# EXTRA LONG STAPLE COTTON SCENARIO IN INDIA AND WORLD

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Cotton (*Gossypium* spp.) is the most important textile fibre and contributes to 62 percent of the Indian Textile Industry's requirement. Among the different quality groups, the ELS Cotton of 35 mm and above is in great demand world over for the manufacture of high quality ring spun yarns. The common end uses of ELS cotton are sewing threads, loom yarns, blend with polyester and high quality fabric. The extra long staple cotton category includes extra long staple (ELS) and long staple (LS) varieties produced in Egypt and ELS varieties produced in other countries. World over, the *Gossypium barbadense* species contributes to the ELS cotton production. However, in India, both *G.barbadense* species and the interspecific hybrids between *G.hirsutum* and *G.barbadense* account for this group.

## Area Production and Productivity of ELS Cotton in the World

| | Area (l. ha) | | Production (l. tonnes) | | Productivity (kg/ha) | |
|---|---|---|---|---|---|---|
| | **2005-06** | **2006-07** | **2005-06** | **2006-07** | **2005-06** | **2006-07** |
| **ELS Cotton** | 6.5 | 6.5 | 5.6 | 7.5 | 872.0 | 1153.8 |
| **World Cotton** | 345.0 | 343.0 | 248.0 | 260.0 | 720.0 | 758.0 |
| **ELS as % of world cotton** | 1.8 | 1.9 | 2.3 | 2.9 | | |

The important ELS cotton producing countries are USA, Egypt, Sudan, China, India, Australia, Israel, Peru, Tajikistan, Uzbekistan and Turkmenistan. United States of America and Egypt alone account for about 60 per cent of the world ELS production cotton. Even though very few countries produce marketable surplus of ELS cotton, several countries trade in ELS cotton. Due to less production, world trade in ELS declined during 2005-06. However, the use of ELS in non ELS producing countries like China and India went up by 12 and 4 per cent, respectively. Decline in production and low end stocks in the ELS producing countries boosted prices during 2005-06 to record levels, forcing countries like India to augment their indigenous ELS production.

## ELS scenario in United States of America

The current ELS Cotton area in USA is around 1.1 lakh hectares with an annual production of 8.1 lakh bales. The average ELS cotton productivity is 1262 kg/ha. The ELS Cotton in USA is commonly referred to as Pima and the quality of the Pima cotton is guaranteed by Supima, the marketing and licensing association for Pima. There are twenty one approved Pima varieties. Ninety percent of the Pima area is in

California state. The popular varieties in this region are Phytogen 800 Pima, Deltapine 340 Pima and Deltapine 744 Pima. Texas and New Mexico states account for 14,500 ha where Deltapine 340 Pima is the predominant variety. Arizona state accounts for 1500 hectares where DP 744 Pima is the primary variety. The public bred varieties Pima 6 and Pima 7 occupy a negligible area in USA.

**Egypt**

Cotton planted area during 2005-06 was 2.75 lakh hectares with a total production of 11.9 lakh bales. The extra long staple cotton production is confined to 66,000 ha with 2.6 lakh bales production. The overall productivity was 736 kg/ha. The ancient Egyptian cotton is known as Jumel. Improvement in Jumel cotton by cross fertilization with the Sea Island cotton lead to the development of first barbadense variety Ashmouni. Currently, Egypt cultivates around 11 varieties which are classified into ELS and LS.

**Quality parameters of Egyptian varieties**

| Variety | Staple | 2.5%Span length (mm) | Micronaire | Strength (g/tex) |
|---|---|---|---|---|
| Giza 88 | ELS | 35.9 | 3.9 | 44.9 |
| Giza 70 | ELS | 36.8 | 3.3 | 45.4 |
| Giza 86 | LS | 33.1 | 4.4 | 42 |

**Sudan:**

Cotton is cultivated in the Gezira scheme area, the vast fertile arable flat lands between the Blue and White Niles with irrigation water from Blue Nile drawn through gravity flow. According to the Sudan country report, the total Cotton area came down to 1.69 lakh ha from 2.06 lakh hectares. during the 2005-06 season. Consequently, the total production also came down to 4.29 lakh. bales from 4.88 lakh. bales. The extra long staple area also came down to 0.79 lakh hectares from 1.02 lakh hectares. However, with better productivity of ELS cotton (650 kg/ha) as against the national average of 431 kg/ha, the overall production of ELS Cotton was of the order of three lakh bales. Shambat and Barakat 90 were the major ELS varieties till 1997. Due to lower ginning outturn, Shambat was withdrawn. Currently, only Barakat 90 is cultivated. Compared to Pima and Giza varieties, Barakat 90 has a low fibre strength (34 g/tex). It has an average fibre length of 35 mm and micronaire of 3.6.

**Peru, Israel and Australia**

Peru, Australia and Israel put together contribute to only about 1.3 lakh bales from around 25,000 hectares. Mostly, acclimatized Pima Cotton is grown in these areas.

**Erstwhile USSR**

ELS Cotton is cultivated in the Central Asian republics of Tadzhikistan, Turkmenistan and Uzbekistan and contributes to only about 2 lakh bales. However, the details of the varieties and species that contribute to ELS production are not known.

**China**

The domestic ELS crop of China is expected to be around 4 lakh bales grown mainly in the restive Xinjiang province. The details of the varieties and their quality are not known.

**West Indies**

West Indies is the acclaimed home of the Sea Island cotton which gave rise to several *G.barbadense* varieties world over. The American 'Sea Island" was later reintroduced in the West Indies during 1900. However, currently barbadense cotton is cultivated only in Barbados in a very limited way.

**India**

The annual production of ELS cotton in India is around 2 lakh bales. Suvin, is the only *G.barbadense* variety currently in cultivation in parts of Tamil Nadu. Even though as many as 10 interspecific hybrids are officially released for commercial cultivation, only two hybrids are currently grown. Hybrid DCH 32 is under commercial cultivation in parts of Karnataka, Tamil Nadu and Madhya Pradesh. Hybrid TCHB 213 is grown in Tamil Nadu alone.

**ELS Cotton Production and Consumption in India**

| | 2005-06 (Revised) | | 2006-07 | |
|---|---|---|---|---|
| | Metric tonnes | l. Bales | Metric tonnes | l. bales |
| Opening stock | 14,464 | 0.85 | 7,864 | 0.45 |
| Production | 30,600 | 1.8 | 34,000 | 2 |
| Import | 51,000 | 3 | 54,400 | 3.2 |
| Total supply | 96,624 | 5.65 | 96,624 | 5.65 |
| Consumption | 88,400 | 5.2 | 93,500 | 5.5 |
| Ending stock | 7,864 | 0.45 | 2,764 | 0.15 |

Source: India, Cotton and Products. Cotton Annual 2006. GAIN Report No. IN 6040

As many by seen from the above Table, India still depends on imports to meet its domestic requirements. With the carry over stocks dwindling down to 15,000 bales, urgent efforts are called for to raise the internal production.

**Fibre Quality of ELS Varieties and Hybrids in India**

| Variety | Ginning Percentage | 2.5% Span Length (mm) | Micronaire | Strength (g/tex) |
|---|---|---|---|---|
| Suvin | 29 | 40.6 | 3.4 | 32.3 |
| DCH 32 | 34 | 33.9 | 3 | 23.9 |
| TCHB 213 | 30 | 34.8 | 3.3 | 24.3 |

**Research and Development Efforts**

The current demand for ELS cotton in India is estimated around 9.0 lakh bales and is expected to increase to 15 lakh bales by 2010. Even though, world's ELS production is expected to recover to 41 lakh bales during 2006-07, in view of the increased consumption expected from countries like China, Pakistan and India and the expected abolition of farm subsidy, the prices are not likely to decline. The Textile Industry fears that the current international rates of ELS cotton and market resistance to increase the super fine yarn price would render the conversion of ELS cotton to high count yarn non-remunerative. As India accounts for 40 per cent of the global share in the fine and superfine cotton yarn trade, the country's R & D efforts should address on the issues regarding enhancing fibre quality parameters, and increasing production and productivity.

**Increased Suvin Production**: The past experience has shown that Suvin cotton can be cultivated in canal irrigated tracts of Karnataka, Coastal districts of Andhra Pradesh and the winter irrigated tracts of Tamil Nadu. The user industry must come in a big way to identify areas in these regions and through contract farming and remunerative prices encourage Suvin cultivation. Increasing the minimum support price for Suvin or partially compensating the farmers for the high cost of production may encourage more farmers to cultivate Suvin.

**Increased Production of Interspecific Hybrids:** Among the interspecific hybrids, only DCH 32 is currently under cultivation in parts of Karnataka, Tamil Nadu and Madhya Pradesh. TCHB 213 is popular in parts of Tamil Nadu. All out efforts should be taken by the State Agricultural Universities, Department of Agriculture and the industry to encourage its cultivation in the irrigated areas with the latest cultivation practices. Parts of Gujarat, Maharashtra, Orissa and Madhya Pradesh have potential to grow inter specific hybrids. These areas should be explored more intensely through Front Line Demonstrations and other developmental activities. Maintenance breeding and hybrid seed production activities needs to be streamlined.

**Bt Cotton Hybrids:** Development and release of interspecific Bt Cotton hybrids opens up new avenues for increasing the ELS production in the country. Efforts should be made to produce sufficient quantity of seeds of the interspecific Bt cotton hybrids viz., MRC 6918 Bt, RCHB 708 Bt and saturate the interspecific areas with these hybrids.

**Research Efforts**

**Development of Improved *G. barbadense* genotype**

Improvement of *G.barbadense* cotton should be viewed in terms of seed cotton yield, ginning percentage and earliness. Hence, increased productivity in barbadense cotton should collectively address the problem of earliness, higher ginning outturn and seed cotton yield. As compared to the Pima and Giza varieties, Suvin cotton

suffers from low micronaire and inadequate fibre strength. Current breeding strategies need to be oriented towards improving both. Research efforts currently undertaken indicate the possibility of increasing the yield and ginning out turn. However, more efforts are needed to increase the fibre quality. Attempts should be made to use molecular markers to identify quantitative trait loci (QTL) governing fibre quality characters, map them and introduce them into a wide variety of populations through Marker Assisted Selection (MAS).

**Development of Interspecific hybrids**

The available interspecific hybrids, viz., DCH 32 and TCHB 213, though high yielding often suffer from low micronaire. The fibre strength also do not meet the CIRCOT norms for 80s cotton. Hence, more efforts are necessary to increase micronaire and strength. Population improvement and synthesis of heterotic pools to develop superior parents and high yielding hybrids with improved fibre quality should receive greater attention. The currently tested hybrids in the national trials show marked improvement in yield with better micronaire and strength.

**Evaluation of interspecific hybrids**

| Hybrid | Seed cotton yield (kg/ha) | Ginning % | 2.5% Span Length (mm) | Micronaire | Strength (g/tex) |
|---|---|---|---|---|---|
| JKCHB 214 | 1496 | 33 | 34.5 | 3.6 | 26 |
| USHB 25 | 1484 | 33 | 34.7 | 3.4 | 26.1 |
| ARBHB 943 | 1388 | 33 | 34.5 | 3.7 | 23.9 |
| RAHB 710 | 1431 | 33 | 34.1 | 3.9 | 24.8 |
| DCH 32 (C) | 989 | 35 | 36.5 | 3.4 | 24.8 |

Ref: AICCIP Project Coordinators Report, 2006

**Biotechnological approaches for cotton fibre quality improvement**

Biotechnological approaches in cotton has led to quantum leaps in cotton improvement, productivity and protection against biotic and abiotic stresses through use of modern molecular techniques like genetic engineering, tissue culture, embryo rescue, marker assisted selection employing molecular markers viz., RFLPs, RAPD, Microsatellites, SSRs and AFLPs etc. In addition to insect resistance and herbicide tolerance, a broad range of other traits that need urgent attention through modern biotechnology are agronomic performance, stress tolerance, fibre quality and yield potential. Cotton fibre quality, in the past has been improved by classical plant breeding techniques; however, this approach has become limited by species incompatibility and available traits. Fibre length, micronaire, uniformity and fibre strength are all components of fibre quality that are subject to modification. It could be very useful to reduce the variability of length or to double the strength based on the understanding of the molecular biology of fibre development and it is possible that a few critical genes involved in fibre development, such as extensin, expansin or cellulose synthase may have profound effects on fibre quality and yields. Moreover,

in addition to the natural developmental genes of fibre, the possibilities increase for protein based polymers being incorporated into cotton fibre, which could increase fibre strength, water absorption, thermal characteristics and dye binding. Other textile needs include improved wrinkle resistance, crease retention, moisture absorbency, flammability, anti -microbial properties, and colour retention. While numerous possibilities can be imagined, the biology of cotton fibres imposes a strict reality. Because the cotton fibre is a single cell, it has been difficult to obtain accumulation of high levels of functional substances in the fibre. Also, cotton's crystalline cellulose structure most likely affects a many quality parameters that give cotton its desirable traits as a textile fibre; so disruption of the structure could be harmful to its main use. Furthermore, most of these fibre quality traits are determined by largely unknown complex biochemical interactions. This may make it difficult to achieve significant improvements through the transfer of single genes. Nevertheless, the rapidly expanding field of genomics applied to cotton fibre development may allow a better understanding of the molecular mechanisms that underlie the different components of fibre quality. Through a better knowledge of gene function and interaction, and of the regulatory processes that control metabolic pathways that impact fibre properties, it may be possible to identify genes that play a key role in fibre quality, and whose manipulation will ultimately impact output traits of primary interest to the farmers and textile industry.

**Summary**

World ELS Cotton area and production declined to 6.45 lakh hectares and 33.11 lakh bales, respectively from 7.35 lakh hectares and 43.11 lakh bales. This leads to sharp increase in prices in the international market. The global output of ELS cotton is expected to increase by 24 percent to 7 lakh tonnes during 2006-07. However, with an annual production of only 2.0 lakh .bales in India as against the demand of 9.0 lakh bales substantial imports are likely to bridge the gap. With the international prices remaining high and market resistance to increase the super fine yarn price, conversion of ELS cotton to high count yarn, is likely to become non-remunerative. Hence, urgent efforts are called for to increase the production and productivity of Indian ELS Cotton.

Phy. 800 Pima and DP 340 Pima are the important Pima varieties in USA, while Giza 88, Giza 70 and Giza 86 constitute the bulk of the Egyptian varieties. Barakat 90, even though a shade inferior to Pima and Giza varieties, constitutes the major ELS variety in Sudan. In India, Suvin is the only ELS variety with a fibre length of 35 mm and above. In India the interspecific hybrids constitute substantially to the ELS cotton production. DCH 32 and TCHB 213 are the popular hybrids. Bt cotton private sector ELS hybrids *viz.,* MRC 6918, RCHB 708 Bt, Kashinath Bt, NCHB 990, NCHB 992 and KDCHB 407 may contribute towards increased ELS production in the coming years. Better developmental efforts are called for to extend the ELS cotton area in the country while urgent research efforts to increase yield and quality will go a long way in making the ELS production more remunerative to the farmers.