CHAPTER- III

OPERATIONAL STRUCTURE OF TEXTILE INDUSTRY

AND PERFORMANCE OF INDIAN TEXTILE INDUSTRY IN

DOMESTIC AND EXPORT MARKETS
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3.1 PRODUCT HISTORY
Cotton, indisputably the most vital and broadly used fibre today dates back to about 3000BC. Early fabrics being found in Indian tombs. Written description in Hindu hymns dating from around 1400BC of the manufacture of cotton yarn and the weaving of the cloth, suggest that by then the fabric had an key place in Indian culture. It was also produced by the early Chinese civilizations and there is proof of cotton production before 2000BC. By the time of Alexander the Great, manufacturing techniques had already become quite sophisticated and beautiful printed cottons of India is mentioned in his records of conquest.

The farming of cotton was spread to Egypt and the Mediterranean basin. By the 12th century, Venice had become a major cotton-manufacturing city, processing cotton from the Mediterranean area into cloth for sale across the Europe. Cotton manufacturing eventually widen to Germany in the Middle Ages together with the increased farming of dye plants such as woad. The fibre was first imported into England in the 16th century but it was not until the mid 18th century that production increased significantly through the series of inventions, which transformed the manufacturing process.
The earlier inventions were intended at purely improving the productivity of the home workers. Increased demand for cotton made it more hard to supervise the work and quality control became more of a concern, as did the embezzlement of materials. The obvious answer to these problems, together with the increasing size and complexity of the textile machinery itself, was to establish factories where all the manufacturing could be done, and controlled, under one roof.\textsuperscript{3.58}

By the 18th century there was a rapid interest in the mechanization of all manufacturing processes. In the textile industry, which was a domestic industry at the time, the main bottleneck in production was the speed at which yarn could be spun. The invention of the Spinning Jenny by James Hargreaves in 1764 improved productivity considerably enabling a single operator to spin eight threads at once. However, the thread produced was coarse and did not have the strength required for producing warp threads on looms (warp threads are tensioned and require considerably more strength than weft threads).\textsuperscript{3.58}
Bucket – Code Cleaner

Central Flat - Ginning
COTTON GIN:
The cotton gin, invented in 1793 by Eli Whitney, was intended to split raw cotton fibres from seeds and other foreign materials before baling and marketing. The design was so well-organized that it remains virtually unchanged to the present day.  

The real breakthrough came in the 1771 when Richard Arkwright successfully established a mill based on the use of the automatic uninterrupted spinning machine called the Water frame. The power for the factory, which was located by the river Derwent in Derbyshire, being supplied by a water wheel. As the mill became more flourishing Arkwright built homes for the workers around the mill. The resulting village of Cromford was the first planned workers village consisting in the main of three storey-terraced houses. The top storey, which was connected by doors along the whole row of houses, was used by the employees to make stocking during the evenings.

The main advantage of the Water frame was that it could produce a stronger, top quality thread. The final step in the early mechanization of spinning came with the invention by Samuel Cromton in 1779 of the mule. This was a hybrid machine, which combined the roller drafting of the water frame with the running twist of the jenny. Fine yarns could now be produced consistently.

The importance of the water wheel in the early development of the cotton industry can be revealed clearly by the fact that in the late 18th century there
Oil Mill Section

Cotton Seeds
were nearly 100 cotton mills within a 10 mile radius of Ashton-under-Lyne, all on the river Tame and all powered by water.\textsuperscript{3.58}

Water mills had been introduced to Britain as far back as Roman times, but on a much minor scale. However, by the Domesday census of 1086 there were 5600 of them used for grinding grain, processing wool, hammering metal and making paper.\textsuperscript{3.58}

At about the same time, growths in weaving were serving to speed up the production of the fabric. The invention of the flying shuttle by John Kay in 1733 opened the way up to mechanically powered weaving, but the invention had to wait thirty years before changes in yarn production began to inspire loom development. Progress was then speedy with the first practical power loom, constructed by Edmund Cartwright, appearing in 1787. This was followed within two years by a steam driven weaving mill in Doncaster with 400 power looms. Flaws in the initial design however, meant that the power loom remained in relatively small-scale use until after the Napoleonic Wars.\textsuperscript{3.58}

An unusual effect of the growth of the spinning mills, and the relatively slow development of the power loom, was the rapid increase in the number of handloom weavers required to convert the yarn into cloth. Only when the initial technical problems with the power loom had been overcome in the 1820's did the revolution of the weaving industry really start to take place. The unemployment that this created produced a significant resistance to change. Some of this resistance can be put down to 'luddism', workers resisting modernization because of fear of losing their primary means of
Pressing Operations
- Cotton

Finished Product- COTTON BALES
income. It was about this time of great change that the first unions of trades or trades unions were shaped. These unions grew out of the early benefit clubs which themselves were formed as an answer to the oppressive acts against unlawful societies and seditious meetings, which were introduced in the late 18th century. 3.58

**BASIC ELEMENTS OF WEAVING:**

Conditions in and around the early textile factories were dire. Most were unclean, poorly designed, badly lit, ill ventilated and poorly drained. It is no shock then that the workers health suffered badly and that people living in the vicinity of factories were also affected. 3.58

Children as young as six were expected to work a 13 to 14 hour day in often humid and dusty environment, and mill fever an initial response to the pollution was very common. There was also a high incidence of tuberculosis, byssinosis and other respiratory ailments especially amongst cotton workers. A high percentage of textile workers were incapacitated or even disabled by the time they were in their early 20’s. 3.58

The invention of the rotary steam engine in 1782 by James Watt, provided the perfect resources for driving many different types of machinery. Whereas earlier machines produced an up and down movement which could be best used for pumping out mines, the new engine produced a rotary motion which could provide belt driven power to the new generation of spinning frames and looms. Entrepreneurs like Arkwright, Cartwright and Greg used Watt’s engines to power their factories. A good example of such a mill that is still operating as a museum, is Quarry Bank at Stal in Cheshire. 3.58
Quarry Bank Mill was established by Samuel Gregg in 1784 using the new Water frames for spinning yarn invented by Arkwright, driven by the power from the most powerful waterwheel in England built across the flow of the River Bollin. It was typical water powered spinning mill of the time. The wide breastshot water wheel supply all the power to twist and pull the cotton fibres into yarn. Transmission of the power was achieved by a series of pulleys, belts and drive shafts arranged up through five floors of the building. A second water wheel was added in 1801 when the length of the mill was doubled and an attic level added.

To work the mill more efficiently and cost effectively, Gregg like Arkwright in Cromford, built a whole community alongside Quarry Bank.³⁵⁸

By 1788 Gregg had built an Apprentice House on the site so that all of the paupers children that he employed would have somewhere to live close by the mill. Eventually the House held 90 children, mainly aged from 10 to 12, who were brought in to work typically on 7-year contracts. This entitled them to board, lodgings, clothes and education. There were times in the mill’s early history when children constituted nearly 50% of the workforce. By 1844 however, restrictions on child labour meant that under 13’s could only work a 6 & 1/2 hour day and were required to have at least 3 hours of schooling per day. In addition to the Apprentice House the Greggs also built cottages, a shop and a chapel in the grounds of the factory.³⁵⁸

In 1796 a steam engine was installed to supply auxiliary power during dry periods when the river was low. This was improved in 1810 and again, to a
more powerful Boulton and Watt engine, in 1936. By the 1830's Samuel Gregg and Co had grown into one of the largest cotton textile businesses in Britain. Over 2000 people were employed by the group with more than 400 at Quarry Bank Mill. Around 3000Bc there was an outburst of invention with fibres like cotton, silk and flax becoming more widely used. Spinning and weaving were already well recognized as domestic crafts. Before the invention of the Spinning Wheel and the later Saxony Wheel, spinning was a slow and tedious task. The spinning of one pound of heavy cotton yarn taking more than a few weeks and one pound of woolen blanket yarn about one week. Spinning would be done between the finger and thumb using a simple spindle and whorl. Even the direction of the rotation was in ancient times dictated more often than not by local tradition. Such was the magnitude of textiles to a community.\(^3_{,58}\)

**TRADITIONAL SPINNING WHEEL:**

Weaving was a much less tiresome task consuming a spinner’s weekly output in a matter of hours. Even so handloom weaving was an discomfited process with the shuttle bearing the yarn being passed slowly across the warp from one hand to the other.\(^3_{,58}\)

**DEFINITION : COTTON – A WHITE GOLD**

Cotton has rightly deserved the sobriquet, “White Gold” because it passes wealth to all those connected with it, be they farmers, market men or consumers. This has been the tradition for countries and it endures to this day and will endure in future as well. The production of Cotton fibre is dependent on the growth of raw-cotton; the growing cycle of raw-cotton is listed below.
GROWING CYCLE:\textsuperscript{3.24}

- The growing season from coming out (poking out of the ground) to picking is about 180 days.
- Cotton plants favor hot summers with low humidity and long hours of sunshine.
- The higher the average temperature, the quicker the cotton will grow and develop.
- The longer and hotter the season the higher the potential yield (amount of cotton per hectare).
- Most on-farm activities take place between September / October and April / May. Time will vary from region to region.
- **August - September - Soil Preparation:** Growers prepare the soil in readiness for seed planting. Need to check moisture levels.
- **September - October - Planting:** Check soil temperature and plant cotton seed. Cotton seed is planted in the spring as soon as the soil is warm adequate to be sure of satisfactory seed germination and crop establishment. The soil is warm enough when the temperature reaches 14 degrees Celsius at a depth of 10cm for at least three days.
- **November - February - Growing Season:** Continuing checks for pests, testing soil moisture leaves and ongoing weeding of crop. Initial irrigation is usually followed by a further four to five irrigations, at two to three week intervals, from mid-December to late February or early March.
- **March / April / May - Defoliation, Picking and Transportation to gins.** Large mechanical cotton pickers pick the crop. Cotton is then ginned - it is processed by machines to separate the cotton fibre from
the cotton seeds. The lint is pressed into bales. Growers usually wait until most of the bolls have opened up and fully matured before picking. It is extremely important that the cotton is dry when picked, however there should be some moisture present.

**May - August - Off season:** Other activities such as the classing and marketing of cotton are undertaken and many growers raise winter crops, graze sheep and cattle of have a well-earned rest.

Cotton is one of the major export items for various developing countries. Various hybrid qualities of cotton have been developed to fight against the pest problem. Countries like India, China, Pakistan and Sri Lanka concentrate on the production and management of cotton crops.

**TRANSGENIC COTTON CROP**

Fifteen countries have undertaken a commercial production of transgenic crops. Of these fifteen countries, Argentina, Canada, China and the US grew 99% of the total. A total of 5.5 million farmers are engaged in genetically modified farming, over 75% of whom are small resource-poor farmers in developing countries. 3,19

Of the global 31.0 million hectares of cotton worth $20 Billion, approximately 70% is grown in developing countries. Asia has up to 60% of world cotton and Africa up to 15%. There are about 20 million cotton farmers globally, 97% of whom farm in developing countries - most are small resource-poor farmers growing two hectares or less of cotton. 3,5

Insect pests are a major problem in cotton and yield losses and insecticides cost cotton farmers $5 billion annually - 20% of global insecticides are used
on cotton. Countries that have introduced genetically modified cotton have derived significant and multiple benefits, including increased yield, decreased production costs and a reduction of at least 50% in insecticide applications, resulting in substantial environmental benefits to small producers, and significant economic and social benefits.⁵

Yield increases for heritably modified cotton range from 5% to 10% in China, 10% or more in the US and Mexico and 25% in South Africa. In the US in 2001 economic gain for genetically modified cotton was $50 per hectare coming to more than $100 million nationally. In China, economic gain was $500 per hectare with a national benefit of $750 million.⁵

**GLOBAL MARKET’S SHARE IN NATIONAL COTTON AREA:** ³²³

<table>
<thead>
<tr>
<th>Country</th>
<th>Share</th>
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<tbody>
<tr>
<td>Argentina</td>
<td>05%</td>
</tr>
<tr>
<td>Australia</td>
<td>30%</td>
</tr>
<tr>
<td>China</td>
<td>45%</td>
</tr>
<tr>
<td>India</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>20%</td>
</tr>
<tr>
<td>Mexico</td>
<td>25%</td>
</tr>
<tr>
<td>South Africa</td>
<td>75%</td>
</tr>
<tr>
<td>US</td>
<td>77%</td>
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</tbody>
</table>

GM cotton occupies about seven million hectares today, accounting for a 20% share in world cultivated cotton crops area. It has the potential to deliver significant benefits on at least half of the world’s 31.0 million hectares of cotton with medium to high insect pest levels.
RISING THE COTTON: TECHNIQUE

Cotton plant’s leaves look like maple leaves and flowers look very much like pink mallow flowers that grow in swampy areas. They are connections and belong in the same plant family. Cotton is grown in about 80 countries, in a band that spread out around the world between latitudes 45 North to 30 South. For a good crop of cotton a long, sunny growing season with at least 160 frosts - free days and ample water are required. Well-drained, crumbly soils that can remain moisture well are the best. In most regions extra water must be supplied by irrigation. Because of it’s long growing season it is best to plant early but not before the sun has warmed the soil enough. Seedlings appear about 5 days after planting the seeds. Weeds have to be removed because they compete with seedlings for water, light and minerals and also encourage pests and diseases. The first flower buds appear after 5-6 weeks, and another 3-5 weeks these buds become flowers.  

Each flower falls after only 3 days leaving behind a small seed pot, known as a boll. Each boll contains about 30 seeds, and up to 500 000 fibres of cotton. Each fibre grows its full length in 3 weeks and for the following 4-7 weeks each fiber gets thicker as layers of cellulose build up the cell walls. While this is happening the boll matures and in about 10 weeks after flowering is splits open. The raw cotton fibres split open out to dry in the sun.

As they lose water and die, each fibre fall down into what looks like a twisted ribbon. Now is time for harvesting. Most cotton is hand - picked. This is the best method of obtaining fully developed cotton because unwanted material, called “trash”, like leaves and the remains of the boll are
left behind. Also the cotton that is too young to harvest is left for a second and third picking. A crop be picked can be picked over a period of two months at the bolls ripen. Countries that are wealthy and where the land is flat enough usually pick cotton with machines - cotton harvesters.

PROPERTIES OF COTTON: $^{3,10}$
No other material is fairly like cotton. It is the most significant of all natural fibres, accounting for half of all the fibres used by the world’s textile industry. Cotton has many qualities that make it the best choice for countless uses. Cotton fibres have a natural twist that makes them so suitable for spinning into a very strong yarn. The ability of water to penetrate right to the core of the fibre makes it easy to remove dirt from the cotton garments, and creases are easily removed by ironing. Cotton fabric is soft and comfortable to wear to skin because of its good moisture absorption qualities. Charges of static electricity do not build up readily on the clothes.

BENEFITS OF COTTON$^{3,4}$
The cotton industry is constantly striving to build up new and improved methods for producing quality products at a reasonable price. The cotton industry continues to look toward the future at further improving their product while providing employment opportunities for millions of people in a variety of related areas. Cotton related job opportunities can be found from the farm where the cotton is produced to the department store where the garments are sold. Cotton supports the dairy industry by providing a source of food for the mills cows. (as a cotton cake) Cotton seed can be processed to produce oil for cooking and blending with food products. Jobs can be found in the trucking and transportation industry as it is often transported
thousands of miles from the cotton gins to the cotton mills, and then again to
the distribution outlets. Transforming the cotton boll through the processes
of delinting and cleaning at the gin to processing at the mill for spinning and
weaving fabric requires a trained labor force. The dying of fabric and the
assembly of clothing and other products can provide employment for many.
High quality papers requiring cotton and paper mills employ thousands
annually. The fashion industry needs trained individuals to select the proper
combination of fabrics and design to market them to the public. The cotton
industry continues to find new and improved uses for cotton worldwide and the
public fuels continuous demand for this important commodity. With cotton
having all these uses and benefits, it has certainly lived up to the name it was
given years ago.... "White Gold".

3.2 TEXTILE INDUSTRY STRUCTURE AND GROWTH

India’s textile industry is one of the largest industry of India. In 2001, the
textile and garment industries accounted for about 4 percent of GDP, 14
percent of industrial output, 18 percent of industrial employment, and 27
percent of export earnings. India’s textile industry is also significant in a
global context, ranking second to China in the production of both cotton
yarn and fabric and fifth in the production of synthetic fibers and yarns. In
contrast to other major textile-producing countries, India’s textile sector is
characterized by mostly small-scale, nonintegrated spinning, weaving, cloth
finishing, and apparel enterprises, many of which use outdated technology.
Some, mostly larger, firms operate in the “organized” sector where firms
must fulfill numerous government labor and tax regulations. Most firms,
however, operate in the small-scale "unorganized" sector where regulations are less stringent and more easily evaded. The unique structure of the Indian textile industry is due to the legacy of tax, labor, and other regulatory policies that have favored small-scale, labor intensive enterprises, while discriminating against larger scale, more capital intensive operations. The structure is also due to the historical orientation towards meeting the needs of India’s predominately low-income domestic consumers, rather than the world market. Policy reforms, which began in the 1980s and continued into the 1990s, have led to significant gains in technical efficiency and international competitiveness, particularly in the spinning sector. However, broad scope remains for additional reforms that could enhance the efficiency and competitiveness of India’s weaving, fabric finishing, and apparel sectors.3,33

POLICIES CREATE FRAGMENTED INDUSTRY STRUCTURE3,33

Unlike other major textile-producing countries, large-scale, vertically-integrated, composite mills that incorporate spinning, weaving, and other operations account for a small and declining share of Indian textile production. Composite mills, which once accounted for 70 percent of domestic textile production, now account for only 3 percent of output as a result of policies that have favored labor intensive, small-scale, unorganized sector enterprises. Although some regulations that differentiate against larger scale operations have been eased since textile reform began with the Textile Policy of 1985, the following past and current regulations continue to shape the structure of the industry:
**Labor Restrictions:** “Organized” sector employers that use manufacturing processes needing power and employ more than 10 people must adhere to wage, employment security, and other regulations. These regulations decrease flexibility and increase wages 50-60 percent relative to the unorganized sector.

**Plant Size Regulations:** Earlier restrictions on loom capacity and the use of automatic looms have recently been lifted. However, they still define the structure and technology stock of the weaving industry.

**Hank Yarn Obligation:** Spinners are required to give a share of their output at fixed prices in the form of manually wound “hank yarn” for the handloom industry, as opposed to machine-wound “cone” yarn. The implicit tax on spinners resulting from this policy has been reduced over time but remains significant.

**Cloth Sales Obligations:** Until recently, composite mills were required to sell a share of their output as coarse cloth at statutory prices. Compliance with this policy significantly damaged the finances of composite mills.

**Discriminatory Excise Taxes:** Until recently, composite mills had to pay excise taxes not applicable to smaller units in the organized and unorganized sector. While all units are now subject to excise taxes, tax avoidance is a common practice for units in the unorganized sector, providing them with a major cost advantage. Excise tax policy also continues to discriminate against manmade and blended products, a policy that prevents firms from adapting to and profiting from consumer demand for manmade products.
STRUCTURE OF INDIA’S TEXTILE INDUSTRY

Unlike other major textile-producing countries, India’s textile industry is comprised mostly of small-scale, nonintegrated spinning, weaving, finishing, and apparel-making enterprises. This distinctive industry structure is primarily a legacy of government policies that have promoted labor-intensive, small-scale operations and discriminated against larger scale firms:

COMPOSITE MILLS
Relatively large-scale mills that integrate spinning, weaving and, sometimes, fabric finishing are common in other major textile-producing countries. In India, however, these types of mills now account for about only 3 percent of output in the textile sector. About 276 composite mills are now operating in India, most owned by the public sector and many deemed financially “unwell.”

SPINNING
Spinning is the process of converting cotton or manmade fiber into yarn to be used for weaving and knitting. Largely due to deregulation beginning in the mid-1980s, spinning is the most consolidated and technically competent sector in India’s textile industry. Average plant size remains small, however, and technology outdated, relative to other major producers. In 2002/03, India’s spinning sector consisted of about 1,146 small-scale independent firms and 1,599 larger scale independent units.
Embroidery Processing
WEAVING AND KNITTING
Weaving and knitting converts cotton, manmade, or blended yams into woven or knitted fabrics. India’s weaving and knitting sector remains highly fragmented, small-scale, and labor-intensive. This sector consists of about 3.9 million handlooms, 380,000 “powerloom” enterprises that operate about 1.7 million looms, and just 137,000 looms in the different composite mills. “Powerlooms” are small firms, with an average loom capacity of four to five owned by independent entrepreneurs or weavers. Modern shuttleless looms account for less than 1 percent of loom capacity.

FABRIC FINISHING
Fabric finishing (also referred to as processing), which includes dyeing, printing, and other cloth preparation earlier to the manufacture of clothing, is also dominated by a large number of independent, smallscale enterprises. Overall, about 2,300 processors are operating in India, together with about 2,100 independent units and 200 units that are integrated with spinning, weaving, or knitting units.

CLOTHING
Apparel is produced by about 77,000 small-scale units classified as domestic manufacturers, manufacturer exporters, and fabricators (subcontractors).

TRENDS IN SPINNING
The spinning industry is the most contemporary and internationally competitive segment of India’s textile industry. Yarn production increased 4.5 percent annually between 1990 and 2004, as rapid gains by independent
spinners more than offset declining production from composite mills. Reflecting trends in domestic demand, the most rapid development has been in the production of blended and 100-percent manmade yams. Between 1990 and 2004, production of manmade and blended yams grew at annual rates of 8.6 percent and 9.1 percent, respectively, compared with 3.2 percent annually for cotton yarn. As a result of this growth, the share of manmade and blended yams in total production grew from 17 percent to 30 percent. The domestic weaving sector absorbed most of the increase in yarn output, although exports became an increasingly important source of growth in yarn demand in the 1990s. Expanding from a small base, yarn exports grew rapidly and peaked at $2.5 billion in 1997. Since 1997, yarn exports have declined because of falling prices and faster growth in domestic weaving, but still average about $1.9 billion annually. Yarn output by the composite mills has declined steadily, as has their share of spinning capacity. By 2003, independent spinning mills accounted for about 75 percent of capacity and 92 percent of production. Capacity use in the cotton-spinning sector averages near 80 percent, with higher rates among the independent spinners. Reflecting production and demand trends, growth in spinning capacity and capacity use has been highest for manmade yams. Between 1990 and 2004, spinning capacity for manmade yams grew about 7 percent annually, while capacity use averaged near 90 percent. The performance of the yarn-spinning industry has been less affected by restrictive labor policies, capacity restrictions, and price controls, largely because it is inherently capital intensive. The modern spinning mills first appeared in response to the Textile Policy of 1985, which removed entry and exit barriers, encouraged the importation of modern machinery, and lowered duties on synthetic raw materials. Since 1985, additional reforms, including the 1991 Industrial
Policy, the 1992 Textile Order, and the 1996 Tax Policy, aided the sector by removing restrictions on domestic and foreign investment, easing industry entry, and reducing tax differentials between cotton and manmade fiber and yarn. Even though the spinning sector now includes a number of technologically advanced spinning mills of recent vintage able to compete on international markets, average plant size and level of modernization remain low by international standards. In addition to the legacy of past policies promoting small-scale, labor-intensive enterprises, a number of policies, including the Hank Yarn Obligation and high excise taxes on manmade fibers, still constrain the sector’s growth and competitiveness.

TRENDS IN WEAVING

In contrast to the spinning sector, the weaving industry remains highly fragmented and small scale and characterized by the use of outdated technology. Growth in fabric output, however, has been strong, with output expanding about 5.5 percent per year between 1990 and 2003. The small-scale, independent powerloom sector, which now accounts for about 78 percent of cloth production, grew about 7 percent annually and the relatively small hosiery sub-sector grew nearly 10 percent annually during this period. Meanwhile, high growth among powerloom and hosiery units offset a 4-percent annual contraction of output from composite mills and the relatively slow 3-percent growth of handloom fabric production. Reflecting trends in spinning and final demand, output of 100-percent manmade (9 percent) and blended cloth (6 percent) led annual growth since 1990, while annual growth in output of 100-percent cotton cloth was only about 0.6 percent. The unorganized powerloom sector filled the void created by the decline of the organized composite mills. The proliferation of powerlooms stemmed
largely from the ability of small-scale operators to avoid or evade government-imposed labor restrictions and excise taxes and, in some cases, payment for electrical power. Over time, however, government regulations, coupled with credit constraints among small-scale operators, led to a sector characterized by the use of obsolete technology and the lack of backward or forward integration with spinning or finishing. India remains internationally competitive in the production and export of low- and medium-quality “grey” (or unfinished) fabrics in relatively small production runs. Between 1990 and 2000, exports of powerloom cotton cloth and “made-ups” (items such as household linens that require minimal manufacturing) grew 27 percent annually in value and became an increasingly important source of final demand and foreign exchange. However, the current small-scale, nonintegrated, low-technology structure is ill-equipped to fight in high-quality markets or to meet the needs of large buyers. In recent years, progressive powerloom operators have upgraded their operations through investment in modern shuttleless looms. Shuttleless looms 70 percent of which are imported into India as second-hand equipment from the United States, Italy, and Japan—produce superior-quality fabric and reduce labor costs by 75 percent, compared with traditional shuttle looms. However, the powerloom sector currently has about only 15,000 shuttleless looms, accounting for less than 1 percent of loom capacity.

TECHNOLOGY UPGRADATION FUND SCHEME (TUFS)
To facilitate needed structural transformation, the Government established TUFS to provide subsidized, low-interest loans (6 percent versus the 12-percent market rate) to buy imported shuttleless looms. However, use of TUFS subsidies within the unorganized sector has been limited largely
because small-scale producers either do not qualify to receive concessional financing under the scheme or recognize the benefits of participating to be less than the costs associated with increased exposure to government taxes and regulations, as well as the possibility of penalties for past evasion (www.fibre2fashion.com, 2003). To encourage additional participation, the Government recently reduced interest rates to 2.5-3.0 percent for investments made by larger cotton-processing units (www.fibre2fashion.com, 2004).

COMPETITIVENESS OF SPINNING AND WEAVING

Yarn and fabric cost of production data for selected major producing countries indicate that India is a highly competitive producer of yarn and unfinished cloth, despite the small-scale, low-technology, and nonintegrated structure of the industry. Based on 2003 data, India is particularly competitive in the production of yarns and fabrics based on both the “Ring” and “Open-ended (O-E)” spinning methods—two standard manufacturing technologies. Ring spinning is an older, relatively labor-intensive method that manufactures a smooth yarn, while the O-E technology produces a less smooth yarn at a faster speed with less labor intensity. India’s cost advantages stem from its comparatively low costs of labor and raw materials, as well as low wastage. These advantages are partially offset by relatively high power costs. Compared with China, India’s most important competitor, India has significantly lower raw material and wastage costs and similar labor costs but higher costs of power and capital. The cost competitiveness of the Indian spinning and weaving industries, even with the current scale and state of technology, suggests that India will continue to be
a highly competitive global player. Access to low-priced supplies of domestically produced cotton appears to be a significant advantage currently not matched by other key countries with competitive labor costs, including China and Brazil. Advantages in raw material and labor costs provide a foundation for India to maintain and even increase competitiveness, especially if complemented with investments to improve technology, scale, integration, and quality.  

HANDLOOMS

The heavily protected handloom sector is growing much more slowly (about 3 percent annually) than the powerloom and hosiery sectors but still accounts for about 13 percent of cloth output. Handlooms, which are highly labor intensive and viewed as a source of employment and supplementary income for 6-7 million people in over 3 million weaver households, will likely carry on to receive preferential policy treatment (The World Bank; Kathuria and Bhardwaj). The Government provides handloom operations with tax exemptions, low-interest loans, and rebates on fabrics sold through cooperatives, and also “reserves” exclusive rights for handloom operators to produce 11 items, such as non-terry towels and some varieties of bed sheets (rediff.com). In addition, through the Hank Yarn Obligation, handloom operators receive a subsidy on inputs of cotton yarn from the organized spinners.

FABRIC FINISHING

As in the weaving sector, most fabric finishing, or processing, is carried out by small-scale, nonintegrated firms in the unorganized sector using outmoded technology. Only about 200 of the roughly 2,300 processors are integrated
with weavers or apparel firms. The current structure allows India to be competitive in the production and export of “grey” fabrics and relatively small lots of medium-quality finished textiles, but not in supplying high-quality product or in meeting the needs of large international buyers. Tough environmental standards, in addition to the tax and power cost benefits that small-scale finishers receive, have affected modernization in the cloth-finishing sector. Fabric finishing involves use of dyes and chemicals that are hazardous pollutants unless properly treated. In some areas, including the intensive textile zone in Tamil Nadu, regulations that include zero or very low emission tolerances discourage the entry of modern, largescale firms and boost incentives for finishers to remain in the unorganized sector and outside the regulatory net.33

APPAREL MANUFACTURING
The apparel sector, like weaving and finishing, is characterized by a huge number of independent, small-scale firms. While it is not unusual for apparel manufacturing to be both relatively small-scale and independent from the upstream segments of the textile supply chain, India’s apparel firms tend to be smaller and more labor intensive than other major exporters. Unlike the other segments of the textile industry, the apparel sector is relatively new because, traditionally, local tailors made in the home or on a custom basis most Indian garments. One study found that about 93 percent of the apparel firms that existed in 1990 did not exist before 1980 (Tait). The small-scale nature of India’s apparel industry has been shaped directly by policies that, until removed in 2001 and 2002, restricted woven and knitted apparel firms to the small-scale-industry (SSI) sector. In 1999, the apparel sector was made up of about 58,000 firms, of which about 48,000 produced woven
products and 10,000 produced knitted products (Hashim). Only 6 percent of firms operate with more than 50 machines, and more than 80 percent operate with less than 20 machines. While some firms produce exclusively for either the domestic or export market, most are “fabricators,” or independent contract producers, that produce for both markets. Even export-oriented manufacturers are small by international standards. According to a 2002 study, the average Indian garment exporter had about 119 machines, compared with 698 in Hong Kong and 605 in China. Because of the predominance of very small-scale fabricators in the apparel sector, most apparel is produced on a contractual basis for large manufacturers/ exporters. The fabricators specialize in low-wage, labor-intensive sewing and have the flexibility to meet small custom orders but are much less competitive with large orders and those typically involving high levels of automation. It is not clear if the current structure of the Indian industry, with many small-scale firms that are not suited to meeting the needs of large international buyers in a timely manner, will remain competitive in the post-MFA world.\(^3\)\(^3\)

Indian apparel producers are increasingly aware of emerging challenges and opportunities. Some firms, including a number of the largest firms in the textile business, are increasing investment in larger scale apparel enterprises, as well as in integrated operations involving some combination of spinning, weaving, finishing, and apparel making. But domestic and foreign direct investments to build capacity and strengthen competitiveness in the apparel sector have been small, compared with investments in some other countries, particularly China.\(^3\)\(^3\)
POLICY DEVELOPMENTS AND PRIVATE-SECTOR INITIATIVES
India has moved more leisurely than other key textile exporters, most notably China, to restructure government policy and boost private investment to compete more effectively in post-MFA markets. In spite of the numerous post-1985 reforms in the textile sector and except for modernization in the spinning sector, India’s industry structure, technology use, and global export market share have changed little. The policy environment, particularly high rates of excise taxation, continues to favor small-scale firms in the unorganized sector that face less regulation and can avoid taxation. A number of Indian companies have recently been investing in larger scale operations that use modern technology, but the pace has been slow, compared with that of China and some other countries. Data on trade in textile machinery indicate the level and pace of investment in upgrading spinning, weaving, and processing technology. During 1992-2002, China’s imports of textile machinery accounted for about 25 percent of world trade in textile machinery and far outpaced those of India and other major developing-country textile exporters. During this period, India’s imports of textile machinery averaged about one-fifth of China’s, with no upward trend. However, a number of policy and private investment trends, including the increasing interest shown by foreign textile buyers, could affect the pace of domestic investment and industry restructuring.33

EXPORT ZONES AND TECHNOLOGY PARKS
Two government schemes, Apparel Parks for Exports (APE) and the Textile Centers Infrastructure Development Scheme (TCIDS), now provide firms with incentives to establish themselves in apparel export zones. Economies can be achieved in these zones with the formation of geographic clusters of
textile firms specializing in the various aspects of production. To encourage development of export parks, the Government exempts firms from various labor regulations and provides them with concessions on land purchases, credit, and taxes. Although established long before the introduction of the APE scheme, one such geographic cluster in Tirapur, Tamil Nadu, has captured scale economies that have enhanced India’s competitiveness in knitwear. Tirapur now supplies 35-40 percent of India’s knitwear exports and has helped India achieve a dominant position in this export market (www.fibre2fashion.com, 2003b).

ELIMINATION OF SMALL-SCALE INDUSTRY RESERVATION FOR APPAREL MANUFACTURING

The removal of the SSI reservation for the woven apparel business in 2001 and for knitted apparel in 2002 could significantly affect India’s clothing sector. In a related move in 2002, the Government also removed a regulation that limited clothing exports to firms that exported at least half of their output, opening exports to all apparel firms. These reforms allow the formation of larger scale firms and allow investment in the more capital-intensive production systems used to produce some apparel items.

EXCISE TAX REFORM

The Government has made limited progress in recent years in reducing the high level of excise taxation in the textile sector—levels that discourage formation of larger, organized-sector firms—and in reducing the tax bias against use of synthetic fibers. In 2003, the Government equalized excise taxes for large- and small-scale yarn producers. The Government has also revitalized the Central Value Added Tax (CENVAT) scheme that will level
the playing field by unifying an assortment of state-level schemes and assessing taxes—including excise taxes—on intermediate and final products based on value addition along the supply chain. Implementation of the CENVAT is, however, facing stiff resistance because it requires states to conform with one scheme, and because it will require firms operating in the unorganized sector to shift to the organized sector and report their activities in order to receive CENVAT refunds on the inputs they purchase. The CENVAT, along with the Government's 2003/04 decision to equalize excise taxes on large- and smallscale yarn producers, could significantly affect industry structure. But it is unclear how effectively either one of these reforms will be implemented. Excise taxes have recently been reduced on some manmade products, but taxes on products made of synthetic fiber remain considerably higher than for those made from cotton. In the 2004-05 budget, the Government reduced the CENVAT rates for products made of pure cotton to 4 percent and the rate for products made of blended fibers to 8 percent. However, while the tax on polyester filament yarn fell from 24 to 16 percent, taxes on all other manmade filament fiber and yarn were raised from 12 to 16 percent.3.33

3.3 ROLE OF THE FOREIGN FIRMS IN DEVELOPING INDIA'S GARMENT EXPORTS3.33

Today, the world clothing market is dominated by buyer-driven commodity chains. Two important aspects are as under;

1. Large retailers and branded marketers play pivotal roles along global supply chains by setting up decentralized production networks linked to countries in the developing world and by coordinating the variety of activities involved in clothing design, production, and marketing. Many of
these firms are interested in creating larger scale operations located in fewer countries than was necessary before removal of bilateral quotas. So far, China has been the supplier of choice as the industry has begun adjusting to the post-MFA environment. But, international firms are also increasingly interested in India as a source of supply, both to reduce risk through diversification and because of the growing perception of India as a competitive clothing supplier with domestic sources of fabric.

2. Interest in India has intensified due to the removal of MFA quota constraints. Large global retailers, such as Wal-Mart, J.C Penney, The Gap, Ikea (Sweden), Cades (France), OTTO (Germany), and branded marketers, such as Calvin Klein, Lacoste, and Sara Lee, are attracted to India because of its potential to provide one-stop shopping. Wal-Mart has expressed willingness to buy goods worth $7-$10 billion from India over the next 2 years provided local companies assure quality products, make timely delivery, and offer competitive prices (www.fibre2fashion.com, 2004). J.C. Penney also plans to make India an important sourcing hub for apparel. (www.fibre2fashion.com, 2004).

FOREIGN DIRECT INVESTMENT CONSTRAINTS
India has relaxed many restrictions on private foreign investment, both economy wide and in the textile sector, within the last decade. The Government removed a 49-percent cap on foreign ownership of individual firms in the weaving sector in 2001, although a 24-percent cap on foreign investment in apparel-sector firms remains in effect. Total inflows of foreign direct investment (FDI) for all sectors have increased in reply to the economic reforms begun in the early 1990s, averaging about $4 billion
annually during 2002-04, but FDI remains small relative to domestic investment. Moreover, since 1991, the textile sector has accounted for only about 1 percent FDI inflows in India (Government of India, 2004a). According to a World Bank survey, bureaucracy and multiplicity of regulations are seen as major impediments to FDI in both the textile sector and other areas of India’s economy (Government of India, 2005).

**LABOR REFORM**

Indian labor policies are cited by Indian companies as a principal constraint on firm size, industry investment, and international competitiveness. These policies include minimum-wage requirements and rules that prevent firms larger than 100 employees from laying off workers. Because of these policies, a number of public- and private-sector composite mills that have not operated since the 1980s are still obligated to financially support the workers they employed. As a result, it is not uncommon for larger firms to organize into small-scale units for the purpose of avoiding labor regulations. Although private industry has tried repeatedly to change these policies, primarily by raising the employment level at which the regulations apply, labor reforms have proven politically difficult to achieve. The current government has proposed that state governments be permitted to substantially ease labor regulations for firms operating in export zones, but this controversial legislation is still pending.

**3.4 MANUFACTURING TECHNOLOGY AND ECOLOGY**

The economic and human cost of industrial degradation of the environment has been a major impetus for developing technology and policies to mitigate the environmental force of textile processing. “Environmental concerns
have long been a major topic and expenditure for the textile industry. American and European producers are confronted with an ever expanding set of regulations Exerting additional pressures, the recent amendment by the U.S. congress of The clean Air Act being the latest example” (Fulmer 1992). 

Fleckenstein (1992), speaking of the European situation, says that the alleviation Of environmental pollution in textile finishing will need the avoidance of Consumables, recycling of chemicals, heat energy, and packaging materials, and utilization of sewage sludge. He notes however, that chemistry is neutral and that risks arise only when it is not controlled. Additionally, policy makers need to be aware of the international nature of the industry so that neither trade competitiveness nor the attainment of environmental objectives is jeopardized.

Basically, ecology should be a associate in the textile chain, not an opponent. For the production of eco-amenable clothing, there [are] a number of requirements: No ecologically harmful additives, a minimum of unbonded chemicals, exclusion of chloro-chemicals, no injurious dyestuffs, no residues of pesticides, scavenge oils, etc., fewer formaldehydes, heavy metals, and bonded halogens, savings in energy, water, and chemicals” (“Ecology in the Textile Chain” 1992).

Other indications that environmental concerns are playing an increasingly important role in the textile industry include the title of the Conference of the Textile Institute finishing Group, “Are Textiles Finishing the Environment?” and the new publication Ecostyle, from the trend forecasting

Some characteristics of the textile industry, such as its high volume use of water, its tendency to focus geographically, and its use of some toxic materials for processing have historically made it necessary to constantly address problems such as workplace air quality and effluent disposal through research. Among the practices and technologies adopted by finishers to minimize water, power, dyestuff, and chemical waste are: 3.2

- Regular maintenance of drying equipment
- Drying ovens that capture and re-circulate air
- Low wet add-on techniques such as low liquor ratio dyeing and vacuum extraction
- Thermo flush after treatment of fiber reactive dyeing Pad batch dyeing
- Wet scrubbers, heat exchange filtration, and incineration to clean stack exhaust
- Ultra filtration for recovery of chemicals
- New dyes and auxiliary chemicals that are environmentally benign (Fulmer 1992)
- Electrochemical processing for wastewater color reduction and reuse capability (Kennedy 1992)
- Shell and tube heat exchangers to recover more heat and reduce energy consumption (ATI Other innovative ideas practiced by some textile companies include the following:

- Donating nitrogen-rich textile waste sludge to area farmers.
• Converting oil tank-contaminated soil into bricks.
• Developing an on-site lagoon system containing waste-eating microbes.
• Refusal of business if production processes are not environmentally sound.
• Conducting R & D on waste minimization and environmental technology recycling of size materials.
• Donating seaming clips and other leftover materials to a government-funded organization that provides a workplace for the handicapped which sells the materials to be recycled into carpet backing.

PROCESSING OF COTTON:
Raw cotton is ginned (impurities removed) and pressed in bales (of 170 kg each) for supply to mills where it is fed into the blow room and is blown into loose form. The loose cotton is passed through a roller to form cotton layers or laps. The laps are taken through carding/combing process where short fibers are removed and cotton is converted into a loose fibrous rope (called sliver). The silvers are stretched through roving machines and further twisted, strengthened and drawn in ring frame (spindles) to form yarn. The yarn can be packed on cone winders or on reeling machines. The final packing is called hank yarn used by handloom operators. Cotton/blended yarn is woven into fabric on looms, which can be automatic (in the organized sector) or hand/power operated mechanical looms in the unorganized sector. The woven fabric is dyed, processed and finished to make the final cloth. Due to insular government policies, there exists a big unorganized sector for textile production, consisting of khadi, cottage industries, handloom, etc.
Two basic technologies are being used in the cotton textile industry: mechanical processing for the conversion of fiber into yarn and yarn into gray cloth and chemical processing for transferring gray fabrics into finished fabrics.

Two spinning technologies – ring spinning and rotor (open end – OE) spinning – are popular. Ring spinning uses a slightly longer process. It gives a softer finish to the yarn and is versatile in spinning yarns of different counts. The basic technology of ring spinning has stayed almost unchanged for almost a century, though evolutionary developments leading to higher speeds and better quality have taken place in the past two decades.\textsuperscript{3,53}

Though invented earlier, OE (open end) spinning became popular since the 1970s. More than 10% of world yarn is currently produced through this technology. OE yarns. Using a shorter process series, have a somewhat harsher handle. The yarn feel and techno-economic factors have meant that OE is largely adopted for coarser counts; i.e., counts below 20s. OE can also handle short fibers and cotton waste. Indian mills have in fact used OE extensively as a waste spinning technology.\textsuperscript{3,53}

Since cotton is a natural fiber, a single cotton ball can have fibers of uneven lengths. Even the same variety of cotton grown in the same field would have fibers of varying lengths. In addition, it would contain some foreign matter like broken leaves, seeds and dust since it is a field –grown crop. The spinning of quality yarn involves two steps.\textsuperscript{3,52}
The lint has to be cleaned and the fibers have to be made of relatively uniform length.

The fibers have to be oriented in the same direction.

The fiber mass has to be converted into a strand of similarly oriented fibers with the optimum mechanical force so that it can be easily drawn out and twisted to form a continuous yarn strand without rupturing the fibers in the process. To achieve this, sheets of fiber are slowly drawn out and twisted to form a continuous yarn strand without rupturing the fibers in the process. To achieve this, sheets of fiber are gradually drawn out over 2 or 3 stages into a decreasing mass of fibers per unit length.  

The preparatory spinning process is designed to achieve these objectives. In this process it generates waste that can either be foreign matter or short fibers. These short fibers are taken out, as they are unsuitable for spinning finer yarn. Normally, such extracted fibers constitute about 5% in carded yarns and 15% to 20% in combed yarns.  

Such waste fibers can however be processed, made uniform and converted into waste yarn. OE technology is more adept in this area. Though these yarns are weak, they are fairly workable for handloom products like “dhurries” and “chaddars”. OE spinning has been adopted for superior coarse count spinning only in the last 5 years with the emergence of denim weaving and furnishing fabric weaving for export.
3.5 SUBSTITUTIONS IN TEXTILES FOR COTTON INDUSTRY: GREEN COTTON:

Green cotton that is being marketed quite heavily at the moment e.g. Tesco’s “Good Goods” range made with Novotex Yarn. Green cotton does not mean Organic cotton it just has a few Organic cotton content. In case of Novotex just 10%. Novotex (whose Green Cotton products are distributed in the U.S. by Ardent Ltd.) has a holistic business philosophy that takes into account the total manufacturing process so that (1) the environment remains clean, (2) consumers gets better quality products, and (3) workers have better working conditions.\(^3\,14\)

Toward these ends, Novotex not only uses organic cotton, it also equips its plants with humidifiers and its knitting machines with vacuums to reduce cotton dust. Ventilators and sound absorbing techniques also improve working conditions in the mills. In addition, hydrogen peroxide rather than chloride is used for bleaching and biodegradable scourers and water soluble, nonmetallic dyes are used for finishing. The use of a “zed” spinning process allows the mills to inject hot water with high speed jets to “blow up” the fabric and then mechanically shrink it with heat so that it has more loft. Novotex uses some muted natural vegetable dyes but they are only 2 to 3% effective with the rest being waste; however, Novotex’s state-of-the-art, high-tech effluent system is able to use high color dyes and securely return water to the ecosystem as pure as it was withdrawn (Spruance 1992).\(^3\,14\)
The characteristics and uses of different fibers are given below.

<table>
<thead>
<tr>
<th>NATURAL FIBERS</th>
<th>Characteristics</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>Strong, absorbent, comfortable, and versatile. Wrinkle easily. May shrink unless treated. Sensitive to mildew to and to silverfish.</td>
<td>Blouses, dresses, shirts, sportswear, underwear, diapers, towels, curtains, and upholstery. Found in fabrics such as broadcloth, poplin, terry, corduroy, seersucker, and denim. Found in fabric blends with manmade and other natural fibers.</td>
</tr>
<tr>
<td>Silk</td>
<td>Strong, absorbent, soft, and lightweight. Resists soil and wrinkling. Sensitive to perspiration, moths, and beetles. Some silks may water spot.</td>
<td>Blouses, dresses, suits, scarves, and lingerie. Found in fabrics such as crepe, brocade, satin, and taffeta.</td>
</tr>
<tr>
<td>Wool</td>
<td>A natural insulator, can be easily molded and shaped, absorbent, resilient, and wrinkle-resistant. Sensitive to mildew, moths, and beetles.</td>
<td>Sweaters, socks, sportswear, dresses, suits, blankets, and carpets. Found in light-, medium-, and heavy-weight, woven, nonwoven, and knit fabrics.</td>
</tr>
</tbody>
</table>

MAN-MADE FIBERS |
<table>
<thead>
<tr>
<th>Textile</th>
<th>Properties</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetate</td>
<td>Silk-like, soft, and drapable. Relatively fast drying. Shrink and moth resistant. Sensitive to heat, silverfish, mildew, and acetone (nail polish remover).</td>
<td>Blouses, dresses, foundation garments, lingerie, linings, shirts, slacks, and sportswear. Found in fabrics such as brocade, crepe, double knit.</td>
</tr>
<tr>
<td>Estron</td>
<td>Knit, faille, jersey, lace, satin, taffeta, tricot, and in blends with other man-made fibers.</td>
<td></td>
</tr>
<tr>
<td>Acrylic</td>
<td>Soft, warm, bulky properties resembling wool. Retains shape, dries quickly, and is wrinkle-resistant. Resists sunlight, mildew, and insects. Sometimes has the tendency to pill. Sensitive to heat.</td>
<td>Dresses, infant wear, knitted garments, skirts, ski wear, socks, sportswear, sweaters, and work clothes. Found in fabrics such as fleece, pile, simulated fur, sweater knit, and in blends with natural and other man-made fibers.</td>
</tr>
<tr>
<td>Aramid</td>
<td>Highly flame-resistant, high strength, and maintains shape.</td>
<td>Protective clothing, military helmets, bulletproof vests, and applications where fire-resistance is important.</td>
</tr>
<tr>
<td>Modacrylic</td>
<td>Soft, resilient, quick-drying, and flame-resistant. Resists mildew and moths. Sensitive to heat and acetone (nail polish remover), collects static electricity, may pill excessively, and is nonabsorbent.</td>
<td>Children’s sleepwear, blankets, deep-pile coats, linings, simulated fur, wigs, and hair pieces. Found in industrial, deep-pile, fleece, and fur-like fabrics.</td>
</tr>
</tbody>
</table>

Trademark names: Airloft, Celebrate, Chromspum, Chromspum, Zefran, Acrilan, Creslan, OrloRemember, Kevlar, Nomex.
| **Nylon** | Exceptionally strong and durable. Abrasion resistant, retains shape, and is resistant to moths and mildew. Absorbs and holds body oils, collects static electricity, tends to yellow, may pill, and has low moisture absorbency. Sensitive to some insects (ants, crickets, and roaches). | Blouses, dresses, foundation garments, hosiery, lingerie, underwear, raincoats, ski and snow apparel, suits, windbreakers, bedspreads, curtains, and upholstery. Found in a range of woven and knitted fabrics. Also found in blends with natural and other man-made fibers. |
| **Trademark names:** Anso, Antron, Cantrece, Shareen, Tolaram, Zafran |
| **Olefin** | Strong, lightweight, comfortable, and good insulator. Abrasion-resistant and quick-drying. Resistant to mildew, insects, soils, and stains. Sensitive to heat, and may pill. | Pantyhose, underwear, knitted sportswear, hosiery, sweaters, upholstery, and hunting apparel. Found in industrial apparel and home furnishing fabrics. |
| **Trademark names:** Avtex, Herculon, Marvess, Spectra, Tolaram |
| **PBI** | Highly flame-resistant and comfortable | Suitable for high performance, protective apparel such as fireman’s coats, astronaut’s space suits, and applications where fire-resistance is important. |
| **Trademark names:** PBI, Arozole |
| **Polyester** | Strong and resists wrinkling, abrasion, shrinking, stretching, and mildew. Generally insect-resistant. Collects static electricity, sensitive to heat, absorbs and holds body oils, and may pill. | Blouses, shirts, dresses, children’s wear, hosiery, insulated garments, ties, lingerie, underwear, permanent pres garments, slacks, and suits. Found in a range of woven and knitted fabrics. Also found in blends with natural and other man-made fibers. |
| **Trademark names:** Dacron, Fortrel, Kodel, Silky Touch, Trevira |
### APPLICATION AREAS OF THE PRODUCT

One traditional segmentation of the cotton textile is woven textiles and nonwoven textiles. Products included in the previous group are generally made from cotton that is of higher quality in terms of staple length and micronaire, since this fiber must be spun in the production process.\(^3\)\(^{21}\)

The later category includes products, which are made without the spinning process and therefore require less fiber strength and length. Overall, the
growth in demand for nonwoven textiles appears to be the more vigorous of the two. Projections are for this segment of the market to grow by approximately five percent per year in the near future. However, cotton is not among the primary fibers used in most nonwoven consumer products so the increases in cotton fiber demand from this part of the market should be considered much lower than five percent.\textsuperscript{3,21}

The problem of changes in traditional methods of textile product manufacture is an old one as it results from the 19\textsuperscript{th} century patents taking into consideration a possibility of making textile products by using gluing agents without spinning, weaving or knitting. The term non-woven has been broadly used since 1955. Jute and other best fibers are used to produce cheap blankets. Now needle looms produce blankets and floor coverings, filtration, horticultural and geo-textile products. Nowadays the most frequent raw material to manufacture non-woven textiles are viscose and natural lignocelluloses fibers.\textsuperscript{3,60}

As the supply of raw cotton fiber increases, the price will clearly fall unless there are surges in demand that are of similar magnitude. Hence, from a producer’s perspective, finding new markets and growing current markets will be a continuing requirement in avoiding large price drops. One observation becomes clear at this point. If we look at the potential market for products made from organic cotton fiber, the demand for raw fiber will obviously hinge on both the volume of final product sold as well as the amount of raw cotton utilized in the final products, the latter being particularly important.
Select group of final products that are relatively similar and use a large amount of raw (conventional) cotton. The likeness that is important is the fact that the sales of these products are not as strongly linked to design fashion and print patterns than other products such as women's shirts and blouses or upholstery cloth.\textsuperscript{3.49}

From this data, one can estimate the volume of cotton in each type of product and identify the products that will generate the most demand for raw fiber. As a group, producers should promote the use of their fiber in products that contain a large amount of fiber as well as those products that sell a large volume of items.

The costs of raw fiber in the various end products at four hypothetical prices to illustrate the fact that because raw cotton makes up a small part of the costs of a final product, the prices of final products need not vary as much as the prices of raw fiber. The data point out that men's/boys' shirts and trousers make up the two most important classes of goods in terms of creating demand for raw cotton. Towels comprise the third largest market, followed by drapery, upholstery, and slip covers, which rank fourth, and women's/juniors' pants, which rank fifth.\textsuperscript{3.49}
### Table: Cotton Content and Value of Raw Cotton in Various End Use Products

<table>
<thead>
<tr>
<th>Product</th>
<th>Pounds Per Unit</th>
<th>Value of Raw Cotton Per Piece</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$.55/lb</td>
</tr>
<tr>
<td>Men's Knit Sport Shirts</td>
<td>0.475</td>
<td>0.26</td>
</tr>
<tr>
<td>Men's Knit Sweat Shirts</td>
<td>0.52</td>
<td>0.29</td>
</tr>
<tr>
<td>Men's Jeans &amp; Dungarees</td>
<td>2.098</td>
<td>1.15</td>
</tr>
<tr>
<td>Terry Towels</td>
<td>0.619</td>
<td>0.34</td>
</tr>
<tr>
<td>Terry Washcloths</td>
<td>0.114</td>
<td>0.06</td>
</tr>
<tr>
<td>Women's Jeans &amp; Dungarees</td>
<td>1.832</td>
<td>1.01</td>
</tr>
<tr>
<td>Men's T-Shirt Sheets</td>
<td>0.303</td>
<td>0.17</td>
</tr>
<tr>
<td>Women's Sheets</td>
<td>1</td>
<td>0.56</td>
</tr>
<tr>
<td>Crib Sheets</td>
<td>0.466</td>
<td>0.26</td>
</tr>
</tbody>
</table>


The data in the table can be used to illustrate a few key points. First, the data show that the price of most textile products is not very greatly dependent on the costs of raw cotton fiber. Although the comparative prices paid by individual manufactures are important to their competitive position in the
market, the overall prices of finished goods should not vary a considerable amount when the price of raw cotton changes.

Therefore, as the manufacturing process for organic cotton textiles becomes more developed and as manufacturers are able to lengthen their production, the price premium of consumer products should fall significantly. Said another way, the price premium on final goods can fall even if there is still a relatively large premium for the raw organic cotton lint. This relationship indicates that research targeting the manufacturing stage will be very important in narrowing the price gap between organic and conventional cotton fabrics.³³⁵

Second, the data show the average quantity of cotton that is being used in specific products. A casual observation of the market for organic cotton textiles will show that many of the principal products being produced are those with relatively little fiber content. In particular, T-shirts (one of the main items being produced with organic cotton) contain on average only one-third of a pound of cotton lint. As the supply of raw cotton boost, if there is a shift in production toward products such as sheets, towels, and men's and women's pants and dungarees, the supply of fiber can be absorbed by the market for a longer time without the need for much of a change in the prices that are paid for the fiber.³³⁵

If final goods production remains concentrated in products that use a small amount of fiber, price rivalry will begin at an earlier stage. This implies a strategy for fiber producers to begin to push for the use of their fiber in a
broader range of products, concentrating on those products that have higher fiber content.

### 3.7 PRODUCT DEVELOPMENT AND MARKETING ORGANIC COTTON

Processing Niche cotton: Naturally colored cotton tends to be shorter and weaker, it might be blended with white cotton to bring it up to par for commercial spinning and weaving. Also, because the pool from which the colored cotton blend is made is smaller than a typical white cotton blend, color consistency is more hard to achieve. In addition, colored cotton exhibits variation in shade from year to year and region to region, due to differences in climate and soil content. For example, some browns are redder than others and some greens are bluer than others.\(^3\)\(^1\)

While clothing crops pollute the environment, adopting healthier alternatives is a solution:

When you hear the term “organic,” odds are that you’ll probably think of food rather than clothing. However, the cultivation of natural fibres – cotton in particular – is arguably the most pesticide-intensive sector of the agricultural industry. Conventional cotton farming is accountable for 10 percent of pesticide use and 25 percent of insecticide use worldwide, due to the crop’s need for defense against a host of natural enemies, including the destructive boll weevil, The cotton bollworm, and the aphid.\(^3\)\(^3\)\(^7\)

The organic fibre market is growing, but not as quickly as organic foods, which have found their way from a few isolated shops to mainstream supermarkets within the past couple of years. Finding retailers of organic
cotton, wool, or flax linen in the Lower Mainland still needs considerable efforts. This disparity between the availability of organic fibres and organic foods is likely due to the fact that the connection between the field and the final product is far less tangible for fibres; after all, processed cotton fabrics look virtually nothing like the harvested raw crop. It's also much easier to overlook or trivialize the use of chemical agents on fibre fields simply because we don't have to worry about ingesting them, although that is in itself a misguided perception. In fact, cottonseed and linseed oils are used often in processed foods, in addition to soaps and other beauty products and cotton gin by products are used as animal feed. What's sprayed on the fibre fields does eventually end up in the food we eat. 3.37

Evidently, however, the concern over organic versus conventionally grown fibres lies not in the potential of toxic residues in the final consumer products. Rather, it's in the ecological impact of synthetic pesticides and fertilizers being introduced into the environment. There are, of course, the obvious consequences of pesticide use: death to wildlife and illnesses ranging from respiratory and skin problems to infertility and cancers in farm workers and local residents. Beyond these effects, however, the abuse of chemical insecticides on cotton and flax fields has on several occasions ironically led to the very consequence the chemicals were trying to prevent. 3.37

For instance, throughout the United States and in Nicaragua, the use of insecticides in an effort to eradicate the boll weevil inadvertently eliminated a number of species of beneficial insects, which help to keep the number of pests under check. This led to an explosion in the population of pests
generally considered more minor, including the aphid, which ravaged cotton and many food crops. In Uzbekistan, careless irrigation and fertilization have left once thriving cotton and linen fields completely barren, and incapable of supporting crops of any kind.\(^3\)\(^{37}\)

Cotton production is one of the heaviest users of synthetic chemicals on the national level. Conventional cotton production generally uses synthetic chemicals for fertilization, insect and weed control, and defoliation at the end of the growing season, and regulating plant development to obtain plant uniformity. Areas favorable to organic production are those with little weed or insect pressure, readily available alternatives to synthetic fertilizer, and natural processes to regulate growth and kill and defoliate plants. In addition, cotton has a relatively long growing season, making this a very restrictive set of requirements.

To cut down on the amounts of herbicides, insecticides, and fertilizers used, many conventional cotton farmers have turned to transgenic cotton. As a consequence, an estimated 50 per cent of North American cotton is genetically modified, which is just as unacceptable an alternative as pesticide-sprayed fibres to most organically minded consumers.\(^3\)\(^{37}\)

Certified organic farms can neither use GMOs nor synthetic chemical agents. Organic cotton and linen farmers are forced to rely on crop rotations and legume cover crops such as fava beans to enrich the soil with nitrogen, and on distraction crops such as corn to attract pests away from the developing cotton and linen. Organic cultivators have to weed their fields manually, use manure as fertilizer, and make use of beneficial insects such
as the ladybug or Catolaccus grandus to control aphid and weevil populations. Despite these measures, their final yields are still generally lower than conventionally cultivated cotton fields, due to the added investment of land and labour resources.  

Following harvest, the organic crop is processed separately from conventionally grown fibres, to avoid contamination. The machines used to gin, clean and spin cotton have to be entirely cleaned out before organic cotton have be sent through, and this added effort, compounded with decreased yields, translates to added costs for the consumer, which is not unfamiliar to most shoppers who buy organic. The increase, however, is only slight. At Mountain Equipment co-op, for instance, a 100 percent organic t-shirt is available for a mere $13.

Organic and naturally colored cottons have emerged in the natural fibers market to fill a small, consumer-driven niche whose durability seems assured by the major shift in values represented by environmentalism. More farmers are beginning to devote acreage to Niche Cottons, attracted by the premium price they receive, the potential to lower input costs, and the opportunity to avoid environmental and health hazards through the decrease or elimination of synthetic agrochemicals.

Textile manufacturers can use their experience with processing niche cottons according to their customers’ specifications as an opportunity to conduct research and to develop processes and products that are less costly and more environmentally benign, allowing them to avoid increasingly stringent regulations. Wholesale and retail companies have found that consumers of
niche cotton products are willing to pay a certain premium and that they hold companies responsible for the environmental integrity as well as the quality of the products. Sales continue to increase as domestic and overseas demand grows.

Those suffering the most in the organic market, then, are the cultivators in the midst of converting their farms from conventional to Certified Organic, which entails a lengthy process that ends in certification only after three years. During that transitional period, farmers have to bear the burden of losing a substantial part of their investment, since they are forced to farm organically, but can only sell their products at the lower prices of conventional crops. The key to encouraging more farmers to turn organic might be to generate a niche market of transitional cotton and linen, and to steer consumption towards garments made from a blend of organic and conventional fibers.

Yet, even when we are prepared to face the additional costs in order to buy organic fibres, finding them presents another roadblock. Despite a handful of large corporations such as Nike and Patagonia committing to blending organic cotton into their merchandise, most manufacturers haven’t followed suit. Although it’s not too hard to buy organic cotton on-line, there appear to be frustratingly few shops retailing organic cotton clothes and accessories in the Lower Mainland. Organic linen is virtually impossible to find, and organic wool, sheared from sheep which have grazed only in chemical-free fields and which haven’t been fed antibiotics, seems the most elusive of all.
Hemp, on the other hand, though politically provocative, is a viable alternative to all three, since it produces high yields and a variety of useful peripheral by-products, including soap, paper and even plastic, with absolutely no help from pesticides or fertilizers. Clothing and accessories produced from industrial THC-free hemp is slowly growing in both popularity and availability.\(^3^3^7\)

Of course, cultivating organic fibres is merely the beginning. The responsibility falls upon the conscientious consumer to follow the chain of production all the way to the final product to make sure that the fiber has been processed in a way that doesn’t undermine all of the effort that went into producing the organic crop. Ethical ginning, spinning and weaving, and environmentally friendly bleaching and dyeing are example of features that a Certified Organic garment might not guarantee.\(^3^3^7\)

However, choosing organic over conventional fibres is a significant first step to cheering environmentally responsible and sustainable agricultural practices that will hopefully see organic fibres move from the fringe to the mainstream much like their edible counterparts.\(^3^3^7\)

### 3.8 THE ENVIRONMENTAL MOVEMENT AND MARKET SEGMENTATION:

Rather than viewing the environmental movement as a threat to current farming practices, some farmers can use it as a way to segment the market for agricultural products and to tailor their output to that market segment. If consumers indicate that organically grown food or fiber is a characteristic deemed important in their consumption decisions, then producers with the
ability to satisfy this demand will be able to target that particular segment of the market.

In general, market segmentation allows producers to obtain a better price for their output. This will be especially true of the initial stages of a product’s life cycle, even for agricultural products. In the cotton industry, taking advantage of the natural characteristics of organic cotton can also help textile manufacturers and growers of raw cotton distinguish their output from much of the low cost imported clothing and cotton fiber. It is the ability to differentiate a product that allows the market segmentation to occur.\textsuperscript{3,15}

Interest in organic cotton clothing and no woven organic cotton products is primarily driven by two segments of the population. The first is a very small group whose demand is based on necessity. This group includes individuals with chemical sensitivities and allergies strong enough to warrant special products with few or no chemical residues. A second group can be characterized as those whose demand is based on choice rather than necessity. This is a much more considerable segment of the market as these are consumers who are changing their buying patterns to emphasize and encourage products that are perceived to be less damaging to the environment. One phrase that has been used to describe this behavior is “voting with your pocketbooks.”\textsuperscript{3,15,344}

This second group will comprise the principal buyers of organic cotton products and represents the consumer group that will drive most of the growth in the organic markets.\textsuperscript{3,15}
In short, the environmental focus of consumers has been around for a long while and appears to have the stamina to continue. The base of consumers with environmental awareness influencing their buying decisions will grow and shrink in direct reply to the degree of public awareness overall. This segment has remained a niche market for several decades and will likely continue as such.

However, because the majority of consumers use the green characteristics to affect only marginal buying decisions, it is clear that the price premium products will play a strong role in the growth of this segment of the market. Based on polling data, the consumer base will enlarge as the price discrepancy becomes smaller because those consumers who are willing to pay a small amount for products that are perceived to be better for the environment will begin to have those products within their acceptable range and will begin to incorporate this characteristic in their buying decisions.  

SUPPLY PROSPECTS:
Several comments can be made about the production of raw fiber. The first and most obvious is that the number of producers of organic cotton fiber will continue to grow. This translates into a greater supply of raw fiber on the market, which will increase the competition among sellers and lower the price of raw organic cotton. Sophisticated forecasting is not required for this prediction; it is a simple characteristic of a market for a new product or in this case a new commodity. Therefore, the early entrants must plan and forecast with an understanding that the large price that currently exists will begin to fall. The supply of consumer products made from organically grown cotton will be strongly influenced by the number of firms that enter
that market segment. Data which might be used to forecast the growth in supply are usual product life cycle, some general comments can be made. There are currently a relatively small number of producers of organic cotton clothing and other products, which is due in part to the limited availability of raw organic cotton fiber. The limited competition in this segment has allowed marketers to charge prices that are relatively high. Although the production of organic cotton clothing is slightly more expensive, it appears to be profitable for firms to sell a relatively small volume, indicating the ability to obtain a premium for these products. Because organic cotton clothing cannot be protected by intellectual property rights such as patents, there will be an increasing number of firms that enter this market segment, and general, more competitors will mean lower markups. The increased price competition will enlarge the market, which is how a larger number of sellers will be able to operate simultaneously. Even if improved consumer awareness of the benefits of organic fiber leads to growth in demand, it is unlikely that this growth will be able to keep pace with the increased supply over an extended period of time to keep the price from falling. This is the typical process that occurs as a product begins to mature. The movement to a mature product will depend crucially on how quickly the supply of raw fiber increases.

DEMAND PROSPECTS:

Forecasting future interest in the environment and the consequential growth of demand for organic products is inherently difficult. However, there are strong signs that the interest in environmental issues and a corresponding demand for products will continue. One traditional segmentation of the cotton textile market is woven textiles and nonwoven textiles. Products
included in the former group are generally made from cotton that is of higher quality in terms of staple length and micronaire, since this fiber must be spun in the manufacturing process. The later category includes products, which are made without the spinning process and therefore require less fiber strength and length. Overall, the growth in demand for nonwoven textiles appears to be the more robust of the two. Projections are for this segment of the market to grow by approximately five percent per year in the near future. However, cotton is not among the primary fibers used in most nonwoven consumer products so the increases in cotton fiber demand from this part of the market should be considered much lower than five percent. The supply of raw cotton fiber increases, the price will clearly fall unless there are surges in demand that are of similar magnitude. Hence, from a producer’s perspective, finding new markets and growing current markets will be a continuing requirement in avoiding large price drops. One observation becomes clear at this point. If we look at the potential market for products made from organic cotton fiber, the demand for raw fiber will obviously hinge on both the volume of final product sold as well as the amount of raw cotton utilized in the final products, the latter being particularly important.

3.9 VALUE CHAIN ACTIVITIES – TEXTILE INDUSTRY FIBER PRODUCTION:

India is the third largest and some of the most diverse cotton producers in the world that makes it the ideal base for the textile industry. Although India has the 2nd largest production base, it ranks 4th in terms of contribution to global cotton fabric exports. Cotton accounts for more than 70% of the total fibre consumption by the textiles industry. This is however, not in line with
the global consumption mix where cotton constitutes less than 40% of all fibres produced. Though India has the world’s biggest area under cultivation, the yield per hectare is around 308 kg/ hectare, which is one of the lowest when compared to high yield countries like Australia, Israel, and China. The reasons for the low yield are monsoon-dependent cotton crops leading to variation in cotton availability and price and also high cotton contamination. These factors have not only contributed to low margins but have also affected the textiles industry adversely.  

SPINNING:
The next in the value chain, spinning, also yields the lowest margins. Yarn spinning in India is dominated by the organized sector, with small-scale industries having only about 7% of the capacity. The spinning capacity in India is the 2nd largest in the world and accounts for 20% of the world spinning capacity. It is also internationally cost competitive and relatively modern, with 35-40% of the spindles less than 10 years field. India is the biggest exporter of spun yarn in the world with a market share of around 25%. India’s cotton yarn exports have grown at a CAGR of 7% during the last three years.  

WEAVING AND KNITTING:
The fabric production industry can be divided into three sectors viz. powerloom, handloom and mill sector. Powerlooms dominate fabric production in India with a 68% share of total fabric production, followed by handlooms with 9% and mills with 5%. Knitted fabrics form 18% of the total fabric production. The decentralized sector accounts for 95% of the total cloth production. The main reasons for the low share of the organized mills
in this segment are the discriminating government policies. Excise duty exemption, subsidized power and availability of cheaper labour helped these unorganized players churn out low cost goods. These goods captured a large segment of the markets for low-value and niche garment export markets. In spite of the presence of large number of looms, 98% of the looms in the unorganized sector have outdated technology and India’s share in shuttleless looms in the world is a minuscule 0.3%.³,3¹

PROCESSING:
Processing is the weakest link in India’s entire textile chain. The processing industry is decentralized with the presence of hand processing units, independent units and composite mill sector. Like weaving, Indian processing facilities are technologically obsoleted and suffer from poor product compared to competitors like China, Pakistan and Bangladesh.³,3²

GARMENTING:
The apparel industry is a fairly large segment accounting for nearly 11% of India’s exports. Till recently, the sector was reserved for SSI (small-scale industry), hence, small-scale fabricators lead the garment-manufacturing sector. Garmenting involves a labour-intensive activity of sewing, which requires skilled labourers. This gives India an unique advantage because of the availability of highly-skilled cheap labour.³,2²

3.10 CHARACTERISTICS OF GLOBAL MARKET
The presence of quota system over the years has led to fragmentation of production process. With the abolition of quotas, the global production and trade is expected to witness a paradigm shift. This will lead to integration of
supply chain to achieve greater consolidation for cost effective production. Vertical specialization as also time to market and tariffs will be the key determinants in deciding the course of the trade beyond MFA. So far as the Indian textile trade and industry is concerned, dismantling of quota will not se result in any automatic growth in exports. Along with opportunities, the new scenario will also bring in challenges in term of not pressure on prices, but also servicing the changing consumer demand in terms of quality, reliability, delivery time, legal compliance, logistics management and after sales services. Fighting growing protectionism will also be a crucial issue to deal with. Growth in preferential trading agreements is also a matter of concern for developing nations. The European Council has been pursuing a policy of growth of the Union towards establishing a Customs Union and a Neighborhood policy, aimed at forming a Euro-Mediterranean trading bloc. This apart, the EU has also amended the anti-dumping provisions to make them more stringent and redefine the standards for GSP benefits. All this may go a long way in reducing the advantages of Indian goods in the European market if appropriate steps are not taken. Similarly, the US is proposing rules of origin so as to promote regionalism, fine tune discriminatory arrangements on the basis of non-trade parameters like environmental safeguards, labour standards and greater compliance requirements. Towards this end, there is need to formulate a comprehensive strategy to leverage our distinct advantages in terms of a highly developed and flexible production system, competitive labour costs, availability of skilled manpower and strong capabilities in certain lines of production requiring design and style. On the other hand, we have to gear up to bring in efficiency in the entire supply chain. The Budget has gone a long way in creating a level playing field for the cotton textile sector. But at the same
time, there is also need to rationalize the duty structure in the manmade segment in order to ensure holistic development. Along with all these measures, there is urgent need to put up suitable infrastructure facility, which is hampering the overall growth. Schemes related to apparel and textile parks have so far been a non starter. The government will have to act as a catalyst, even as the industry is not coming forward to invest in these facilities. Moreover, investors are showing reluctance to invest due to uncertainties in returns. Though transaction costs have come down in the last few years, there is need to bring it further down. 3.61

The following are the main characteristics.

1. Business process optimization:
In order to make the supply chain efficient, collaboration is becoming a necessity. Companies in the automotive and consumer durables sectors have been active on that front for some time; the textile and apparel industry also needs to graduate to the same level of coordinated supply system. Technology has become a major facilitator in information-sharing throughout the supply chain. This benefit could then be passed down the chain. Today, it is anticipated of a supplier to provide all services to the buyer and buyers are willing to pay a premium for full-service packages. Vertically integrated companies are, therefore, likely to benefit. 3.26

2. Improvement through innovation:
Significant growth in revenue will only come from jaw-dropping new products and services. In this respect, the apparel industry contrasts poorly with sectors such as automotive and telecommunications. Apparel has barely changed, except in the area of functionality. Here, durability has improved,
and special washes, finishes and functional features have been introduced. The percentage of income used up on apparel by consumers has been falling over the years. Reversing years of steady margin erosion requires “a truly-novel value proposition” requiring systemic, radical innovation. This can happen by making innovation a part of the corporate culture. Managers need to start thinking about innovation as a business concept in its own right. And remember, the entire company should be driven towards innovation, not just the top management. Some of the current innovations that are taking place are: machine washable wool, biodegradable fibres derived from renewable sources such as corn starch, and the use of lipase enzymes to remove waxes and oils from fabrics. Radical developments are also taking place in the production of “intelligent” garments that can sense the wearer’s physical condition. In conclusion, the biggest potential for eliminating inefficiencies and affecting improvements in the textile value chain lies in collaborating and integrating the supply chain. Every member of the chain should contribute towards making its front end - retail and - more effective. Collaboration between textile and apparel supply chain members will help to realise improved margins and build better delivery systems as far as the retail stage. However, beyond collaboration, the industry needs to perpetuate a culture of innovation and of commercializing that innovation.3.4,3.3.28

3. Creating and preserving value in the textile and apparel supply chain:
Creating and preserving value can help textile and apparel firms become more competitive, and hence gain market share. Value can be created or preserved by either reducing costs or improving products. Reducing costs can help in improving margins. Costs can be reduced through manufacturing
process improvements to increase productivity and business process optimization, through collaboration.

4. Manufacturing process improvement:
There is limited scope for falling manufacturing costs in the spinning, weaving and processing sector. However, production efficiency in apparel factories can be improved to a significant extent by focusing on methods and training of manpower. In apparel manufacturing, focusing on production management, flexibility in operations (to reduce idle time), operator training and implementing standardized industrial engineering practices can help reduce production costs. 3.39

5. International Non–Price forces partly offset influence of decreased prices:
Thus, political and non-price forces in the international cotton market emerge to be overpowering the influence of price movements. A strong U.S. dollar is only one of the factors partly offsetting decreased cotton prices. Foreign government influence on production, textile manufacturing and export and import policies are major factors too. Clearly, export markets are far more unstable than the domestic market year–in, year–out. The “roller coaster” price movements now occurring are the expected results from an export-dependent market. And, with the steady closing of U.S. textile mills, domestic use is headed back toward 5 to 6 million bales consumed for five seasons in the early 1980’s. During those years 13-30% sets asides were used to manage supply, support frame price and to control government program spending. 3.45

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3.11 DRIVING FORCES OF GLOBAL COTTON INDUSTRY

PRICE FACTOR:
The price decrease, since 1996, that followed from more cotton production and increased supply relative to demand, has not been successful in counterbalancing the non-price competition from foreign countries. Further evidence shows that limitations on acreage and increases in market shares occurred at the same time during the 1991 to 1995 seasons.  

THE EU COTTON POLICY REGIME AND THE IMPLICATIONS OF THE PROPOSED CHANGES FOR PRODUCER WELFARE:
A new European Union (EU) policy regime has been announced for cotton for introduction in 2005. The orientation is towards a scheme which includes a mix of coupled and decoupled measures, i.e., a mix of non trade-distorting (green box) and less trade-distorting (blue box) forms of farm support. These measures include a fully decoupled single farm payment (income aid) and an area payment (production aid).

MFA – A PERSPECTIVE:
Global trade in textiles and clothing was governed by these MFA (Multi-Fibre Agreement) prior to 1995. Under this arrangement the developed nations protected their domestic textile industry by imposing quotas on imports from other countries. This was done mainly to thwart competition from cheap imports from the developing nations. The MFA also provided for higher quotas and liberal market access for the least developed countries like Bangladesh and Sri Lanka. In 1995, the ATC (Agreement on Textile Clothing) was signed. This agreement aimed at gradually phasing out the
MFA over a decade culminating in the total dismantling of quotas from January 1, 2005. Thus, in effect, on December 31, 2004 the quota regime would and countries would be free to trade in textiles across the globe. This is a historic event and will have a greater impact on developing nations like India, China, Mexico, and Turkey, which are cost-competitive manufacturers of textiles.\textsuperscript{3.27, 3.34}

MFA has restricted developing countries' textile exports.... Since 1974, the global trade in textiles has been regulated by the Multi-Fibre Agreement (MFA), which restricts developing countries' exports to industrialized countries. The MFA determines quotas- the quantities of specified items to be traded between the signatory countries. Each exporting country then assigns licenses to firms to export a certain proportion of each quota. The system favors the least-developed countries, whose export quotas are far higher than those of developing countries. That is why garment industries in Bangladesh and Sri Lanka have enjoyed disproportionately high growth rates, despite their lack of domestic raw material production bases especially in ready made garments and home textiles. Quotas restrict exports South East Asian countries like India, China and Pakistan to lucrative markets. Meanwhile the manufacture of end products is shifting to low cost countries, and consequently, so are the markets for yarns and fabrics. So the USA and the EU are no longer attractive markets for exporters of intermediate products. But developed countries continue to be the key consumers of the end products-garments and home textiles. Thus manufacturers of these products are the worst hit by quota restrictions. This is evident from the fact that countries like India and Pakistan have been
using up almost all their allocated quotas. Export quotas are trading at high premiums. 3.52, 3.30, 3.59

3.12 INDUSTRY STRUCTURE - INDIA

TEXTILE

Indian textile sector comprises mainly of spinning sector, consisting of mainly medium to heavy units. Small weaving and processing firms operating in handloom and powerloom sector undertake most of the weaving and fabric processing activity. The handloom sector consists of traditional weaving with manually operated looms manufacturing 5 metres per day. Handloom weavers buy yarn and sell grey fabric to local buyers. 3.47

The powerloom sector consists of small, traditional weaving units. The difference is these units use power shuttled looms. Unlike the mill sector, the powerloom sector does no conform to labour regulations. The powerloom sector accounted for 71% of the total production. The mill sector accounts for 6% of the production. 3.50

In the organized sector, about 1100 units produce the entire yarn output. The scenario is very different in the weaving segment where independent weaving and processing units account for more than 16,000 million metre of the woven fabric production followed by handloom units producing 6000 million metre and composite mills producing 1800 million metres. 3.55

India has the world’s largest spinning capacity (over 32.10 million spindles) the finest varieties of raw cotton in large quantity, India produced 2148
million kgs. of cotton yarn. Currently, India has about 2,600 spinning and composite units with about 35 million spindles and 3,45,000 open end rotors, in the mills sector. Besides, there are about 15.6 lakh powerlooms in the decentralized sector, employing about 77 lakh persons. In the handloom sector, there are 38.90 lakh looms providing employment opportunities to 124 lakh people. There are about 12,400 processing factories of which around 10,000 are hand processors. The capacity utilization for world was 81 percent while it was 41 in the mills sector, over 11 million spindles are non-viable and hence fit for scrapping. Similarly, a large number of decrepit looms need to be scrapped. An Important point to note is the low capacity utilization for synthetics. In case of polyester filament yarn the capacity utilization for the world was 82 percent while for India it was only 54 percent. Similarly, in the case of Polyester Staple Fib4 percent for India, in 1996-97.

PRODUCTION OF FABRICS BY SECTORS

<table>
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<th>Type of Fabrics</th>
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<th>2000-01</th>
<th>2001-02</th>
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COTTON TEXTILES

Cotton textiles occupy a prominent position in the country’s textile industry. The industry comprises of three important segments, namely:-

- Hand spun and hand woven handloom sector.
- Powerloom sector representing the de-centralized small scale units.
- Capital intensive sophisticated mill sector.

The industry has rapidly undergone transformation in the recent past. Handlooms constitute an important segment of the textile industry of the country. This is more so because of the employment provided by this sector. Floor covering and table linen are the two major items of exports of handloom made-ups. Other items of exports are bed linen, towels, dish, clothes etc. the handloom sector plays a very significant role in the country’s economy. It is the largest economic activity after agriculture providing direct and indirect employment to more than 9 million by 2012.3,4,6

Home furnishing and floor-covering industry turns out an array of exquisite products, which enjoy worldwide reputation for their beauty, workmanship and individuality. Furnishings and floor coverings including carpets constitute one off the important segments of India’s decentralized industrial
sector. As the name itself suggests, handloom is the conventional hand-operated home made machine on which millions of Indians in the countryside weave cloth for themselves and the local markets. Next to agriculture, handloom is the source of livelihood for the largest number of Indians. It is estimated that there are around 3.89 million handlooms in the country producing mainly cotton fabrics. The handloom sector consists of cotton weaving units, wool weaving units, and units engaged in weaving silk cloth. As the same itself suggests, handloom is the traditional hand-operated home made machine on which millions of Indians in the countryside weave cloth for themselves and the local markets. Next to agriculture, handloom is the source of livelihood for the largest number of Indians. The handloom sector consists of cotton weaving units, wool weaving units, and units engaged in weaving silk cloth. But almost 90% of all handloom fabric produced in large varieties, textures and designs in different parts of the country, have a special textures and designs in different parts of the country, have a special ethnic flavour as the people who make them often weave into the motifs reflecting the distinct racial, religious, social and cultural moorings. The mercurial output of these looms includes plain casement, checks and stripes, handwoven bed linen bed linen with prints or jacquards designs and popular cotton varieties and furnishing fabrics made from coarser yarn counts. As the handloom weavers are generally from the poorer sections of society, some articles or class of articles are reserved for manufacture by them. These items includes yarn dyed dhoties, piece dyed dhoties, lungies, gamchos, bed covers and bed sheets, cloth of plain weave, table cloth and napkins and dusters.
3.13 PRODUCTION AND TRADE POLICIES AFFECTING THE COTTON INDUSTRY IN INDIA

Although India is a most important cotton producer with significant potential to expand output, it is not clear, if domestic production will keep pace with the quantity and quality needs of an expanding textile and apparel industry. India is the third-largest cotton producer in the world. Cotton area is significantly larger than any other country in the world—accounting for about 25 percent of global cotton area—but average yields are the lowest among the top-10 global cotton producers. Area and yield gains have boosted cotton production 2.4 percent annually since 1990, but progress in raising yields toward levels achieved by other major producers has been slow. In addition to low yields, the quality of India's cotton is often poor because of an array of technical, economic, and institutional factors. The degree to which these productivity and quality factors can be addressed will be critical in determining India's competitiveness in global textile markets and whether rising cotton demand will be supplied by domestic producers or by global markets.\textsuperscript{3,33}

PRODUCTION TRENDS

Cotton production has grown significantly since the mid-1980s due to improvements in both area and yield, but growth slowed in the 1990s because of a sharp slowdown in yield gains. Since 2000, rising yields and, more recently, a rebound in area planted have again restored stronger growth in production, but it is uncertain if these gains will be sustained. Output continues to show great annual variations due primarily to weather-induced fluctuations in average yields. About 65 percent of cotton area is not irrigated and is dependent on erratic monsoon rainfall, a share that has
stayed relatively constant since the late 1980s. Area, yield, and production
trends have varied sharply across each of India's distinctly different cotton-
producing regions. The overall slowdown in growth of cotton production
during the 1990s was due primarily to declines in area and yields in the
North Zone (Haryana, Punjab, and Rajasthan) that began after 1995. Most
cotton in this zone is irrigated, explaining why the North has traditionally
achieved the highest yields. But both area and yield fell in this region during
the late 1990s because of adverse weather and pest infestations, as well as a
lack of suitable high-yielding, short duration, and pest-resistant varieties.
Crop competition also played a role, as increased support prices for wheat
and rice be inclined to shift area out of cotton, as well as decrease the
harvest period. During the last several years, yields have improved
significantly in the North Zone, largely due to the availability and increased
planting of higher yielding, short-duration hybrid varieties.333

Cotton production showed relatively strong growth in the Central Zone
(Gujarat, Maharashtra, and Madhya Pradesh), India's major cotton region,
throughout much of the 1990s. The Central Zone, which accounts for about
63 percent of all cotton area and where only 16 percent of cotton area is
irrigated, has had the fastest growth in output (5.0 percent) and yields (3.4
percent) since 1990. Yields in the Central Zone, traditionally the lowest in
India, have now gained substantially on those in the North and South Zones,
but remain susceptible to the most annual weather-induced variation. India's
highest cotton yields since the mid-1990s have generally been in the South
Zone (Andhra Pradesh, Karnataka, and Tamil Nadu), where about 20 percent
of cotton area is irrigated and about 60 percent of area is planted to hybrid
varieties. Yields in the South Zone, however, showed little growth during
the 1990s, partly due to significant problems with pest resistance to insecticides in some areas, but have shown a modest upward trend since 2000.\textsuperscript{3,33}

**FACTORS CONTRIBUTING TO LOW YIELDS\textsuperscript{3,33}**

The relatively rapid gains in productivity in the predominately rainfed Central zone since 1990 are due to technological advances that, if combined with a continuation of recent modest expansion in the North and South Zones, could lead to a substantial hike in national average yields and production. Current yields in farmers' fields are well below not only the theoretical peak yields of the major varieties cultivated, but also the average yields achieved in demonstration plots under both irrigated and unirrigated conditions. While this productivity gap indicates that significant further on-farm yield improvements are possible, a range of technical, economic, and institutional factors prevent realization of the potential of the varieties cultivated:

**Delayed Sowing** Late sowing of cotton reduces yields by providing less optimal sunlight conditions for crop development and, in some areas, by allowing less time for picking the grown-up crop before clearing the field for the following crop. Sowing delays are caused either by the late arrival of seasonal rainfall needed for sowing or by delays in harvesting the preceding crop. Yield losses connected with late sowing and shortened harvest times may be reduced by new shorter duration varieties and better management, but crop competition will likely continue to limit yields in some areas.
Monsoon Dependence Erratic monsoon rainfall affects 60-70 percent of cotton area, reducing yields through moisture stress and creating risk that reduces investment in seed, fertilizer, and pesticide inputs. Even with improved varieties and management, regular yields in the mostly rain fed Central and South zones are likely to remain below those achieved in other countries with more reliable rainfall.

Poor Seed Quality Poor seed quality is a pervasive problem in cotton cultivation. Only about 35 percent of cotton area is sown with certified seed with assured varietal purity and germination. Commercially available seeds are often of poor quality, with sale of uncertified, substandard, and second generation (F2) hybrid seeds not uncommon. Although supplies of certified seed are generally available, financial constraints direct most farmers to use retained seeds or lower priced uncertified seeds from the market. The proliferation of cotton varieties in markets and farmers' fields confounds efforts to improve seed quality, maintain varietal purity, and develop crop management practices. Roughly 100-130 cotton varieties developed in both the public and private sectors are now cultivated in India. A study by the Central Institute for Cotton Research (CICR) indicates that the average cotton farmer in the Central and South zones plants 3-4 varieties on farms averaging about 2 hectares, a practice that greatly complicates crop and seed management.

Plant Protection Insect and disease infestations, including bollworms, white fly, jassids, and leaf curl virus, are significant problems in India’s three cotton production zones. Although per hectare use of pesticides is higher for cotton than for any other crop, efficient plant protection is constrained by
poor farm management, pesticide subsidies that encourage indiscriminant use, and problems with pesticide quality. Improved on farm pest management practices, including appropriate crop rotations, pest surveillance, pesticide applications, and adoption of Integrated Pest Management (IPM) practices have showed difficult to implement on small, resource-constrained farms.

**Crop Management** Large gaps between average onfarm yields and the potential of existing varieties also stem from poor management practices, including use of inappropriate varieties, seed rates, seed spacing, and fertilizer dosages. As in the case of plant protection, improvement of crop management practices is complicated by the need to extend recommended practices to large numbers of small, limited-resource farmers.

**Lack of Suitable Varieties** Cotton yields are affected by lack of varieties—or genotypes—suitable for some agronomic conditions. Indian scientists cite three priorities for plant breeding efforts: (1) higher yielding, short-duration, and pest-resistant cultivars for the irrigated North zone, (2) higher yielding varieties for the drought-prone Central zone, and (3) varieties suited for the soils on rice fallow common in the South zone.

**Bt Cotton and Implications for Yield Improvement**

The most significant recent technological development affecting Indian cotton production is the approval of insect-resistant hybrid Bacillus thuringiensis (Bt) cotton for cultivation in India. primarily, the Government’s Genetic Engineering Approval Committee (GEAC) approved three Bt varieties developed by a joint venture between Monsanto and
Mahyco, an Indian seed company, in March 2002. In April 2004, a fourth variety developed by the Indian company Rasi Seeds was approved by the GEAC. During April-May 2005, the GEAC approved an additional 14 varieties from Monsanto, Rasi, and Ankur Seeds. Importantly, while all varieties approved earlier were for cultivation only in the Central and South zones, the 2005 approvals incorporated six varieties for the North zone. In May 2005, the GEAC also withdrew its approval for one of the original Monsanto varieties in all southern states and for the two others in Andhra Pradesh because of reports of poor performance. However, with the recent approvals, there are still five Bt varieties available for Andhra Pradesh and seven for the other Southern states. In addition to the 19 officially approved Bt varieties, approximately 50 unapproved Bt varieties developed and sold by farmers and private seed companies are reportedly being cultivated in the South, Central, and North zones. With only 3 years of cultivation, including a very poor weather year in 2002, and no official area or yield data that differentiate conventional and Bt cotton, assessing the performance and impact of Bt cotton is difficult. Available information indicates that adoption has been rapid. Approved Bt cotton varieties were planted on an estimated 525,000 hectares in 2004/05, with an additional 600,000 hectares planted to various illegal varieties. In 2005/06, Bt cotton planting is projected at 1.6 million hectares, including 900,000 hectares of government-approved varieties and 700,000 hectares of illegal varieties. Reports on yields, and economic benefits to farmers, have been inconsistent, owing to erratic weather and pest infestation conditions during the initial years of cultivation, the proliferation of unregulated varieties, and whether the source is an opponent or supporter of the technology.
The rapid growth in adoption of Bt varieties implies that farmers see economic benefit from planting Bt cotton, despite the fact that the cost of Bt seed—about Rs1,600 ($36.80) per 450-gram package—is more than three times the cost of non-Bt hybrids (U.S. Department of Agriculture, Foreign Agricultural Service, GAIN Report). Two recent scientific studies also provide evidence that Bt cotton is effective in preventing damage caused by bollworms on Indian cotton fields and, hence, in improving yields. The studies indicate that the financial benefits of planting Bt cotton in India stem from superior yields rather than reduced costs; the savings from reduced insecticide use are roughly offset by the higher cost of Bt seed. Qaim and Zilberman analyzed data collected in 2001 from Bt field plots designed by Mahyco in seven states and supervised by regulatory authorities. Subsequently, Bennett et al. evaluated data collected from large samples of farmers growing both conventional and Bt cotton under commercial field conditions in the state of Maharashtra in 2002 and 2003. Both studies showed not only a substantial reduction in insecticide use on fields planted with Bt varieties but also significantly higher yields. Qaim and Zilberman found that the average yield in controlled field trials of Bt cotton exceeded those of non-Bt counterparts by 80-87 percent. Bennett et al. found that the average increase in yield on farmer’s fields for Bt cotton over non-Bt cotton was about 45 percent in 2002 and 63 percent in 2003. Two factors suggest that widespread adoption of Bt cotton could significantly affect cotton production in India:

First, by affording built-in protection from bollworms, Bt cotton helps address one of the most vital yield-loss factors in all three cotton-producing zones. The Bt technology should permit more effective protection from bollworm damage more quickly than would extension
efforts to boost use of conventional and IPM methods among the large number of small-scale, resource-poor farmers. In developed countries, the primary benefits of Bt technology have been to reduce costs of both labor and pesticides. In India, by contrast, the evidence suggests that the more effective plant protection afforded by Bt technology will result in higher yields. Adoption of newly approved Bt varieties for the highly bollworm-prone North zone could lead to significantly faster yield growth under the irrigated conditions in those states.

Second, by reducing pesticide and associated labor costs, Bt technology should be affordable for resource-poor farmers, freeing up resources to purchase other needed inputs, including quality seed. State-level cost of production data for cotton for 1998 and 1999 (the most recent available) indicate that pesticides account for 10-27 percent of production costs. In addition, labor costs—a significant share of which are for pesticide use—account for 44-59 percent of costs (Government of India, Ministry of Agriculture, 2004). Although Bt seed costs more than other varieties and some pesticide applications would still be needed, cost savings may prove to be significant.

3.14 CHARACTERISTICS OF COTTON PRODUCED

India is unique among major cotton-producing countries because a broad range of agro-climatic and soil conditions permit cultivation of all varieties and staple lengths of cotton. Indian and international standards use different staple length definitions for classifying cotton. By Indian standards, about one-half of Indian cotton is medium staple length, but, by international
standards, only about one-quarter of Indian cotton is considered medium staple. The North zone tends to produce mostly short and medium staple type, the South zone mostly long and extra-long staples, and the Central zone a range of medium and long staple varieties. India has the capacity to produce the full range of staple lengths of cotton needed to meet the needs of its textile industry. And India’s hand-picked cotton is considered superior to mechanically harvested cotton in terms of sheen of finished fabric, amenability to spinning, tensile strength, etc. India, however, has significant problems in meeting other quality needs. In particular, Indian cotton is generally contaminated with other fibers and foreign matter and often consists of admixtures of multiple varieties with different fiber characteristics. These problems reduce efficiency (yarn realization) in the spinning process and result in higher levels of yarn impurities and deficiency. A 2001 survey by the International Textile Manufacturer’s Federation indicated that 5 of the world’s 10 most contaminated traded cotton types came from India. Problems with contamination and other quality attributes of Indian cotton have been a key factor behind the upward trend in cotton imports by India’s export-oriented textile mills since the late 1990s. The risk associated with the unreliable quality of domestic cotton leads some textile producers to prefer imported cotton to meet export orders that demand consistent quality. The noteworthy problems with admixture of varieties and contamination stem from practices on farms and in market yards that are not amenable to quick solution. Improvements in quality require better on farm seed management; improved technology of handling, transportation, and ginning; investments in market infrastructure; and a marketing system that provides price premiums that reflect the costs of supplying quality cotton. Accomplishing these changes will likely require
implementation of grades and standards for domestic cotton and improvements in marketing that provide adequate incentives to producers, ginners, and traders to adopt quality-related practices.

**Production Policy and Incentives**

The principal mechanism to support domestic farm prices is the system of Minimum Support Prices (MSPs), in which the Government sets minimum prices for cotton and other major crops. Cotton MSPs are set for all major varieties and revised annually by the Government in accordance with the recommendations of the Commission on Agricultural Costs and Prices (CACP). CACP advices are based on assessments of changes in production costs and trends in domestic and world prices. Cotton MSPs, which are defended by market purchases by the Cotton Corporation of India (CCI) when necessary, generally have little influence on producer prices of cotton because market prices are typically well above the MSPs. By contrast, MSPs have considerably influenced market prices for wheat and rice in the principal surplus areas, including most of the North zone (wheat and rice) and Andhra Pradesh in the South zone (rice). The MSPs set for wheat and rice can directly affect area allocated to cotton by affecting relative returns to growers. Returns to wheat and rice production can also affect cotton yield by influencing the portion of the growing season that farmers are willing to devote to cotton production and, hence, the duration of the varieties cultivated and the time available for picking before planting the next crop. Recent trends in domestic market prices for cotton and competing crops show that cotton prices tend to be more volatile than those for wheat and rice. In addition, market prices of wheat and rice increased 7-9 percent annually between 1995 and 2001 because of unusually large increases in
wheat and rice MSPs. By contrast, market prices for cotton increased only 2 percent during the same period. More recently, however, increases in wheat and rice MSPs have slowed and relative market prices of cotton have begun to strengthen. While the MSP system has generally had little direct impact on cotton production incentives, a number of other domestic regulatory measures have, historically, tended to suppress domestic cotton prices. Over the last 10 years, however, reforms have phased out these regulations and created an environment for stronger incentives to produce cotton:

**REFORM OF MAHARASHTRA MONOPOLY PROCUREMENT SCHEME.**

Until procurement was opened to private traders in 2003, all cotton in Maharashtra, India’s second-largest producing state, had to be sold at fixed prices. While protecting farmers against low prices in some years, the policy also led to lower returns in years of high market prices and in delayed payments to farmers when the scheme ran large financial deficits. The 2003 reform, in addition to falling financial costs, has clarified and strengthened price signals to farmers.

**LEGALIZATION OF FUTURES TRADING.**

Futures trading in cotton was legalized in 1997 and in 2003 for most other farm commodities. Although illicit forward contracting in cotton was a common practice prior to legalization, expanded futures trading is likely to make price discovery more efficient and transparent while also providing a means to manage price risk. To date, futures trading in cotton remain small, but trading volumes may amplify, as they have for several other commodities.
ELIMINATION OF EXPORT QUOTAS

Until their elimination in 2002, India used annual cotton export quotas to limit exports and ensure low and stable raw material prices for the domestic textile industry. The quotas tended to suppress domestic cotton prices by limiting exports, and uncertainty regarding annual quota levels was a source of price risk for growers and traders. Removal of the quotas will strengthen links between domestic and world prices, likely boosting grower returns and eliminating a source of price risk.

ELIMINATION OF GINNING REGULATIONS

Regulation of variety-specific ginning fees ended in 1997. The fee-setting mechanism raised costs by stopping competition among gins, encouraged contamination by ginners, and reduced incentives for investment in the industry.

ELIMINATION OF CREDIT CONTROLS

Until lifted in 1996, government regulations restricted use of credit by cotton traders, successfully limiting private storage of cotton lint and yarn and reducing market prices.

ELIMINATION OF COTTON CONTROL AND TRANSPORT ORDERS

Until elimination in 1995, these controls gave the Government authority to direct domestic movement and storage of cotton, including confiscation of cotton under certain market conditions. These regulations and their erratic use increased doubt and marketing costs, thus reducing and destabilizing grower returns.
TECHNOLOGY MISSION ON COTTON

Slowed growth in cotton production during the late 1990s, together with the opportunity created by the termination of the MFA, raised the priority for addressing factors that constrain cotton production and quality in India. In 2001, the Government established the high-level Technology Mission on Cotton (TMC) to direct, coordinate, and fund initiatives to raise the productivity and quality of Indian cotton and strengthen returns to growers. TMC activities focus on four program areas, including (1) research and technology generation, (2) transfer of technology to farmers, (3) improvement of marketing infrastructure, and (4) modernization of gins. Although it is too early to assess TMC impacts on research and extension, progress in improving market facilities and, particularly, cotton gins is evident in cotton-producing areas.

COTTON TRADE

India has traditionally been a net cotton exporter, but emerged as a significant net importer in 1998. Increased import demand has been associated with a mixture of steady growth in domestic consumption, rising exports of cotton-based textiles, and a period of stagnating cotton production during 1997-2002. Rising imports have also been supported by more liberal import policies for cotton since the early 1990s and, in the late 1990s, by increased demand for quality cotton not available in India. Although imports declined in 2003 and 2004 along with the recovery in cotton production, it remains uncertain if the recent gains in production can be sustained.
IMPORT POLICY

Cotton imports were liberalized in 1991, when the import monopoly of the Cotton Corporation of India was terminated and imports were placed on Open General License, allowing unrestricted imports by private traders. The import duty was originally set at zero, but little import trade occurred until the late 1990s, when world prices declined and India faced domestic supply shortfalls. The import duty was lifted to 5.5 percent in 2000 and to 10 percent in 2002 but remains low relative to tariffs imposed on most other agricultural products. Export-oriented textile units, which are exempt from the import duty, account for most, if not all, of India’s cotton imports.

3.15 TEXTILE EXPORTERS AND THE ROLE OF COTTON QUALITY

Cotton importers and export-oriented textile firms indicate that both price and quality are important factors in decisions to purchase imported versus domestic cotton. Premiums over domestic prices are normally only paid when the desired quality is not available in the domestic market. Typically, large crops have yielded sufficient amounts of quality cotton to meet domestic demand, while small crops result in shortages of quality cotton. But, with textile exports now accounting for a rising share of cotton use, quality needs may be a more consistent driver of imports unless substantial improvements are made in the quality of domestically produced cotton.

Two quality factors of most concern to export-oriented spinners, weavers, and apparel firms are (1) consistency of fiber quality and (2) lack of contamination with other fibers. Both factors pose chronic problems with a large proportion of domestically produced cotton. Indian cotton experiences
from inconsistent quality because of the many varieties cultivated and the large numbers of small farmers contributing to each bale. Contamination with other fibers, primarily jute and synthetic fibers from the sacks used by farmers for picking and transport, is a chronic problem that is difficult to identify and rectify once it occurs. Contaminated cotton cannot be used to produce some exported products, such as white and pastel shirting, and, as a result, imported cotton is often used to produce certain items destined for the export market. In addition to quality, more favorable credit and contracting terms for imported cotton also provide an inducement for export-oriented mills to use imported cotton. Imported cotton typically is purchased with 3-6 months of supplier credit, compared with 15-30 days of credit for domestic cotton. And delivery of imported cotton can typically be arranged over a longer period at a fixed contracted price than can domestic cotton.

3.16 IMPLICATIONS FOR COTTON DEMAND AND TRADE

Demand for cotton and manmade fibers in India will likely rise as a result of strong growth in incomes in India, as well as increased Indian exports of textiles and apparel associated with the end of MFA quotas. The pace of demand growth for cotton will depend heavily on implementation of reforms in the domestic textile industry, including taxes that differentiate against the use of manmade fibers and the array of past and current regulations that have affected the scale, technology use, and export competitiveness of the textile and apparel industry. Imports of raw cotton have increased in concert with rising demand in recent years, but future growth will depend on the extent to which India can boost chronically low cotton yields and improve cotton quality. Low per capita use and the significant shares of income devoted to textile consumption indicate that fiber demand will continue to respond to
the now rapid growth in rural and urban incomes. Fiber demand will, however, also be responsive to changing prices, so further reductions in the relatively high excise taxes on manmade fibers, coupled with strong rural demand for durable manmade fiber products, will likely continue to slow relative growth in domestic consumer demand for cotton fiber. The end of MFA quotas is likely to result in significantly faster growth in India’s exports of cotton-based textiles and apparel. India’s fundamental cost competitiveness in cotton-based textiles and its large share of exports destined for the historically quota-constrained U.S. and EU markets support prospects for significant export growth even without major reforms in the domestic textile industry. Growth in export-based cotton demand would, however, be substantially higher with implementation of measures to boost investment and improve technology, scale, and integration in the weaving, finishing, and apparel sectors to levels of efficiency achieved by China and other major producers. The recent trend in government policy has been to reform the sector, but the pace of reform can be expected to be slowed by political concerns with the adjustment costs associated with restructuring an industry that accounts for a large share of industrial employment. India has the agronomic potential to meet much, if not all, of its future growth in cotton demand domestically. However, it is unclear if and when the necessary productivity gains will be achieved. The advent of Bt cotton, which appears to be yield enhancing and is being adopted rapidly, should lead to significant gains in production in the medium term. The combination of erratic moisture conditions in rainfed producing areas and weak institutions for delivery of seed, technology, and other inputs seem equally likely to slow the pace of productivity growth. In addition, meeting rising demand for quality cotton—particularly contamination-free cotton—will
require changes in the cotton supply chain that are unlikely to be implemented quickly. To the extent that textile and apparel exporters, such as India, can meet rising export demand with domestically produced cotton, the elimination of MFA quotas is likely to lead to diminished prospects for net cotton exporters, such as the United States. Recent yield increases in India, due in part to Bt technology, may signal slower expansion in cotton imports in the medium term as the technology is more widely adopted. However, the quality needs of India’s export-oriented textile firms will likely sustain a market for quality cotton for the foreseeable future. Market shares for the Indian cotton market appear to be sensitive to both price and quality. U.S. cotton, with a reputation for consistent quality, can maintain its market share provided it remains price competitive.

3.17 THE MULTIFIBER AGREEMENT\textsuperscript{3,33}

Until recently, global trade in textiles and apparel operated outside established international rules based on a system of quotas originally sanctioned by the 1974 Multifiber Agreement (MFA). However, the Uruguay Round (UR) negotiations that concluded in 1995 included an agreement to render the sector compliant with General Agreement on Tariffs and Trade (GATT) rules, thus reversing three decades of steadily growing protectionism. The UR’s Agreement on Textile and Clothing (ATC) mandated the phase-out of quantitative import barriers on textiles over a 10-year period, with complete MFA quota removal by the end of 2004. In addition, commitments were made to reduce tariffs on imported textiles and clothing throughout the world—in both developed and developing countries.
IMPACTS OF THE MFA\textsuperscript{3,33}

In 1994, MFA quotas governed most global trade in 105 textile and garment categories. The quota restraints limited shipments from exporters, mostly developing countries, to the United States, EU, Canada, and Norway. Key effects were as follows:

- World textile and clothing production and trade became fragmented. The quotas supported production in developed country markets and in countries having quotas to ship to these markets. Production did not necessarily occur where costs were lowest.

- Prices were higher and consumption lower in developed-country markets than they would have been without the quotas. Studies indicate that the MFA regime added 5-10 percent to U.S. consumer prices.

- Impacts on developing countries were mixed. Production and exports by low-cost producers of textiles and clothing, such as China, India, and Pakistan, were reduced by the quotas. But in other low-income countries, like Bangladesh and Mauritius, and in higher income countries, like South Korea and Taiwan, quota access supported an export industry that or else would have been smaller or nonexistent.

IMPACTS OF THE END OF MFA QUOTAS\textsuperscript{3,33}

The elimination of MFA quotas is re-orienting world production and trade of fiber, yarn, fabric, and clothing in basic ways:

- Textile and clothing output will accelerate among low-cost developing-country producers, including India, Pakistan, and, especially, China due to the abolition of quotas. Production in the United States and EU will continue to decline.
Some higher cost producers will continue to receive tariff protection; others will still profit from either geographic proximity to or preferential trade arrangements with U.S. and EU markets (for example, the Caribbean Basin Initiative, the North American Free Trade Agreement, and the Customs Union between the EU and Turkey).

Mill use of raw cotton will continue to shift toward low-cost developing-country exporters. Unless such countries as China, India, and Pakistan can also produce more cotton, cotton import demand will also shift toward these countries.

Textile and clothing prices will fall in the United States and EU.

MFA QUOTA REMOVAL AND INDIAN TEXTILE EXPORTS

In the world market, bilateral quotas sanctioned under the MFA restricted developed-country imports from India in various product categories until the quotas were eliminated in January 2005. In India, the lowering of these trade barriers is viewed as an opportunity as well as a threat. It is an opportunity because markets will no longer be restricted and a threat because markets will no longer be guaranteed by quotas and even the domestic market will be open to competition (Kathuria and Bhardwaj). India is, however, likely to be a net beneficiary of the elimination of MFA quotas for two reasons:

- Evidence indicates that India's exports have been constrained by MFA quotas.
- The MFA quotas may have discriminated against export of cotton products, products in which India appears to have a strong relative advantage. Under the MFA regime, about three-quarters of Indian garment exports were destined for the United States and the EU,
where most quotas were levied. In 2002, the MFA quotas were binding on eight product categories exported to the United States and five categories exported to the EU (USITC). The degree to which the MFA quotas restricted Indian exports can be analyzed using export tax equivalents (ETEs), which quantify the implicit tax on India’s exports in specific product categories in specific markets.3 In 2002, the most recent year for which estimates are available, ETEs for Indian apparel exports averaged 12.5 percent, lower than for Bangladesh (21.5 percent), China (19.7), and Hong Kong (18.6), but higher than for other developing-country exporters (Andriamananjara et al.). The 2002 ETEs for India’s textile exports averaged 18.4 percent, the highest among the developing-country exporters. The ETE estimates suggest that the removal of the MFA quotas will provide potentially important benefits to Indian exporters in a number of important product categories, such as knitwear and men’s shirts. The overall significance of these potential gains are borne out in model-based economic analysis. Success is not, however, a foregone conclusion partly because of nonquota constraints and emerging developments in the international market:

China:

China is generally viewed as posing the biggest threat to the expansion of textile and apparel exports by India and other potential suppliers. The World Trade Organization (WTO) predicts that, in a free market, China could capture half of the world market for textiles and apparel by 2007, up from 16 percent in 2002 (Nordas). China’s clothing sector is considerably more competitive than India’s. On average, Chinese factories are 20 times larger
than those in India. China benefits from the management expertise of firms from Hong Kong now operating in China and from foreign direct investment inflows that are 10 times larger than in India. By contrast, India’s underdeveloped infrastructure, high costs of doing business, and stringent labor laws hinder investment and competitiveness.

**Tariffs:**

Even with quotas removed, steep tariffs on textiles and clothing continue to be widely used to protect many countries’ markets from imports. Tariffs are as high as 12 percent in the European Union (EU), 33 percent in the United States, and higher still in many developing countries (*Financial Times*, 2004). In the United States, the average tariff on clothing made from cotton is 28 percent, while the average rate for clothing made from manmade fibers is 17 percent.

**Regional Trade Agreements:**

Many textile-producing developing countries, such as Mexico, Mauritius, and Guatemala, have duty-free access to developed-country markets because they belong to regional preferential trade agreements, like the North American Free Trade Agreement (NAFTA), the African Growth and Opportunity Act (AGOA), and the Caribbean Trade Partnership Basin Act (CTPB). The South Asian Association Regional Cooperation (SAARC), the regional agreement to which India belongs, is setting up a consortium on textile and apparel. However, such a consortium is unlikely to significantly benefit India given the similar economic profiles of the South Asian countries. The preferential tariffs among members of various regional trade
agreements will continue to pose a barrier to Indian exports even in the absence of the MFA quotas.

Domestic Trade Remedy Laws:
Trade-remedy measures, such as antidumping duties (ADs) and countervailing duties (CVDs), adopted by importing countries to shield domestic firms from foreign competition represent a growing problem for Indian exports. Between 1997 and 2001, the EU imposed ADs ranging from 7 to 20 percent on Indian bed linens. Following the WTO case ruling against such duties, the EU used CVDs ranging from 4.4 to 10.4 percent to constrain imports of Indian bed linen (www.fibre2fashion.com, 2003). Trade remedies were also imposed on Indian imports by South Africa (acrylic blankets) and South Korea (cotton yarn) in 2003. In the absence of the MFA quotas, trade remedy action may become an increasingly important barrier to Indian exports, mainly in markets formerly protected by the quotas.

3.18 PERFORMANCE OF INDIAN TEXTILE INDUSTRY TRENDS IN EXPORT DEMAND

Exports of yarns, textiles, and clothing to the world market are an increasingly important source of derived demand for Indian cotton. Since 1992, Indian textile and clothing exports have grown 7.7 percent annually, reaching $13.4 billion in 2002 and accounting for 4 percent of global trade in this sector. In 2002, India was the fifth-largest global exporter and the second largest net exporter of textiles and clothing. India’s net exports of $12.1 billion in 2002 were, however, far below those of China ($54.9 billion).
The bulk of India’s textile and clothing exports, as well as most export growth, is in cotton-based yarns, fabrics, clothing, and household furnishings, as opposed to synthetic and blended products.

Exports of textiles and clothing now account for about 30 percent of India’s domestic use of all natural and manmade fibers, a share that is likely to continue to increase. India’s exports of textiles and clothing are growing at nearly twice the rate of domestic demand. Export growth is likely to quicken as a result of the recent elimination of the MFA quotas that served to constrain India’s exports to the United States and the European Union (EU). The MFA quotas were most restrictive of trade in clothing, particularly cotton-based clothing, which accounts for a large share of India’s textile and apparel exports. India’s success in the global textile marketplace hinges greatly on the pace of internal market reforms and its ability to achieve international competitiveness in its heavily regulated spinning, weaving, and apparel sectors. Current government targets call for quadrupling exports to the United States and increasing global exports to $50 billion by 2010.

TRENDS IN DOMESTIC CONSUMPTION

Domestic fiber demand has accelerated along with stronger growth in the Indian economy. Major reforms in domestic and trade policies during 1991-93 have led to faster growth in per capita incomes in India, helping boost annual growth in fiber consumption to 4.9 percent since 1990. Comparatively rapid growth in consumption of manmade fibers, particularly since 1990, has also been an important trend in Indian fiber demand. During 1990-2001, per capita demand for manmade and blended fabrics grew 6.8 percent annually, compared with negligible growth in demand for 100- percent cotton fabrics.
As a result of this rapid growth, manmade and blended fabrics now account for the bulk of household cloth purchases. Between 1991 and 2003, the share of manmade and blended products in household cloth purchases rose from about 38 percent to 54 percent. The fastest growth has been in use of 100 percent manmade, as opposed to blended, fabrics. However, despite the rapid growth in use of manmade fibers, cotton continues to account for a relatively large share of total consumption in India, compared with other developing countries, as well as with developed and transition economies.

Demand for manmade and blended textile products in India is strong in both urban and rural households due to their durability and ease in maintenance (washability, fewer wrinkles, etc.), compared with 100-percent cotton textiles, factors very important in the Indian tropical and subtropical weather. Demand is, however, strongest in rural households, which account for about 78 percent of India’s population. As of 2002, the share of manmade and blended products in household cloth purchases was 61 percent in rural areas and 54 percent in urban areas. In rural households, where average incomes are about half those in urban areas, and in urban low-income households, manmade fabrics are favored because of their durability, as well as their generally low cost.

Overall growth in fiber consumption in India is also affected by the large share of household income allocated to textile purchases. According to government data, Indian households spent an average of 17 percent of their income on textiles in 1997, a share that has increased from 12 percent since 1990. Urban households spent about 22 percent of income on textiles in 1997, compared with 15 percent for rural households. The higher urban share partly mirrors larger purchases of higher value fabrics and readymade
goods in urban households, compared with rural households. The sensitivity of consumer textile demand—and of textile sector output—to rural incomes was demonstrated by the industry slump of 1998/99. Uncharacteristic declines in yarn and cloth output in that year were associated with weak rural demand from sluggish growth in farm incomes and high cotton prices after a poor crop in 1997/98. A drop in yarn export demand resulting from the Asian financial crisis also contributed to the 1998/99 slump.

**ROLE OF PRICES IN CONSUMER DEMAND**

Most Indian consumers are highly price sensitive. The average Indian household spends about 55 percent of its income on food and, as a result, spends discretionary income carefully. Faster economic growth beginning in the early 1990s has led to the emergence of an expanding middle class of 150-200 million consumers, with the capacity and propensity to purchase higher priced items. But price-sensitive, lower income households carry on to account for the bulk of India’s more than 1 billion consumers. Declining real prices for yarns and textiles have likely stimulated growth in demand for textile products since the early 1990s, particularly those made of manmade fibers. Real prices of cotton yarns and textiles have generally declined since the mid-1990s primarily due to lower prices for raw cotton. Prices for manmade fibers and yarns, however, have fallen dramatically—about 10 percent annually in real terms—since 1990. The price declines for manmade fiber have been driven by increasing domestic production capacity and lower international prices of raw materials, as well as reduced Indian import tariffs and excise duties on synthetic raw materials and products.
POLICIES AFFECTING CONSUMER PRICES

The principal government policies affecting consumer prices for textile products are excise taxes charged on products as they leave the factory and import tariffs charged on raw and midway products used in manufacturing. Historically, both excise taxes and tariffs have been used to discourage domestic use of manmade fibers, which are based heavily on imported raw materials, and to promote the use of cotton, most of which is produced domestically. Both excise taxes and, to a lesser extent, tariffs on manmade fibers have been reduced during the past decade as part of policy reforms aimed at reducing protection and regulation throughout the industrial sector. Overall, excise tax rates on manmade and blended products have been reduced nearly 40 percent since the mid-1990s, while taxes on cotton goods have been reduced about 25 percent. Tariff reductions on manmade raw materials and goods have been more recent and less noteworthy than the excise tax cuts. Despite the cuts, taxation of manmade goods remains high relative to cotton goods. Tariff and excise tax policies that have discriminated against manmade fibers have played a key role in shaping relative consumer prices and consumption patterns for cotton and manmade products. Recent tariff and excise tax adjustments have reduced discrimination against manmade fibers, but with continued high differentials in taxes on cotton and manmade goods, there is considerable scope for future tariff and tax reductions to further reduce prices for manmade products.
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