

Cotton Finds Markets Beyond Traditional Uses

About 90 percent of collected cotton linters and motes are transformed by chemical or mechanical means into hundreds of diverse products, while only about 5 percent of cotton lint is used in industrial applications. In 1994, an estimated supply of 10.8 billion pounds of cotton lint, linters, motes, and textile wastes were available for industrial purposes.

Cotton fibers are mechanically processed to form yarns, threads, fabrics, and absorbent products, or chemically converted to produce fiber pulp, whose cellulosic nature provides the basis for hundreds of industrial and consumer products. Some of the more traditional uses of cotton include nonwoven felts and fabrics, buffing wheels, awnings, machine belts, and upholstery fabric, linings, and padding. Moreover, the industrial market for cotton fiber has expanded into such varied applications as solid rocket propellants, oil-spill absorbents, and fingernail polishes.

Cotton Fiber Available in Various Forms

Cotton bolls are the part of the plant that hold the seed and fiber. Each boll contains four to five locks, and each lock has approximately seven seeds firmly attached to the fibers. After cotton is harvested, the ginning process separates the fiber (lint) from the cottonseed. Only very short fibers (linters) remain on the cottonseed after ginning. Linters are removed during the delinting process at cottonseed oil mills. Linters are identified as first cut, second cut, and mill run, depending upon the number of passes through the delinters. Linters, by far, are the largest source of cotton fiber for industrial applications.

Cotton ginning also can supply another source of useable fiber, gin motes. Motes are cotton fibers that are reclaimed from cotton ginning waste that accumulates during lint-cleaning operations. Reclaimed motes can be cleaned of foreign matter and sold for use in padding and upholstery filling, nonwovens, and low-quality yarns. In 1994, about 45 to 50 percent of the 1,350 U.S. cotton gins reclaimed motes for sale.

Textile-mill waste is primarily shorter or tangled fibers removed in carding and combing operations in the yarn-formation process. This material is generally very clean and can be reused by blending it back with other cotton lint to produce coarser count yarns, or used directly to form high-quality nonwovens, fine writing paper and currency paper, or in certain medical applications. For many higher value uses, it is important that mill waste be 100 percent cotton fiber and not mixed with manmade fibers.

Fiber Supplies Depend on Level of Cotton Production

The level of domestic cotton production primarily determines the quantity of the various cotton fibers available for alternative uses. While cotton-lint yields per acre can change sig-

nificantly from year to year, the relative output of cottonseed and gin motes remains fairly constant per pound of cotton lint produced. The quantity of cotton linters obtained per pound of processed cottonseed also changes very little.

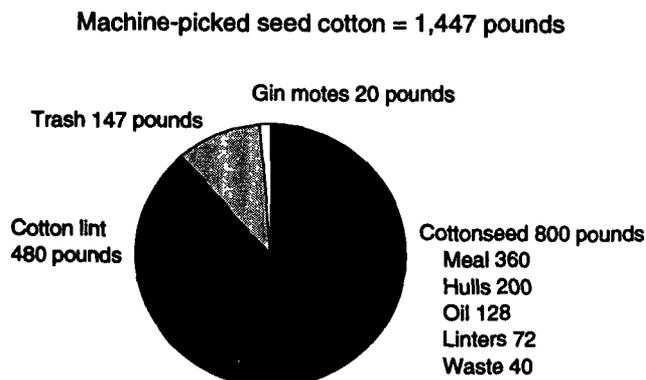
The 1994 cotton crop was produced on over 13.3 million harvested acres, and totaled nearly 19.7 million bales or 9.5 billion pounds of cotton lint. (The standard cotton bale weighs 480 pounds.) An average of 1,447 pounds of seed cotton must be machine picked to produce one 480-pound bale of lint (figure 5). Ginning yields approximately 800 pounds of cottonseed, and about 20 pounds of motes are available for reclaiming. Seventy-two pounds of cotton linters can be removed from the 800 pounds of seed, about 9 percent by weight. The remaining 147 pounds is trash, such as sticks, leaves, and hulls. This material is usually incinerated, composted, or plowed into fields as a soil conditioner.

Not all available motes are gathered for sale, and not all cottonseed is delinted. With about half of the U.S. cotton gins collecting motes, this would indicate a potential 1994 supply of about 197 million pounds.

Cottonseed production during marketing year 1994/95 (August-July) totaled 15.2 billion pounds. According to recent estimates, nearly 44 percent was used as animal feed (mainly for dairy cattle), seed, and other uses; 3 percent was exported as whole cottonseed; and the remaining 53 percent was crushed at oil mills. The total quantity of cotton linters is estimated at 725 million pounds (15.2 billion pounds of cot-

Figure 5

Distribution of Harvested Seed Cotton



tonseed x 53 percent crushed x 9 percent linters yield). Historically, about 20 percent of linter production is first cut, 70 percent is second cut, and the remaining 10 percent is mill run.

The supply of textile-mill or spinning waste is dependent upon the amount of cotton used by domestic mills and the type of yarn being produced. On average, a textile-processing waste factor of 7.5 percent yields an estimated supply of 407 million pounds of mill waste in 1994/95, based on the 11.3 million bales consumed.

Market Outlets Expand as Supplies Increase

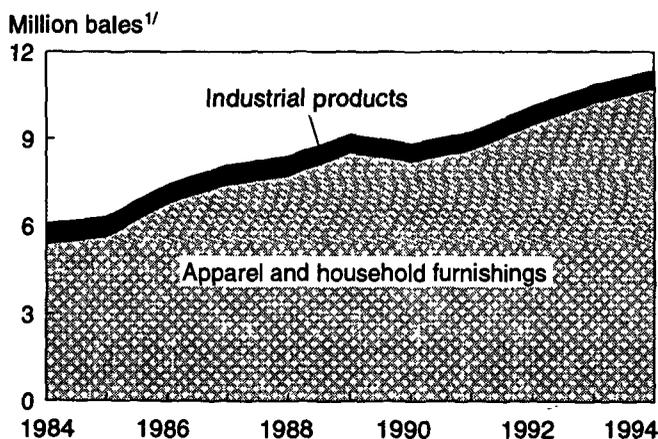
Industrial markets for cotton fiber are expected to grow in coming years as traditional markets expand and new uses are developed. Sharply increasing raw cotton production since 1986 is expanding the supply of cotton lint, linters, and motes for industrial applications. These larger supplies should improve cotton's competitive position for industrial uses compared with manmade fibers, rayon, and wood pulp.

During the past 10 years, U.S. consumption of cotton lint in all end uses has risen steadily from about 6.4 million bales in 1985 to 11.2 million in 1994 (figure 6). The use of cotton lint in industrial products, however, has remained fairly constant at about 610,000 to 680,000 bales, or 293 to 326 million pounds. Market gains in some outlets have generally been offset by losses in others.

The largest single industrial market for cotton lint is in medical supplies, accounting for 129,000 bales in 1994 and about 40 percent of all fibers used in medical applications (table 11). Together with industrial thread, tarpaulins, abrasives, and book bindings, these five markets accounted for nearly 64 percent of all industrial uses of cotton lint. In terms of fiber market share, cotton represents only about 11 percent of all fibers consumed, indicating a potential for expansion in a number of market areas.

In contrast to cotton lint, where industrial uses account for only about 5 percent of total use, approximately 90 percent

Figure 6
U.S. Cotton Fiber Markets



1/ A bale weighs 480 pounds.
Source: National Cotton Council of America, Memphis, TN.

of collected linters and motes end up in some form of industrial application. Through mechanical or chemical means, these fibers are transformed into hundreds of diverse products.

According to the National Cottonseed Products Association, chemical applications account for about three-fourths of total volume (figure 7). Generally, first-cut linters are longer and whiter and are used in nonchemical markets. They usually compete with textile mill waste and lower quality cotton lint in manufacturing absorbent products, gauze, twine, wicks, and carpet yarns. A large quantity is put through a process called garnetting to produce belts and batting for use in bedding products and cushioning for furniture and automobiles.

Second-cut linters, those in largest supply, are used primarily by the chemical industry. Since linters are composed of almost pure cellulose, they represent a valuable industrial feedstock. Linters are purified by chemical treatment consisting of digesting, bleaching, and washing, and drying. The resulting linter pulp is then bulk baled, formed into long rolled sheets, or cut and packaged flat for shipment.

Further processing turns linter pulp into dissolving pulp. This pure cellulosic material is used to produce:

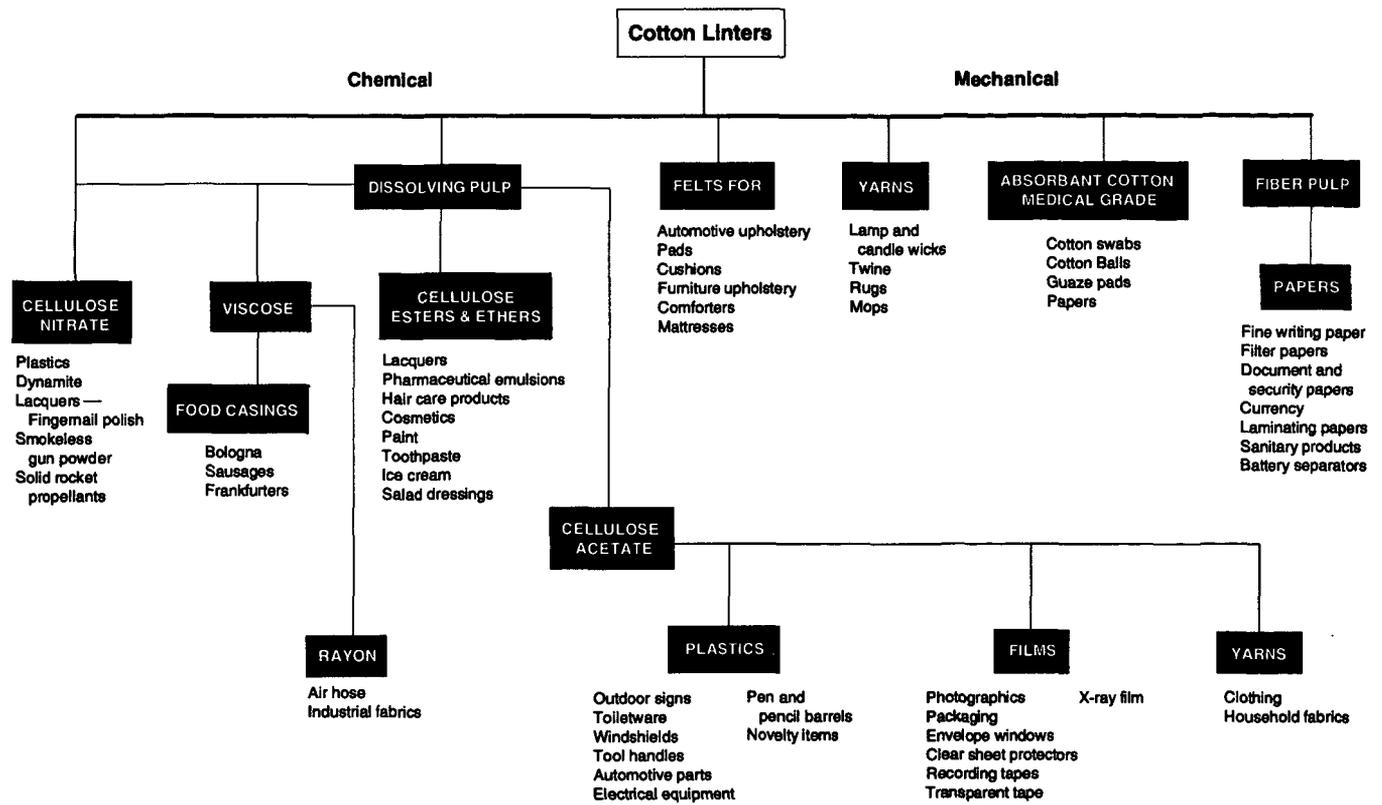
- Cellulose nitrate, the basis of many plastics, smokeless gun powder, rocket propellants, and even fingernail polish;
- Viscose, which is used extensively in food casings for bologna, sausages, and hotdogs;
- Cellulose esters and ethers, which are used in making pharmaceutical emulsions, lacquers, cosmetics, paint, and even salad dressings; and
- Cellulose acetate, a primary ingredient in producing various plastics and films, such as outdoor signs, tool handles, and automotive parts. A large quantity of cellulose acetate

Table 11—Consumption of cotton lint in major industrial markets, 1994

Product	Cotton lint consumed 1,000 bales	Fiber market share Percent
Medical supplies	129	40
Industrial thread	111	23
Woven tarpaulins	62	40
Woven abrasives	50	68
Book bindings	40	29
Rope, cordage, and twine	33	8
Machinery belts	23	20
Wiping and polishing cloths	23	65
Shoes and boots	20	33
Wall covering fabric	19	27
Automobile uses	16	1
Sleeping bags	14	26
Tents and trailers	14	18
Boat covers	11	17
Woven bags	11	9
All other	37	5
Total	613	11

Source: Cotton Counts Its Customers, National Cotton Council of America, Memphis, TN, June 1995.

Figure 7
Most Cotton Linters Are Chemically Processed



Source: National Cottonseed Products Association, Inc.

is used in making photographic and x-ray film, envelope windows, and recording and transparent tapes. Acetate yarns are also used in many household and industrial fabrics.

New and innovative markets continue to be developed for cotton fiber. For example, flame-retardant cotton fabric is now widely used for protective clothing in civilian and military applications, and loosely woven cotton lint and linters

are being used as a planting medium to combat erosion. A recently developed linter product is an edible grade of linter fiber containing more than 99 percent total dietary fiber. This product is a pure white, flavorless, odorless flour that is chemically stable and will not react with other ingredients. It is used in many food products including baked goods, dressings, snacks, and processed meats. [Edward Glade, Jr., (202) 219-1286]