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Impact of Bt Cotton in India

EXPERT's Column

Dr K.R. Kranthi

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The views expressed in this column are his own and not that of Cotton Association of India)

There has been a constant debate on the impact of genetically modified (GM) cotton. In India, thus far, GM cotton is available only in the form of Bt (Bacillus thuringiensis) cotton. The Bt cotton technology developers, seed companies and some researchers claim that Bt cotton doubled the yields, reduced insecticide usage by 50%, improved quality of cotton and thus farmers prospered. However, some activists allege that Bt cotton has aggravated the cotton crisis, especially in the dry tracts of Vidarbha. The allegations also point out that 'Bt-cotton is unsuitable for rainfed regions', 'insecticide usage has increased with Bt-cotton', 'input usage has increased with Bt-cotton', 'India's yields stagnated irrespective of the increase in Bt-cotton area' and bio-safety issues were not examined independently and stringently. Further some activists tried to associate goat and sheep deaths to feeding on Bt cotton.

A book 'Bt Cotton Q&A' written by Kranthi addressed some of these questions. The book published in 2012 by the ISCI (Indian Society for Cotton Improvement), Mumbai, can be downloaded from http://www.cicr.org.in/pdf/Bt_book_Kranthi.pdf

Excerpts from the book are summarised below, primarily to give the reader a perspective on the overall impact of Bt cotton in India. I am presenting some basic aspects of what Bt cotton is, before the impact can be properly understood.

Bacillus thuringiensis (Bt): Bt is a soil bacterium that produces many proteins which act as stomach poisons only to some worm species that eat crops, but are considered safer to cattle and human beings. The bacteria produce three types of proteins, crystal (cry), cytolytic (Cyt) toxins and vegetatively expressed insecticidal proteins (vip). For more than 50 years, in many parts of the world, Bt formulations were used as eco-friendly sprays on crops to control caterpillar worms. Thus far, until November 30, 2013, scientists discovered that about 67 different Bt species produced 402 proteins that are more specifically toxic to insects. These include 286 cry toxins, 11 cyt toxins and 105 vip toxins. Bt sprays are now used in many countries mostly on vegetables in integrated pest management (IPM) programmes.

Bt Cotton: Cotton plants producing Bt-cry proteins in all plant parts are called Bt cotton. First, a gene from the Bt cells is isolated and introduced into the cell of a cotton plant. The single cell of the cotton plant is then developed into a full plant through tissue culture. This Bt cotton plant produces the Bt protein in all its cells. Thus when target insects eat any plant part, they will die. A general biological rule is that 'one gene produces one protein'. A gene is a chemical micro thread of fixed length that codes for a specific protein. The genes of crystal (cry) proteins called cry1Ac and cry2Ab were introduced into cotton first by Monsanto, USA. Bt cotton was

The three cotton bollworms

American bollworm Pink bollworm Spotted bollworm

introduced into India as Bollgard (one gene cry1Ac) in 2002 and Bollgard-II (two genes cry1Ac+cry2Ab) in 2005.

A record number of 1128 Bt cotton hybrids: Hybrid cotton area in India reached 40% by the year 2001 in over 30 years since its inception in 1971. In 2013, more than 95% of India's cotton area was under hybrids. Interestingly, a total number of 40 hybrids were released by the public sector institutions in 40 years. With the advent of Bt cotton by the private sector, the scenario changed completely. In just five years between 2006 and 2011, about 800 new hybrids were released into the market. Bt cotton was first introduced In 2002 after the Genetic Engineering Approval Committee (GEAC) approved Bt cotton, Mahyco (Maharashtra Hybrid Seeds Company) released three hybrids MECH-12, MECH-162, and MECH-184 for commercial cultivation in central and south Indian cotton–growing zones. By 2005, there were 20 hybrids including some popular ones from Rasi and Nuziveedu seeds. In 2006, Nath Seeds and JK seeds released their new Bt cotton events with different version of the cry1Ac gene. Subsequently Metahelix India released the cry1C based Bt cotton. There was a steady increase in the number of Bt cotton hybrids available in the market. By 2012 there were 1128 Bt cotton hybrids.

Tissue cultured cotton plants

Genetically Modified Bt cotton Plants can be developed from a single cell through tissue culture after the Bt gene is introduced into the cell.

Bacillus thuringiensis

The black colored crystal protein can be seen in the cell. Insects eat this and die.

Bt cotton captured the market: Within six years after its approval in 2002, by 2008, Bt cotton occupied 80% of India's cotton area. The area increased significantly to 120 lakh hectares by 2011, with about 30 to 35 lakh hectares of new additions. The new areas were mainly, about 15 lakh hectares in Gujarat and 10 lakh hectares each in Andhra Pradesh and Maharashtra.

The main reason for the immense popularity was the bollworm menace. By the year 2000, the American bollworm emerged as a major terror to cotton producers. Insecticide usage was rampant. Insecticide cocktails were tank-mixed and 20-30 applications were not uncommon. Despite the excessive usage, the bollworm continued to survive and cause damage to cotton. The normal damage to yields ranged from 15% to 50% and the bollworm could cause a complete crop failure in outbreak years. The bollworm menace caused a decline in cotton area from 87 lakh hectares in 2001 to 78 lakh hectares in 2002. The introduction of Bt cotton in 2002 which gave spectacular protection against the three bollworms, including the American bollworm, resulted in a resurgence of cotton.

Strong impact on cotton farming: Despite anything that may have been said or written against Bt cotton, it is clear that farmers endorsed the technology and there is a huge continued demand. There has been shortage in specific brands and instances of farmers standing in long queues to obtain specific hybrid brands are common. Studies conducted by the Central Institute for Cotton Research, CICR Nagpur showed that Bt cotton effectively controlled bollworms, especially the American bollworm, Helicoverpa armigera, thus preventing yield losses from an estimated damage of 30.0% to 60.0% each year in India thus far for a decade from 2002. The usage of insecticide reduced and quality of the harvested cotton improved significantly.

Reduction in insecticides: Before 2001, more than 1.0 kg insecticide active ingredient was used per hectare on cotton. After 2005, it declined to 0.6 kg per hectare due to the impact of Bt. Similarly insecticides worth Rs 1084/ha were used during 2001-2004 on an average annually, which declined to an annual average of Rs 771/ha during 2005-2011. Cotton consumed 13,176 M tonnes which was 46% of the total insecticides used in India in 2001. Introduction of Bt cotton in 2002 resulted in a significant decline to 4623 M tonnes, which was less than 21% by 2006. For bollworm control, the reduction in insecticide usage was spectacular. Over 10 years from 1995 to 2004, the average insecticide use for bollworm control was 6767 M tonnes per year, which reduced to an average of 1089 M tonnes per year after 2005. However the average usage of insecticide for sucking pest control was 3335 M tonnes during 1995 to 2004, which increased to an average of 4600 M tonnes during 2005 to 2011, because of the increase in area of hybrid cotton from 40% in 2001 to 94% in 2011.

No more fear of bollworm attacks: The widespread cultivation of Bt cotton over the past ten years also reduced the intensity of bollworms significantly on cotton and also on other host crops. Clearly, there have been no outbreaks of the American bollworm after 2001 either on cotton or other subsequent crops such as chickpea and pigeonpea. Bt cotton also helped farmers to overcome the fear of impending bollworm infestations and the associated stress of using deadly cocktails of insecticide mixtures.

Healthy bolls and better fibre quality: Bt cotton protects bolls from damage caused by bollworms and thus the proportion of bollworm affected 'bad-kapas' in Indian cotton became almost negligible. Generally, any damage to the green bolls aggravates further damage by secondary pathogens or other insects, thus leading to bad boll opening and poor fibre quality. Moreover, the general quality of cotton becomes bad because of the mixing with affected poor quality bolls. Prior to 2004, Indian cotton was less respected in the global markets because of such poor quality. Studies conducted by CICR and CIRCOT (Central Institute for Cotton Technology, Mumbai) showed that the quality of seed-cotton and fibre from Bt-cotton fields was found to be significantly superior than non-Bt cotton. Bt cotton did not have any adverse effects on fibre quality. However, the textile industry pointed out that micronaire (fineness) value declined in the later pickings. Incidentally, the trash content in Indian cotton also reduced because of good boll opening and better picking. The introduction of Bt cotton also brought about a major changes in the proportion of long staple cotton in the country. About 80% of Indian cotton is now of the long staple category. Prior to 2002, long staple cotton production was only 38% of the total cotton.

Advantage of early harvest: Bt cotton conferred other advantages such as more balanced plant growth, earliness and determinate habit, because of the effective protection of early fruiting parts and higher retention of first formed bolls due to low damage to fruiting point and bolls. Protection of the first flush resulted in 2 to 3 week early maturity of the crop in many hybrids in many parts of the country. Due to early retention of bolls in Bt cotton hybrids, the boll bursting commenced nearly 15-20 days in advance and required lesser number of pickings to complete the harvest. There have been several added benefits to this. In North India, farmers were able to take up wheat cultivation immediately after early harvest of cotton. The number of picking reduced and the yield per each of the few pickings, increased. Farmers were able to get remunerative returns because of higher prices generally prevalent early in the market during the initial cotton arrivals.

Increase in export reduced imports: The quality of Indian cotton which was hitherto considered as inferior, is now acceptable internationally as export quality, with improvement in quality after the introduction of Bt cotton. India became a leading global exporter of raw cotton with exports averaging at 53 lakh bales over nine years from 2003-2011 compared to an average of 1.18 lakh bales during the years 1997 to 2002 prior to the introduction of Bt cotton. Indian cotton exports reached an all time high of 128 lakh bales in 2011. Imports declined from an average of 16.50 lakh bales over 6 years between 1997 to 2002, to an average of 6.9 lakh bales over 9 years from 2003 to 2011. In 2001, 25.3 lakh bales were imported which plummeted to lakh bales in 2.4 in 2010.

Criticism: There are issues related to Bt cotton in India, which must be addressed. Activists have been highlighting these. Primarily the main issue relates to hybrids and Bt technology per-se. A survey of global impact of Bt cotton shows that the potential of Bt technology was not harnessed in India to its fullest potential, mainly because Bt was available only as hybrids and not as varieties. India is the only country in the world to use Bt hybrids in such an extensive manner. It wouldn't have been a matter of concern if the extensive cultivation of hybrids in 95% area of the country would have catapulted India to the top rank in the world. Unfortunately that is not the case. Despite such a brilliant technology as Bt in the much touted high yielding hybrids and the best of all available technologies, India ranks 32nd in productivity out of the 80 cotton growing countries. This ranking leaves India behind at least 20 countries which do not have Bt cotton and behind 31 countries which cultivate only varieties and not hybrids. Hybrids are inherently designed to perform best under high input conditions. Many of the hybrids available in the India are of long duration and are not ideally suited for rain-fed tracts, which suffer from severe soil moisture deficit during the boll formation stage. Many hybrids are susceptible to many insect pests and diseases and need chemical inputs for effective protection, thus diminishing the advantage that Bt cotton gives by reduction of chemicals for bollworm control. The high cost of hybrid seed production also contributed to spurious seed in the market and concomitant poor quality of the fibre. The problems of yield stagnation and resurgence of insecticide usage over the past 6-7 years is primarily because of the insistence on hybrids for Bt and also because of the long list of hybrids which were approved for cultivation in rain-fed regions without ascertaining their suitability for rainfed soils that constitute 60% of Indian cotton area. However, it must also be stated that the yields in Vidarbha have also increased after Bt cotton was introduced, but the input costs increased as well. On a comparative note with other rain-fed regions of the world such as Brazil, the productivity of Vidarbha is five-fold less.

Field experiments conducted at CICR showed that goats were healthy even after feeding in Bt cotton fields continuously for three months. Such studies must be conducted by veterinary institutions under the aegis of the GEAC to reconfirm safety.

Other criticisms relate to the decrease in varieties available to farmers, which would have enabled them to use farm saved seeds. It is true that the strong Bt hybrid market has had a negative impact on the availability of varieties. CICR has taken up active initiatives to conserve and maintain seeds of the varieties that were released in India. The institute is also promoting varieties that can be cultivated by farmers for high yields with low inputs especially in rain-fed tracts where hybrids are not very suitable. The seed and chemical input costs have sky-rocketed over the past 3 to 4 years and rain-fed farmers face the heat of high production costs that do not commensurate with the market prices. There is thus an imminent need to develop technologies that can obtain hig h yields with low input costs in a sustainable manner. This can happen with varieties and certainly not with hybrids which cannot be sustainable for the entire cotton growing tracts of India.

Sustainability in Cotton Production: A Summary of the SEEP Report

During the 72nd Plenary Meeting, the ICAC received a report from its Expert Panel on the Social, Environmental and Economic Performance of Cotton Production (SEEP), "Measuring sustainability in cotton farming systems: Towards a guidance framework." SEEP provided recommendations about the indicators that should be used to measure sustainability in cotton production. The recommended indicators cover the three pillars of sustainability: social, environmental, and economic. The Executive Summary of the Report is available online at https://www.icac.org/cmte/Social,-Environmental-Economic-Performance-SEEP/Documents?lang=en-US

The report was commissioned in the belief that standardizing the indicators by which the performance of the global cotton industry is measured will allow for more focused data collection, and thereby improve the ability of the cotton industry, as a global entity, to understand, report on, and improve its social, environmental and economic performance. Better data on the impacts of cotton production will also better enable the cotton industry to identify and defend its achievements.

During his presentation at the Plenary Meeting, Mr. Allan Williams, Chair of SEEP, noted that other links of the supply chain are developing tools to assess the performance of cotton growing as part of a wider assessment of the impacts of a whole range of raw materials used by them (such as the clothing 'footprint' calculator developed by the Waste and Resource Action Plan, Made By's environmental benchmark for fibers, and the Higg Index adopted by the Sustainable Apparel Coalition). SEEP considers that there is an opportunity for cotton demand expansion if the cotton sector can provide good quality data on the improvements being made in how cotton is produced.

The Measuring Sustainability Report proposes a set of recommended indicators that could act as the starting point for anyone working with cotton farmers – governments, industry organizations, development agencies, funders and voluntary standards initiatives – as the basis for their reporting. The list of recommended indicators is not being proposed as mandatory, neither with the objective of providing a pass/fail grade, neither that all recommended indicators need to be collected by any one country or initiative. The report provides sufficient details to enable readers to undertake their own prioritization of indicators based on their individual circumstances.

The list of 68 recommended indicators was compiled from a list of nearly 200 indicators using three criteria:

Their relevance: how well does the indicator align with sustainable development priorities at the global level, and for the cotton industry more specifically?

Their feasibility: how practical is it to actually collect the information, considering: the costs involved, the availability of information and the likely accuracy of the data collected?

Their usefulness: how well does the indicator link the activity being measured and the outcomes sought: is it a logical and significant link, and is the information comparable?

The scores for each of these criteria were then assessed for 'balance', i.e. if there was too large a difference between average scores for the three different criteria for an indicator, the indicator was assessed as 'unbalanced' and potentially less relevant. Lastly, the inclusion or exclusion of each indicator was reviewed by SEEP.

During the Plenary Meeting, more than 160 participants discussed potential implementation approaches for the proposed indicators framework at 19 so called World Café tables in the 5 official languages of ICAC. Most of the discussion groups agreed on the following three aspects:

1. The measurement framework needs country-specific implementation structures. From an international perspective, the cotton sector is too heterogeneous to allow the same model to be rolled out in all cotton producing countries.

2. The implementation of the framework should not lead to any discrimination of any country or region within the cotton sector.

3. An idea that was developed by several tables was to establish a national multi-stakeholder consultation board to jointly define the implementation steps and the roles of different national value chain actors in order to share the responsibilities of data collection.

The controversial issues listed by the discussion groups were:

- Should the data collection be voluntarily or compulsory?
- Should it work via self assessments or via third party assessments?
- Does it aim to better compare cotton with other fibers or rather to compare different cottons within the sector?
- How will the data be used? E.g. promotion potential approved buyers' lists, internal progress
- Weighting of indicators to construct an index?
- What is the optimal number of indicators to be used in each case?

The groups came with creative and substantial suggestions regarding the measures that could be taken to prepare the implementation of the sustainability metrics:

- Conduct pilot studies to test the feasibility of each indicator
- Compile an inventory of already existing national and local data gathering schemes to identify synergies
- Develop capacity building schemes for people that are assigned for data collection (e.g., as mandated by the national boards as mentioned in suggestion 3)
- Develop a scheme that allows learning from the data and aiming at improving production.

There was a consensus among plenary meeting participants that any framework for measuring sustainability needs to be implemented on a country-by-country basis, and that committees should be formed in each country to create the initial framework of metrics and to ensure that the framework is updated as production practices evolve.

The Plenary Meeting accepted the recommendations of the SEEP Panel, recognizing that discussions of sustainability are ongoing. Representatives of governments and the private sector pledged to consider how best to implement the recommendations of SEEP in their countries.

(Source: Cotton Review of the World Situation)

Chalenges of Inter-fiber Competition: A Summary of the TFCF Report

Trends in Cotton's Market Share

ICAC research indicates that increased business risks stemming from higher and more volatile cotton prices, recession followed by weak and decelerating economic growth in industrialized countries, and the economic slowdown in developing countries contributed to the loss of 9 percentage points of the market for cotton textiles between 2007 and 2012. Cotton consumption at the retail level declined in all regions, although more strongly so in industrialized countries. Non-cotton fiber consumption, on the other hand, increased by 29% to 55.3 million tons between 2007 and 2012, mostly during the recovery that started in 2009. So not only did noncotton textiles cover the demand destruction observed in cotton textiles, but they also satisfied the increasing needs of a bigger and higher earning world population.

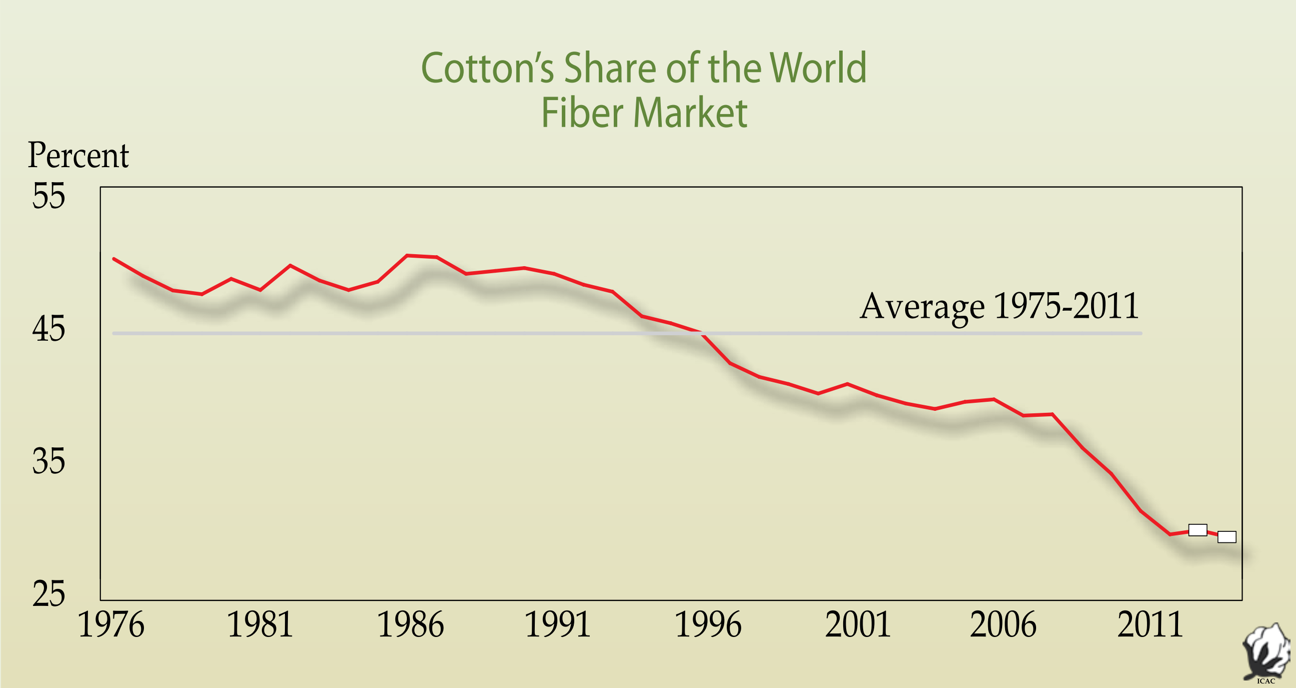
The market share of cotton declined from 38.4% in 2007 to 31.5% in 2011 and to 29.8% in 2012. While according to the ICAC Textile Demand Model a moderate rebound to 30.1% is projected in 2013, the projected increase assumes that cotton prices will remain competitive with polyester prices and postponed consumption of cotton goods in industrialized countries in 2010-2012 will spur cotton demand.

Factors Behind the Decline

The ICAC's Task Force on Competing Fibers (TFCF) presented a report to the 72nd Plenary Meeting of the ICAC that listed several factors that undermine the competitiveness of cotton and put forward a number of suggestions for government, industry and ICAC action. Price volatility, quality controls and the perceived value of cotton in the market are three areas that affect the competitiveness of cotton.

Price volatility can be caused by factors such as weather, speculation or changes in demand. However, government policies and direct interventions have the biggest impacts on cotton price volatility, because of the usual magnitude and unanticipated nature of those interventions.

Governments were urged to avoid interventions in cotton markets, since the damaging consequences can increase price volatility, endanger contract sanctity, disrupt trade and cause a loss of market share to fibers with more stable prices.



Improving quality control through testing and identification helps improve cotton's competitiveness. The task force recommends continued support of the Commercial Standardization of Instrument Testing of Cotton (CSITC) task force's work on standardization of HVI, which is a leadership role for ICAC.

The cotton industry and governments were urged to strengthen efforts to improve efficiency by adopting standardized instrument testing, developing a standardized bale identification system, and adopting the FAO model phytosanitary certificate.

The Task Force indicated that in order to improve cotton's value in the market, consumers need to know what they are buying (why labeling is important) and the cotton industry needs to promote the social and environmental benefits of cotton by using the results of the Expert Panel on Social, Environmental and Economic Performance of Cotton Production (SEEP) and coordinating promotion efforts through the International Forum for Cotton Promotion (IFCP).

Governments were urged to introduce and/or enforce fiber content labeling requirements to enable consumers to exercise preferences in favor of cotton. The ICAC Secretariat was urged to take a more proactive role in answering public criticisms of the cotton industry.

Other Challenges

Speculation

The Task Force could not reach an agreement on how much speculation promotes liquidity or causes high volatility. Key issues lie in the transparency of government programs and their implementation, constraints by some countries on investing in international markets and limited delivery points for the cotton futures contract operated by the Intercontinental Exchange (ICE). Members agreed that where regulatory oversight is appropriate, programs should be implemented transparently. Uncertainty regarding government policies and inadequate statistics contribute to uncertainty and lead to poor decision making.

Governments were urged to heighten

transparency in cotton polices, improve systems of providing statistics, and ensure that the industry has access to tools of price risk management.

Identifying the Benefits of Cotton

It was noted that sustainability issues are becoming increasingly important for major brands and retailers and much work needs to be done on communicating and educating consumers on the sustainability of cotton production.

There is a critical need to provide reliable information to the public on cotton production vis-à-vis production of other fibers: use of renewable vs. non-renewable resources, economic development opportunities in cotton, and the benefits of using cotton for the human body and skin.

Members conducted a literature review on the technical benefits of cotton in comparison to viscose and polyester fibers. Studies indicate that the technical benefits of cotton include considerably more resistance to abrasion and wear than the other fibers. Cotton garments have good moisture absorption capacity and have good aesthetic appearance for a longer time, suggesting an additional sustainability component. Research documented that cotton scores higher on several positive effects on the human body than polyester: level of immunoglobulin A, sebaceous gland activity, parameters of oxidative stress and muscle tension. Cotton or linen bedding have the most positive influences on human rest and sleep quality. The general conclusion of the study was that garments made of cotton, in contrast to polyester garments, positively influence human physiology, ensuring the most favorable environment for the human body. The best uses for cotton textile are: home textiles and garments including underwear, outerwear, children's wear, and apparel for everyday life, work, leisure, sleep and others. There are also excellent opportunities for cotton in cosmetic and medical textiles.

The Task Force urged the cotton industry to communicate the positive attributes of cotton for the environment, economy and human health and wellbeing.

(Source: Cotton - Review of the World Situration)

UPCOUNTRY SPOT RATES

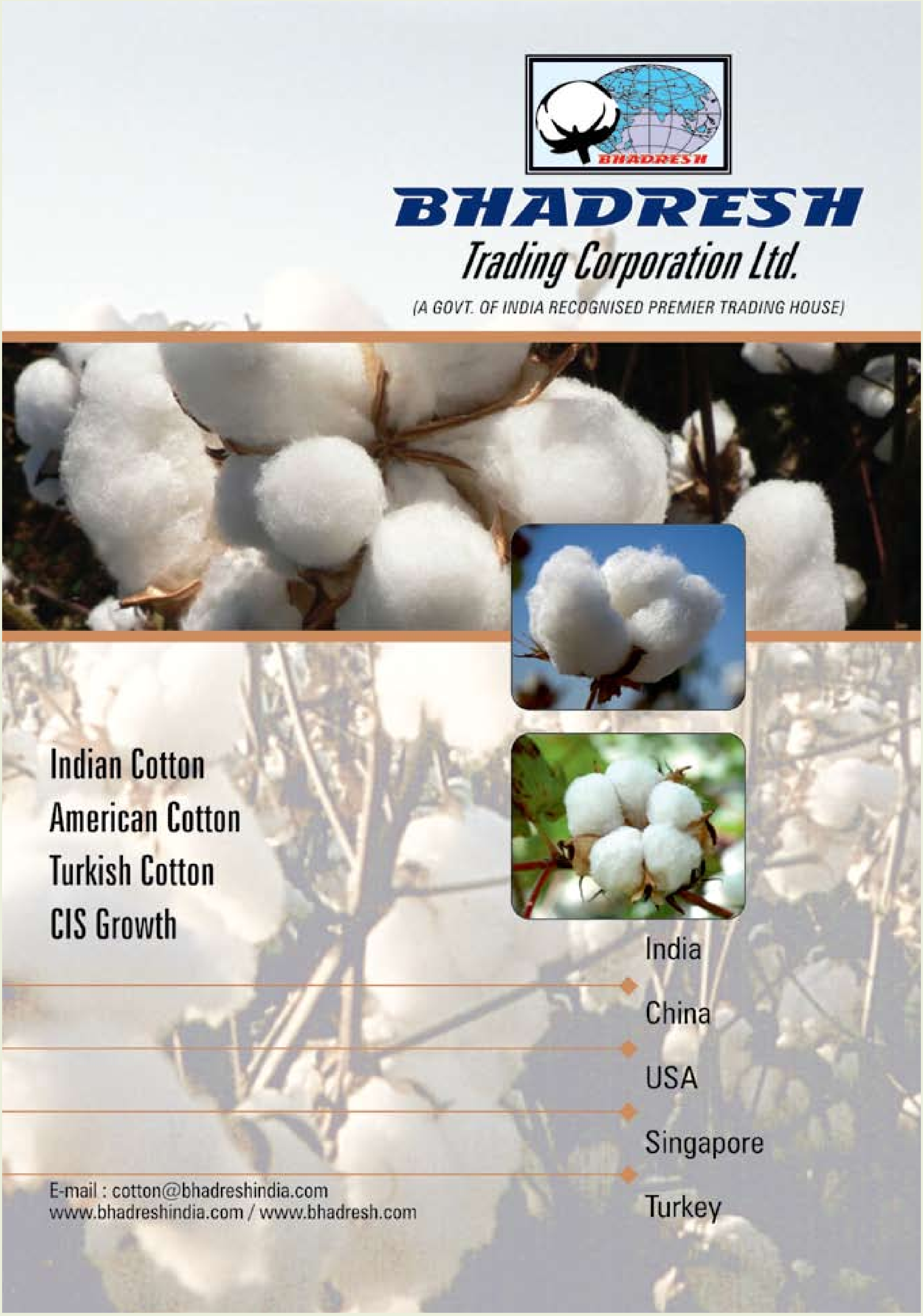
(₹\Quintal)

November 2013

2013-14 Crop

Growth	P/H/R	P/H/R	GUJ	KAR	M/M	P/H/R	M/M/A	M/M/A	P/H/R	M/M/A	M/M/A	P/H/R	M/M/A	GUJ	M/M/A/K	GUJ	M/M/A/K	M/M/A/K/T/O	K/A/T/O	M(P)/K/T
G. Standard	ICS-101	ICS-201	ICS-102	ICS-103	ICS-104	ICS-202	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-105	ICS-106	ICS-107
Grade	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Fine
Staple	22 mm	22 mm	22 mm	23 mm	24 mm	26 mm	26 mm	26 mm	27 mm	27 mm	27 mm	28 mm	28 mm	28 mm	29 mm	29 mm	30 mm	31 mm	32 mm	34 mm
Micronaire	5.0-7.0	5.0-7.0	4.0-6.0	4.0-5.5	4.0-5.5	3.5-4.9	3.0-3.4	3.5-4.9	3.5-4.9	3.0-3.4	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.5-4.9	3.0-3.8
Strength/GPT	15	15	20	21	23	26	25	25	26	26	26	27	27	27	28	28	29	30	31	33
1	11332	11642	7986	9280	10573	N.Q.	N.Q.	N.Q.	11557	N.Q.	N.Q.	11754	11332	11248	11389	11445	11529	11698	11810	14904
2	11332	11614	7986	9280	10545	N.Q.	N.Q.	N.Q.	11501	N.Q.	N.Q.	11698	11248	11164	11304	11360	11445	11614	11726	14904
4		...		...		...		...		HOLIDAY				...		...		...		
5		...		...		...		...		HOLIDAY				...		...		...		
6	11332	11614	8042	9280	10545	N.Q.	N.Q.	N.Q.	11501	N.Q.	N.Q.	11698	11164	11192	11248	11360	11445	11614	11726	14904
7	11332	11614	8042	9280	10545	N.Q.	N.Q.	N.Q.	11670	N.Q.	N.Q.	11867	11164	11192	11304	11417	11389	11473	11585	14904
8	11473	11754	8042	9280	10404	N.Q.	N.Q.	N.Q.	11473	N.Q.	N.Q.	11670	11192	11192	11332	11389	11389	11473	11585	14904
9	11473	11754	8042	9280	10404	N.Q.	N.Q.	N.Q.	11276	N.Q.	N.Q.	11501	11192	11192	11332	11389	11389	11473	11585	14904
11	11585	11867	8042	9280	10404	N.Q.	N.Q.	N.Q.	11332	N.Q.	N.Q.	11557	11248	11276	11389	11445	11445	11529	11642	15044
12	11698	11979	8042	9280	10404	N.Q.	N.Q.	N.Q.	11417	N.Q.	N.Q.	11642	11304	11332	11445	11501	11529	11614	11698	15185
13	11698	11979	8042	9280	10404	N.Q.	N.Q.	N.Q.	11389	N.Q.	N.Q.	11614	11248	11276	11389	11445	11473	11557	11642	15185
14	11698	11979	8042	9280	10404	N.Q.	N.Q.	N.Q.	11276	N.Q.	N.Q.	11501	11192	11220	11332	11389	11417	11501	11585	15185
15	11642	11923	8042	9280	10404	N.Q.	N.Q.	N.Q.	11248	N.Q.	N.Q.	11473	11107	11135	11248	11304	11332	11417	11501	15185
16	11642	11923	8042	9280	10404	N.Q.	N.Q.	N.Q.	11192	N.Q.	N.Q.	11389	11023	11051	11164	11220	11248	11332	11417	15185
18	11360	11642	8042	9280	10404	N.Q.	N.Q.	N.Q.	10967	N.Q.	N.Q.	11192	10854	10882	10995	11051	11079	11164	11248	15185
19	11360	11642	8042	9280	10404	N.Q.	N.Q.	N.Q.	11107	N.Q.	N.Q.	11304	10939	10995	11079	11164	11192	11248	11304	15325
20	11360	11642	8042	9280	10404	N.Q.	N.Q.	N.Q.	11107	N.Q.	N.Q.	11360	10995	11051	11135	11220	11248	11304	11360	15466
21	11220	11501	8042	9280	10404	N.Q.	N.Q.	N.Q.	11192	N.Q.	N.Q.	11445	11023	11107	11164	11276	11304	11360	11417	15466
22	11220	11501	8042	9280	10404	N.Q.	N.Q.	N.Q.	11192	N.Q.	N.Q.	11445	10967	11051	11107	11220	11248	11304	11417	15607
23	11220	11501	8014	9223	10348	N.Q.	N.Q.	N.Q.	11051	N.Q.	N.Q.	11304	10882	10939	11023	11107	11164	11220	11332	15466
25	11360	11585	7958	9139	10123	N.Q.	N.Q.	N.Q.	11051	N.Q.	N.Q.	11332	10826	10854	10967	11023	11079	11192	11304	15747
26	11276	11501	8014	9280	10208	N.Q.	N.Q.	N.Q.	11023	N.Q.	N.Q.	11304	10911	10939	11051	11107	11164	11276	11389	15888
27	11135	11360	8014	9280	10208	N.Q.	N.Q.	N.Q.	10967	N.Q.	N.Q.	11248	10854	10882	10995	11051	11107	11220	11360	15888
28	11135	11360	7958	9223	10151	N.Q.	N.Q.	N.Q.	10826	N.Q.	N.Q.	11107	10770	10798	10911	10967	11023	11135	11276	15888
29	11135	11360	7902	9167	10095	N.Q.	N.Q.	N.Q.	10770	N.Q.	N.Q.	11051	10714	10742	10854	10911	10967	11079	11220	15888
30	11135	11360	7902	9167	10095	N.Q.	N.Q.	N.Q.	10742	N.Q.	N.Q.	11023	10714	10742	10854	10911	10967	11079	11220	15888
H	**11698**	**11979**	**8042**	**9280**	**10573**	-	-	-	**11670**	-	-	**11867**	**11332**	**11332**	**11445**	**11501**	**11529**	**11698**	**11810**	**15888**
L	**11135**	**11360**	**7902**	**9139**	**10095**	-	-	-	**10742**	-	-	**11023**	**10714**	**10742**	**10854**	**10911**	**10967**	**11079**	**11220**	**14904**
A	**11381**	**11650**	**8015**	**9260**	**10362**	-	-	-	**11201**	-	-	**11437**	**11036**	**11061**	**11167**	**11236**	**11274**	**11370**	**11473**	**15337**

H = Highest L = Lowest A = Average N.Q. = Not Quoted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UPCOUNTRY SPOT RATES

(Rs./Qtl)

Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [By law 66 (A) (a) (4)]							Spot Rate (Upcountry) 2013-14 Crop NOVEMBER 2013					
Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Strength /GPT	25th	26th	27th	28th	29th	30th
1	P/H/R	ICS-101	Fine	Below 22mm	5.0 – 7.0	15	11360 (40400)	11276 (40100)	11135 (39600)	11135 (39600)	11135 (39600)	11135 (39600)
2	P/H/R	ICS-201	Fine	Below 22mm	5.0 – 7.0	15	11585 (41200)	11501 (40900)	11360 (40400)	11360 (40400)	11360 (40400)	11360 (40400)
3	GUJ	ICS-102	Fine	22mm	4.0 – 6.0	20	7958 (28300)	8014 (28500)	8014 (28500)	7958 (28300)	7902 (28100)	7902 (28100)
4	KAR	ICS-103	Fine	23mm	4.0 – 5.5	21	9139 (32500)	9280 (33000)	9280 (33000)	9223 (32800)	9167 (32600)	9167 (32600)
5	M/M	ICS-104	Fine	24mm	4.0 – 5.5	23	10123 (36000)	10208 (36300)	10208 (36300)	10151 (36100)	10095 (35900)	10095 (35900)
6	P/H/R	ICS-202	Fine	26mm	3.5 – 4.9	26	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.
7	M/M/A	ICS-105	Fine	26mm	3.0 – 3.4	25	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.
8	M/M/A	ICS-105	Fine	26mm	3.5 – 4.9	25	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.
9	P/H/R	ICS-105	Fine	27mm	3.5 – 4.9	26	11051 (39300)	11023 (39200)	10967 (39000)	10826 (38500)	10770 (38300)	10742 (38200)
10	M/M/A	ICS-105	Fine	27mm	3.0 – 3.4	26	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.
11	M/M/A	ICS-105	Fine	27mm	3.5 – 4.9	26	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.	N.Q.
12	P/H/R	ICS-105	Fine	28mm	3.5 – 4.9	27	11332 (40300)	11304 (40200)	11248 (40000)	11107 (39500)	11051 (39300)	11023 (39200)
13	M/M/A	ICS-105	Fine	28mm	3.5 – 4.9	27	10826 (38500)	10911 (38800)	10854 (38600)	10770 (38300)	10714 (38100)	10714 (38100)
14	GUJ	ICS-105	Fine	28mm	3.5 – 4.9	27	10854 (38600)	10939 (38900)	10882 (38700)	10798 (38400)	10742 (38200)	10742 (38200)
15	M/M/A/K	ICS-105	Fine	29mm	3.5 – 4.9	28	10967 (39000)	11051 (39300)	10995 (39100)	10911 (38800)	10854 (38600)	10854 (38600)
16	GUJ	ICS-105	Fine	29mm	3.5 – 4.9	28	11023 (39200)	11107 (39500)	11051 (39300)	10967 (39000)	10911 (38800)	10911 (38800)
17	M/M/A/K	ICS-105	Fine	30mm	3.5 – 4.9	29	11079 (39400)	11164 (39700)	11107 (39500)	11023 (39200)	10967 (39000)	10967 (39000)
18	M/M/A/K/T/O	ICS-105	Fine	31mm	3.5 – 4.9	30	11192 (39800)	11276 (40100)	11220 (39900)	11135 (39600)	11079 (39400)	11079 (39400)
19	K/A/T/O	ICS-106	Fine	32mm	3.5 – 4.9	31	11304 (40200)	11389 (40500)	11360 (40400)	11276 (40100)	11220 (39900)	11220 (39900)
20	M(P)/K/T	ICS-107	Fine	34mm	3.0 - 3.8	33	15747 (56000)	15888 (56500)	15888 (56500)	15888 (56500)	15888 (56500)	15888 (56500)

(Note: Figures in bracket indicate prices in Rs./Candy) *N.Q. = Not Quoted*