uniform blend of fibers.



High-speed carding, framing, combing, and spinning machines make yarn.



The manufacture of yarns and fabrics and the production of high quality consumer and industrial products involve some of the most complex technologies used in commerce today.

At the textile mill, the bales are opened by machines, and the lint is mixed and cleaned several times before going to the combing machine. The combing machine finishes the job of cleaning and straightening the fibers and makes them into a soft, untwisted rope called a sliver. The twisted and pulled fibers reach a spinning frame, which gives them a last pull and twist. The fiber leaves the spinning frame wound on bobbins as cotton yarn.

Modern looms, which work at great speeds, weave cotton yarns into fabrics. The woven fabric is sent to a finishing plant where it is bleached, pre-shrunk, dyed, printed, and given a special finish before being made into clothing or products for the home.



Knitting machines may use more than 2,500 needles to produce a wide variety of fabrics and shapes.

Cotton's versatility makes it the preferred fabric for year-round use.

# Cotton Fabric Uses

Cotton is used for virtually every type of clothing from coats and jackets to foundation garments. Most of its apparel usage, however, is for men's and boy's clothing. Cotton supplies over 70% of this market, with jeans, shirts, and underwear comprising a large part of the market.

In home furnishings, cotton's uses range from bedspreads to window shades. Cotton is also popular in sheets and pillowcases where it holds over 60% of the market.

Industrial products containing cotton are as diverse as wall coverings, book bindings, and zipper tapes. The biggest cotton users in this category, however, are medical supplies, industrial thread, and tarpaulins.

## Qualities of Cotton

Cotton not only has a variety of uses, but it can be made into medium and heavy weight fabrics. It can be made smooth or textured, Cotton's versatility makes it comfortable in warm or cold weather. It's durable and launders well. Cotton fabric breathes, making it very comfortable to wear.



Cotton supplies 100% of the towel and washcloth industry



Cotton can also be found in a myriad of household furnishings.



Back in 1880, the US Navy issued sailors an elbow-and hip-length under-shirt. Laid out on a flat surface, it formed a perfect "T"—hence the name—T-shirt.



Cotton is known for its natural comfort.



## Cottonseed – Oil and Meal Have Valuable Uses, Too



Textiles are only part of the cotton story. Although fiber is the most valuable product from a cotton field, the real news is that the cotton plant produces more food for man and feed for animals than it does fiber, making it a valuable food crop.



**Peanut butter, pancake mix, and corn and potato chips all include cottonseed oil.**

### Oil from Cottonseed

Of the four primary products produced by cottonseed processing plants, oil is the most valuable. On the average, it accounts for about 40 % of the total value of all four products. Cottonseed oil is used almost entirely as a food for man. Depending on its stage of refinement, it can be used in snack foods, mayonnaise, margarine, baking or frying oils, explosives, cosmetics, rubber, soap, insecticides and many other products. Foodstuff cottonseed oil has superior nutritive qualities and is on the American Heart Association's list of "okay foods."



*Cottonseed oil now ranks 3rd in volume behind soybean oil and corn oil.*

### Whole Cottonseed

Dairy producers have found that whole cottonseed is a highly effective protein source in cattle feed. Those who use whole cottonseed have found it to be an excellent high-energy feed that also provides a high level of fiber that can become important during times of dry weather and tight forage supplies.



### Cottonseed Meal

Cottonseed meal is the second most valuable product of cottonseed, usually accounting for about 1/3 of total product value. It may be sold in the form of meal, cake, flakes, or pellets. Cottonseed meal is used principally as a high-protein feed for livestock.

### Cottonseed Hulls

The hulls of cottonseed are used primarily as feed for livestock. Hulls differ from meal, in that they are a roughage rather than a protein supplement. In feeding value, hulls are comparable to good quality grass hay and can serve as a practical, quality supplement to pastures.

### Linters

Cottonseed linters, the short fibers removed from seed in the first step in processing, are sometimes referred to as "the fabulous fuzz." Through mechanical or chemical conversion, they enter a wider variety of end use products than any of the other products of cottonseed.

## Partnerships for the Future of Cotton



In 1951, a progressive group of North Carolina cotton farmers came together to form a cotton organization dedicated to improving the welfare of cotton farmers in the state. Chartered in 1954, the group later became the North Carolina Cotton Producers Association. Through a 70-cent per bale assessment, the group contributes to the important work of the Southern Cotton Growers Association and the National Cotton Council of America.

The NCCPA continues to help achieve gains through research, efficiency in production and marketing, quality improvement, public relations, and legislative policies designed to keep the North Carolina cotton industry strong and healthy.

It does so, working with NC State University, the NC Cooperative Extension Service, the NC Department of Agriculture

and Consumer Services, and other industry institutions and agencies in the state.

Another important organization headquartered in North Carolina is Cotton Incorporated. Cotton growers from across the state and the entire Cotton Belt have invested millions of dollars over the years for Cotton Incorporated scientists and researchers to develop new uses and processes for cotton. The mission of Cotton Incorporated, working with cotton producers and importers of American cotton, is to increase the demand for and profitability of cotton through research and promotion.

To do so, Cotton Incorporated leaders and staff share their unparalleled technical expertise all over the world with mills and manufacturers, promoting the purchase of more U.S. cotton. In addition to influencing the textile industry with new fabric innovations, Cotton Incorporated also works effectively to influence consumers through retail promotions, advertising, and media exposure.



**Cotton Incorporated creates cotton technology today...for worldwide use tomorrow.**



*Presidents of the NC Cotton Producers Assn. over the past 50+ years.*





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