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Cotton In India At Bt Cross Roads

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EXPERT's Column

Dr. K.R. Kranthi

Cotton farming changes its colours quite frequently leading to pertinent questions on sustainability of cotton production systems in India. In 2015, a tiny insect called the pink bollworm declared clear resistance to Bt-cotton and challenged the might of a full range of multinational seed companies. Similarly, another small insect called the whitefly, declared resistance to a majority of the recommended insecticides, thus pulling the rug from under the feet of mighty chemical pesticide companies. In the short term, the genetically modified (GM) Bt-cotton technology controlled bollworms effectively and so did the wide range of insecticides. But within a few years after being effectively controlled by these powerful technologies, insects showed their prowess by emerging victorious over the potent pesticides molecules and the mighty Bt-cotton. It is baffling that the pink bollworm developed resistance to Bt-cotton in India in just seven to eight years, whereas in USA, Mexico, Australia and China, Bt-cotton is still invincible against the insect, despite the fact that Bt-cotton has been intensively adopted in these countries for 19-20 years.

How do such potent and powerful technologies crumble? Why do they bite the dust only in some countries and not in others? Is it the inherent weakness in the technology or is it poor stewardship? The pink bollworm episode in India can be blamed on the casual approach in handling the technology. In the early years of Bt-cotton in India, there was a strong perception and feeling in the minds of seed companies and regulators that Bt-cotton was all powerful and invincible against bollworms. The possibility of insect resistance to Bt-cotton was invariably greeted with scorn. IRM (insect resistance management) strategies were never taken seriously. If anything, there was a casual approach, with a counter argument that the Bt-cotton technology was still effective in the US despite being grown for a much longer period.

Needless to say, every new technology must come with a road-map for its sustainable use in consonance with ecology and environment. But this was certainly not the case with Bt-cotton in India. At least six different Bt-events were approved without any event-specific plans devised for their sustainability. Science and scientists were never taken seriously, especially when resistance issues were pointed out. More than a thousand Bt-cotton hybrids were approved within just four to five years, creating chaos for agronomy and insect pest management. As a result, the country is likely to face serious uncertainties of pest management starting this year.

Technologies are necessary and it would be wrong to prevent any technological progress, as long as high productivity through sustainable ecology is ensured. For sustainability to be ensured, it is important to develop sustainability indicators for every new technological intervention before it is introduced. This article makes an attempt to analyse the current predicament of cotton farming at Bt-cross roads from a scientist's perspective.

Pink bollworm returns back in the pink of health

Pink bollworm returned back after being out of news for about 30 years. It returned back with a bang against the mighty 'Bollgard-II® Bt-cotton'. Prima-facie analysis shows that a few important aspects of sustainability were ignored which resulted in pink bollworm resistance to Bollgard-II®. A few of these aspects are as follows:

1. **Bt-cotton in India should have been released in open pollinated varieties, not in hybrids.** Even if hybrids were a corporate necessity for value capture of the technology to ensure that farmers buy seeds every year, the Bt genes should have been in homo-zygous (two copies of each gene) condition in the Bt-cotton hybrids and not hemi-zygous (one copy of the gene) as was the case with all Bt-cotton hybrids in India. In hemi-zygous Bt-cotton hybrids of the single gene (cry1Ac), the bolls produce seeds (≈ 32) which comprise of 8 non-Bt seeds and 24 Bt seeds and in the case of two gene (cry1Ac + cry2Ab) based Bt-cotton hybrids such as Bollgard-II®, the bolls are expected to contain two non-Bt seeds, six seeds of cry1Ac, six seeds of cry2Ab and 18 seeds with cry1Ac+cry2Ab. Except India all other countries used Bollgard-II® varieties (not hybrids) wherein all the seeds contain cry1Ac+cry2Ab, and do not segregate as it happens in the bolls of hybrids in India. Segregation of toxins in the seeds inside bolls is one of the strongest factors that accelerate resistance development, especially in insects such as the pink bollworms that feed only on developing cotton seeds as their main food source. This fact was known to all experts in the field. But commercial considerations overshadowed the sustainability concern, and the technology providers/seed companies went ahead with hemi-zygous Bt-cotton hybrids. The results are out now in the form of 'Bollgard-II® resistant pink bollworm' that barely took five years to break the technology into smithereens.

2. **Hundreds of Bt-cotton hybrids should not have been released.** The vast number of hybrids is a nightmare for agronomists and pest management specialists. In every village, there are innumerable number of hybrids each of different duration, different flowering window and different levels of susceptibility to insect pests and diseases. As a result, it is not uncommon to find flowers all the time all through the season in all villages. Flowers attract insects and the continuous availability of flowers in the ecosystems attract bollworms and sustain them over a long flowering window in extended number of insect generations to accelerate resistance development to Bt-toxins. The flowering window in Bt-cotton hybrids extends over 80-90 days in India whereas it is just about 20-30 days in other countries.

3. **Bollgard-II® technology should not have been approved in long duration hybrids.** The long duration hybrids under irrigation continue to produce flowers and bolls which coincide with the peak phase of the pink bollworms that extends from mid-November to late February in Central and South India. If the crop is harvested by the end of November or December, followed by a clear six month 'cotton-crop-free window', the chances of pink bollworm infestation during the next ensuing season are minimised. Most importantly, the number of pink bollworm generations gets reduced and thus resistance development slows down. Despite the first reports in 2010 of pink bollworm resistance to Cry1Ac based Bt-cotton, there were hardly any revisions in the technology deployment policies from the technology providers or seed companies to combat the impending resistance to Cry1Ac+Cry2Ab based Bollgard-II®. Instead, from 2011 to 2015, long duration hybrids were approved and cotton crop continued to be extended for an additional three to four months beyond mid-November in Gujarat, AP and western Maharashtra, because of high market prices of cotton, which resulted in two or three extra generations of the pink bollworm, thereby accelerating resistance.

4. **Insect resistance management (IRM) plans were weak and the implementation was bleak.** The introduction of Bollgard-II® in 2006 should been accompanied with robust resistance management plans. All stakeholders were aware of the poor compliance of the GEAC stipulated refugia comprising of 20% non-Bt-cotton or 5 rows of non-Bt-cotton around Bt-cotton fields. Bollgard-II® specific IRM plans were essential to tackle the pink bollworm resistance threat. But there was hardly any serious thought on enhancing the practicability of implementation

by removing the weakness in logistics of compliance. Refuge in bag with 5% non-Bt seeds of the iso-genic (genetically similar) hybrid in the Bt-cotton bag, would have helped to slow down resistance. Studies conducted by ICAR-CICR showed that many seed companies were not at all serious in complying with the statutory provision of providing the refugia 120 g seed packet of 'non-Bt cotton hybrid similar in duration, fibre characteristics and yield'. Unfortunately, some seed companies were providing Bt-cotton seeds as refugia, while some provided non-Bt-cotton seeds that had extremely poor levels of germination. Further, almost all the non-Bt-cotton varieties had a flowering window that never coincided with the flowering of Bt-cotton hybrids. Therefore poor refugia compliance by some seed companies accentuated the poor compliance by farmers. Thus, pink bollworm resistance to Bollgard-II® was imminent.

5. **Integrated pest management (IPM) was forgotten.** Bt-cotton is a brilliant innovation in pest management. But it requires support systems to ensure sustained efficacy for the longest possible time. After the introduction of Bt-cotton in India, IPM and IRM were virtually neglected with a belief that Bt-cotton was all powerful and that there was no need for any other strategies to combat the bollworms. Unfortunately, this negligence may cost the technology more dearly when the American bollworm is likely to strike back with resistance in the next few years from now. The best way forward even at this point of time, is to develop plans to strengthen biological control backed IPM and IRM for cotton.

What is in store for Bt-cotton after 2015?

Bt-cotton was meant to control bollworms. But farmers will now find bollworms surviving in Bt-cotton fields and they will have to adjust to the less effective Bt-cotton that has become vulnerable to the pink bollworm. The problem with pink bollworm is that farmers would not know the hidden damage before the bolls burst, because of which there can be sudden shocks during harvest and also at the market yards when the bollworm damaged cotton gets low market price. For over the past one decade, Bt-cotton especially Bollgard-II® containing two cry (crystal) genes (cry1Ac + cry2Ab) derived from the bacterium Bacillus thuringiensis was considered to be invincible against bollworms with the clear tangible benefits of prevention of boll damage coupled with reduced pesticide usage for bollworm control. But farmers across the country are now questioning the ability of Bt-cotton in controlling pink bollworms. Pink bollworms in Gujarat and other southern states of India have been found to have developed resistance to cry1Ac + cry2Ab. There are reports of significant pink bollworm damage in BG-II bolls from Andhra Pradesh, Madhya Pradesh, Karnataka and parts of Maharashtra. Until last year, BG-II was the undisputed champion for bollworm control, but not any longer, certainly not at least against the pink bollworm.

Unfortunately, there is hardly any other technology in sight now or in the near immediate future, whether GM or insecticides, that is as potent as BG-II. There is a need now to fall back on the standard time tested IRM and IPM strategies to manage pink bollworm. But does pink bollworm resistance issue signal that the 'writing on the wall' for Bt-cotton in India? Bollworm resistance to Bt-cotton has implications for IPM. The Bt biopesticide Bacillus thuringiensis was a very useful IPM tool that has been used effectively for several decades in cotton IPM programmes across the world. Unfortunately, with high levels of bollworm resistance to Bt-cotton, it may not be effective any longer as a bio-pesticide against pink bollworms in India. Thus, a potent bio-pesticide may have lost its utility for the future generations because of Bt-cotton. Similarly, several tools of pest management have been lost for future generations due to unsustainable practices.

A brief history of 'humbled' high profile technologies in cotton pest management

The entire history of cotton pest management has been a history of powerful technological interventions that eventually turned out to be unsustainable in short spurts of time. In the early 1960s, several new organophosphate and carbamate insecticides were introduced into India and were used extensively for cotton pest management. By the late 1970s, the leaf worm Spodoptera litura developed resistance to these insecticide groups. The introduction of cotton hybrid technology in 1971 propelled hopes for high production. But high production cost and market price of hybrid seeds, rendered the technology less sustainable. Hybrid technology crawled at a snail's pace from 1974 to cover an area of 38% until Bt-cotton arrived in 2002 and saturated the country with Bt-cotton hybrids by 2011. The introduction of the broad spectrum and highly potent synthetic pyrethroid insecticides in 1981 propelled hopes for effective cotton pest management. But within seven to eight years of pyrethroid introduction into India, American bollworm Helicoverpa armigera and whiteflies Bemisia tabaci emerged as major pests. By 1992, the

American bollworm and whiteflies were reported to have developed high levels of resistance to almost all recommended insecticides. In 1991, a new group of highly potent systemic insecticide group called 'neonicotinoids' were introduced to propel hopes for effective management of sap-sucking insects. The neonicotinoid insecticides were highly effective as seed treatment and soon became immensely popular for seed treatment with hybrid seeds. By 2008, sap-sucking insects such as leaf hoppers and whiteflies developed high levels of resistance to neonicotinoid insecticides. The American bollworm and the whiteflies are experts in becoming resistant to chemicals that are meant to kill them. The whiteflies showed their prowess last year in Punjab with full scale resistance against the wide range of insecticides recommended to control them.

Bt-cotton: An interesting journey

By the year 2000, Helicoverpa armigera had become invincible to all the recommended insecticides. The high levels of bollworm resistance to insecticides compelled farmers to resort to repeated applications of insecticides, which further aggravated the problem of resistance and ravaged ecosystems many a times beyond repair. Farmers were desperate for reliable bollworm control. In 1996-97, the cry1Ac based Bt-cotton Bollgard® was released for cultivation in USA, Mexico, Australia and China. By 1998, a few farmers in Gujarat obtained Bollgard® seeds clandestinely and started cultivating them without any bio-safety clearance. These were termed as illegal. In the year 2000, a new hybrid called Navbharat-151 made waves in Gujarat. It soon became clear that the immense popularity of Navbharat-151 was because of the GM-Bt-cry1Ac gene and varietal tolerance to leaf hoppers, which helped farmers to get high yields with least pesticide applications.

It's paradoxical, but the success of Navbharat-151 in effectively combating cotton bollworms, paved the way for official approval of Bt-cotton in India in 2002. Bt-cotton (Bollgard® event Mon-531) was developed by Monsanto, USA, by integrating a Bt gene cry1Ac gene into the cultivar Coker 312. In 2002, the genetic engineering approval committee (GEAC) approved three Bollgard® Bt-cotton hybrids MECH-12, MECH-162, and MECH-184 for commercial cultivation in central and south Indian cotton–growing zones in India. The three Bt-cotton hybrids were developed by Mahyco India using Monsanto's technology. Subsequently in 2006, three new Bt-cotton GE events namely, MON-15985 (®Bollgard-II, cry1Ac+cry2Ab2 genes), Event-1 (cry1Ac gene) of JK seeds and GFM event (fusion gene with cry1Ab+cry1Ac sequences) of Nath seeds were approved for commercial cultivation. Later, Bt-cotton event BNLA-601 of UAS Dharwad was approved in 2008 and cry1C event MLS-9124 of Meta-helix life sciences was approved in 2009. Thus, so far six Bt-cotton events have been approved for commercial cultivation in India. For the first three years during 2002-04, only three Bt-cotton hybrids from Mahyco seeds were available in the market and by 2004-05 the area under Bt-cotton was less than 5.0% of the total cotton area in the country. Until the year 2006 cropping season, though a total number of 62 Bt-cotton hybrids were approved, only 20 hybrids were available in the market. In 2006, Bollgard-II® was introduced for cultivation in India and Bt-cotton was approved for cultivation in north India. From 2007 onwards, a large number of Bt-cotton hybrids were approved at an average of 200 hybrids per year and the total number reached to 1128 by the year 2012 and 1667 by 2014. The area under Bt-cotton increased from 29 307 hectares in 2002 to an estimated 110 lakh ha in 2015.

Bt-cotton adoption in India resulted in 50-60% reduction of insecticides and assisted in doubling of yield. Bt-cotton was able to reduce insecticide use on bollworms by 90%. But because of continued damage by sap-sucking insect pests, especially on hybrid cotton, even now, 21 to 24% of the total insecticides are used on cotton in India. Yields have been stagnating at 460 to 560 kg/ha over the past ten years, despite the area being almost saturated with Bt-cotton hybrids. Though bollworms were under check, other challenges such as sap sucking insects and cotton leaf curl viral disease CLCuD emerged as concerns. With the large scale adoption of Bt-cotton, bollworms were expected to develop resistance sooner or later. The monophagous (feed on single type of food source) pink bollworm Pectinophora gossypiella was reported by Monsanto and ICAR-IARI New Delhi, to have developed resistance to cry1Ac in 2010. Pink bollworm started appearing on Bollgard-II® in seriously damaging proportions over the past 2-3 years, especially in Gujarat and was confirmed by ICAR-CICR, Nagpur in 2014 to have developed resistance to cry1Ac+cry2Ab. Multinational companies are reported to have been working on the development of new transgenic cotton with several new genes (Vip3A, cry2Ae, cry1Ab, cry1F and undisclosed) for the future, but none of these appear as potent as the existing combination of cry1Ac + cry2Ab. Moreover, bollworms that developed resistance to cry1Ac and cry2Ab are likely to adapt to these new toxins very easily in a very short time.

Conclusion

Clearly cotton production systems in India and also elsewhere in many parts of the world have been caught in the unsustainable technology treadmill, sometimes because of poor stewardship plans and sometimes because of weak implementation of strategies that can ensure sustainability. Irrespective of the fragility and vulnerability infused by these technologies into cotton production systems in India, doubting Thomas's still continue to doubt if cotton can ever be cultivated without these technologies. While existing technologies continue to break down, new technologies continue to be invented, almost all of them for short term gains and they invariably come at a new higher price. Many a time new technologies are presented in good light with safer bio-safety profile. However, the entire history of pesticides and pharmaceuticals is replete with examples showing that, what was declared safe in yester years, would have been declared unsafe and banned after the product had served its commercial life. With corporate interests being profit oriented, it is natural for them to exploit the farm market for commercial gains, not necessarily with ecology and environment as their main priorities. Thus the story of unsustainable farming could continue unabated in the absence of a strong political will and technical competence.

Does pink bollworm resistance signal 'writing on the wall' for Bt-cotton? From 2016 onwards, it is certain that bollworm control with Bt-cotton will be laced with uncertainties. Today it is the pink bollworm; tomorrow it would be the American bollworm. It is now just a matter of time. What then would be the future of cotton with Bt-resistant bollworms? Of course it would be equivalent to the future of non-Bt cotton. At this juncture in cotton history, it is essential that policy-makers introspect and examine the story of each and every technological intervention from it's hey days to obituary, so that lessons can be learnt. These lessons must effectively lay a foundation for any further new technologies and technological interventions to be mandatorily laden with eco-friendly and environmentally consonant stewardship, so as to ensure long term sustainability of cotton production systems. With bollworm resistance to Bt-cotton, cotton farming is certain to enter into a stage of turmoil once again, if left unattended. If this journey would signal the 'end of the road' for Bt-cotton, we must soon learn to discover new paths in the woods, in consonance with nature that can lead us to sustainable progress through tranquillity. This can happen only through good science sans corporate greed.

Courtesy : Cotton India 2015-16

(The views expressed in this column are of the author and not that of Cotton Association of India)

Cotton Consumption - Cotton Year-wise

(In Lakh bales)

Month	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15 (P)	2015-16 (P)
Oct.	17.33	18.32	16.54	18.13	22.09	17.77	21.84	24.03	24.17	24.54
Nov.	17.81	16.94	16.94	18.47	21.09	18.34	21.09	22.96	25.05	23.22
Dec.	18.49	18.86	17.98	19.49	22.57	20.13	22.63	25.16	25.89	25.21
Jan.	18.22	18.54	16.93	19.54	22.1	20.33	23.3	25.19	25.77	24.94
Feb.	17.11	18.14	16.23	18.81	20.23	20.31	22.24	23.22	24.58	
March	18.39	18.45	17.51	20.01	21.77	20.38	23.61	25.07	26.18	
April	18.06	17.98	17.12	20.53	20.17	20.31	23.22	24.32	25.57	
May	17.89	18.95	17.83	20.93	18.64	21.27	22.85	24.38	25.62	
June	17.85	18.55	18.01	20.71	18.23	21.17	22.51	24.11	25.61	
July	18.42	18.5	18.98	22.11	19	22.14	24.11	24.54	25.56	
Aug.	18.58	17.62	18.59	21.73	18.64	22.08	24.23	24.46	25.86	
Sept.	18.03	16.9	18.29	21.42	21.71	21.46	23.7	25.81	24.58	
Total	**216.18**	**217.75**	**210.96**	**241.88**	**246.23**	**245.47**	**275.34**	**293.24**	**304.43**	**97.92**

(P) = Provisional

Source: Office of the Textile Commissioner

Glimpses of the **Mahashivratri festival** celebrated at the Bhid Bhanjan Mahadev Temple at Colaba on 7th March 2016

Stocks Shrinking Due to Production Loss in 2015/16

World ending stocks are projected to decrease by 8% to 20.4 million tons, which represents about 86% of world cotton consumption in 2015/16. This is the first reduction in world ending stocks since 2009/10. China's ending stocks are forecast to decrease by 7% to 12 million tons, the majority of which are held by the Chinese government in its reserves. Ending stocks for the rest of the world are expected to decline by 9% to 8.4 million tons. However, this reduction in stocks is due to the 15% decline in world cotton production, estimated at 22.2 million tons, and not to growth in consumption. In fact, world cotton consumption is projected to decrease by 2% to 23.9 million tons.

Aside from Australia where production is forecast to increase by 6% to 546,000 tons, cotton production in the top 10 cotton producing countries all declined in 2015/16. This decrease resulted from both a reduction in cotton area and in the average yield. World cotton area contracted by 8% to 31.2 million hectares as low cotton prices in 2014/15 and higher prices for competing crops discouraged farmers from planting cotton. Adverse weather in many countries led to the world average yield decreasing by 7% to 711 kg/ha. India's cotton area contracted by 7% while yield remained similar to 2014/15. As a result, production in India fell by 7% to just under 6 million tons. Production in China decreased for the fourth consecutive season by 20% to 5.2 million tons. A large contraction in cotton area and reduced yields from adverse weather led production in the United States to decrease by 21% to 2.8 million tons. Pakistan's production is estimated down 34% to 1.5 million tons due to pest pressure and inferior inputs lowering yields. In 2016/17, poor returns for competing crops and relatively stable cotton prices may encourage farmers to plant more cotton, and cotton area may expand by 1% to 31.9 million hectares. Modest increases in cotton area in India, Pakistan and the United States are expected to offset losses in China, Brazil and Uzbekistan. The world average yield may recover by 3% to 733 kg/ha and as a result, world cotton production is projected to increase by 3% to 23 million tons in 2016/17.

As discussed last month, low prices for polyester, the main competing fiber, has hurt world cotton consumption in 2015/16. Cotton consumption in China, the world's largest consumer of cotton and polyester, has declined continuously since 2009/10 when it reached just over 10 million tons. In 2015/16, cotton consumption in China is forecast at 7.1 million tons, down 5% from last season and 30% from 2009/10. While much of that consumption shifted to other countries in Asia during this period, weak demand for cotton yarn in 2015/16 has reversed or slowed growth this season. India's cotton consumption is expected to decline by 2% to 5.3 million tons, making it the world's second largest consumer. Cotton consumption in Pakistan is projected to decrease by 12% to 2.2 million tons due to weakened demand from China and the low volume of cotton production this season keeping domestic cotton prices firm. In contrast, consumption in Vietnam may increase by 22% to 1.1 million tons in 2015/16 as China continues to invest in spinning mills there. Bangladesh's mill use is forecast to expand by 13% to 1.1 million tons. In 2016/17, world cotton consumption is projected to remain stable as modest growth in the top consumers outside of China offsets the decline in China's cotton consumption.

With consumption shifting to countries that depend on imports, China no longer dominates cotton trading. In 2015/16, world cotton imports are likely to decrease by 3% to 7.4 million tons with imports by Vietnam, Bangladesh and China all projected at 1.1 million tons each. This represents 44% of world imports. Including imports by Indonesia, forecast at 782,000 tons, and Turkey, at 740,000 tons, the total volume of imports by these five countries accounts for 65% of world imports in 2015/16. The United States will lead in cotton exports despite reducing export volume by 12% to 2.1 million tons. India's exports are expected to recover by 22% to 1.1 million tons. Brazil, the third largest, may see export volume expand by 3% to 877,000 tons in 2015/16. In 2016/17, world trade may increase 3% to 7.6 million tons.

Although world cotton production is expected to increase in 2016/17, it is projected to remain below world consumption. As a result, world ending stocks may decrease by 5% to 19.6 million tons, which represents 82% of 2016/17 consumption.

Source : ICAC Cotton This Month, March 1, 2016

SUPPLY AND DISTRIBUTION OF COTTON

March 1, 2016

Seasons begin on August 1 — Million Metric Tons

	2011/12	2012/13	2013/14 Est.	2014/15 Est.	2015/16 Proj.	2016/17 Proj.
BEGINNING STOCKS						
WORLD TOTAL	**10.319**	**15.349**	**18.363**	**20.421**	**22.12**	**20.45**
CHINA	2.087	6.181	9.607	12.088	12.89	12.02
USA	0.566	0.729	0.903	0.651	0.98	0.87
PRODUCTION						
WORLD TOTAL	**27.838**	**26.809**	**26.228**	**26.113**	**22.19**	**23.00**
INDIA	6.239	6.290	6.766	6.460	5.98	6.48
CHINA	7.400	7.300	6.929	6.480	5.17	4.65
USA	3.391	3.770	2.811	3.553	2.82	3.07
PAKISTAN	2.311	2.002	2.076	2.305	1.53	2.05
BRAZIL	1.877	1.310	1.734	1.551	1.50	1.45
UZBEKISTAN	0.880	1.000	0.940	0.885	0.86	0.88
OTHERS	5.740	5.137	4.973	4.879	4.33	4.42
CONSUMPTION						
WORLD TOTAL	**22.784**	**23.563**	**23.878**	**24.314**	**23.85**	**23.95**
CHINA	8.635	8.290	7.517	7.479	7.11	6.75
INDIA	4.231	4.762	5.186	5.359	5.27	5.48
PAKISTAN	2.121	2.216	2.470	2.506	2.20	2.23
EUROPE & TURKEY	1.498	1.564	1.615	1.698	1.71	1.73
VIETNAM	0.410	0.492	0.694	0.903	1.10	1.27
BANGLADESH	0.700	0.765	0.880	0.937	1.05	1.16
USA	0.718	0.762	0.773	0.778	0.78	0.79
BRAZIL	0.897	0.910	0.862	0.797	0.77	0.73
OTHERS	3.574	3.802	3.881	3.857	3.85	3.82
EXPORTS						
WORLD TOTAL	**9.825**	**10.022**	**9.012**	**7.705**	**7.40**	**7.59**
USA	2.526	2.836	2.293	2.449	2.15	2.18
INDIA	2.159	1.685	2.014	0.914	1.11	1.10
CFA ZONE	0.597	0.829	0.974	0.885	1.01	1.10
BRAZIL	1.043	0.938	0.485	0.851	0.88	0.72
UZBEKISTAN	0.550	0.653	0.650	0.594	0.53	0.54
AUSTRALIA	1.010	1.343	1.057	0.520	0.49	0.60
IMPORTS						
WORLD TOTAL	**9.784**	**9.790**	**8.720**	**7.604**	**7.40**	**7.59**
CHINA	5.342	4.426	3.075	1.804	1.08	0.94
VIETNAM	0.379	0.517	0.691	0.941	1.10	1.37
BANGLADESH	0.680	0.631	0.967	0.964	1.08	1.13
INDONESIA	0.540	0.686	0.651	0.728	0.78	0.77
TURKEY	0.519	0.803	0.924	0.800	0.74	0.88
TRADE IMBALANCE 1/	-0.041	-0.232	-0.292	-0.101	0.00	0.00
STOCKS ADJUSTMENT 2/	0.018	0.001	0.000	0.000	0.00	0.00
ENDING STOCKS						
WORLD TOTAL	**15.349**	**18.363**	**20.421**	**22.119**	**20.45**	**19.50**
CHINA	6.181	9.607	12.088	12.888	12.02	10.85
USA	0.729	0.903	0.651	0.980	0.87	0.98
ENDING STOCKS/MILL USE (%)						
WORLD-LESS-CHINA 3/	**65**	**57**	**51**	**55**	**50**	**50**
CHINA 4/	**72**	**116**	**161**	**172**	**169**	**161**
COTLOOK A INDEX 5/	**100**	**88**	**91**	**71**		

1/ The inclusion of linters and waste, changes in weight during transit, differences in reporting periods and measurement error account for differences between world imports and exports.

2/ Difference between calculated stocks and actual; amounts for forward seasons are anticipated.

3/ World-less-China's ending stocks divided by World-less-China's mill use, multiplied by 100.

4/ China's ending stocks divided by China's mill use, multiplied by 100.

5/ U.S. cents per pound.

Source : ICAC Cotton This Month, March 1, 2016

Cottonology School Contact Program

Beacon High School, Khar West held on 5th February 2016

Posters on display

MC explaining the posters

Students attend the SCP in large numbers

Students answer the quiz

King Cotton declares the quiz winner

Getting the feedback from the students

Distributing goodie bags

Posing with King Cotton

COTTON ASSOCIATION OF INDIA

Established 1921

COTTON STATISTICS & NEWS

ADVERTISEMENT RATES

effective from April 2015

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Half Page	3,000	3,300

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Full Page	US $ 100
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Email: publications@caionline.in

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) 2015-16 Crop FEBRUARY – MARCH 2016					
Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Strength /GPT	29th	1st	2nd	3rd	4th	5th
1	P/H/R	ICS-101	Fine	Below 22mm	5.0-7.0	15	8380 (29800)	8380 (29800)	8323 (29600)	8295 (29500)	8267 (29400)	8267 (29400)
2	P/H/R	ICS-201	Fine	Below 22mm	5.0-7.0	15	8520 (30300)	8520 (30300)	8464 (30100)	8436 (30000)	8408 (29900)	8408 (29900)
3	GUJ	ICS-102	Fine	22mm	4.0-6.0	20	5849 (20800)	5849 (20800)	5765 (20500)	5708 (20300)	5708 (20300)	5708 (20300)
4	KAR	ICS-103	Fine	23mm	4.0-5.5	21	7311 (26000)	7311 (26000)	7227 (25700)	7171 (25500)	7171 (25500)	7171 (25500)
5	M/M	ICS-104	Fine	24mm	4.0-5.0	23	8408 (29900)	8408 (29900)	8380 (29800)	8352 (29700)	8323 (29600)	8323 (29600)
6	P/H/R	ICS-202	Fine	26mm	3.5-4.9	26	9167 (32600)	9139 (32500)	9083 (32300)	9055 (32200)	9026 (32100)	9026 (32100)
7	M/M/A	ICS-105	Fine	26mm	3.0-3.4	25	8380 (29800)	8352 (29700)	8323 (29600)	8295 (29500)	8267 (29400)	8267 (29400)
8	M/M/A	ICS-105	Fine	26mm	3.5-4.9	25	8689 (30900)	8661 (30800)	8633 (30700)	8605 (30600)	8577 (30500)	8577 (30500)
9	P/H/R	ICS-105	Fine	27mm	3.5.4.9	26	9448 (33600)	9420 (33500)	9364 (33300)	9336 (33200)	9308 (33100)	9308 (33100)
10	M/M/A	ICS-105	Fine	27mm	3.0-3.4	26	8548 (30400)	8520 (30300)	8492 (30200)	8464 (30100)	8436 (30000)	8436 (30000)
11	M/M/A	ICS-105	Fine	27mm	3.5-4.9	26	8886 (31600)	8858 (31500)	8830 (31400)	8802 (31300)	8773 (31200)	8773 (31200)
12	P/H/R	ICS-105	Fine	28mm	3.5-4.9	27	9561 (34000)	9533 (33900)	9476 (33700)	9448 (33600)	9420 (33500)	9420 (33500)
13	M/M/A	ICS-105	Fine	28mm	3.5-4.9	27	9055 (32200)	8998 (32000)	8970 (31900)	8942 (31800)	8914 (31700)	8914 (31700)
14	GUJ	ICS-105	Fine	28mm	3.5-4.9	27	9139 (32500)	9083 (32300)	9055 (32200)	9026 (32100)	8998 (32000)	8998 (32000)
15	M/M/A/K	ICS-105	Fine	29mm	3.5-4.9	28	9251 (32900)	9195 (32700)	9167 (32600)	9139 (32500)	9111 (32400)	9111 (32400)
16	GUJ	ICS-105	Fine	29mm	3.5-4.9	28	9392 (33400)	9336 (33200)	9308 (33100)	9280 (33000)	9251 (32900)	9251 (32900)
17	M/M/A/K	ICS-105	Fine	30mm	3.5-4.9	29	9476 (33700)	9420 (33500)	9392 (33400)	9364 (33300)	9336 (33200)	9336 (33200)
18	M/M/A/K/T/O	ICS-105	Fine	31mm	3.5-4.9	30	9758 (34700)	9701 (34500)	9673 (34400)	9645 (34300)	9617 (34200)	9617 (34200)
19	A/K/T/O	ICS-106	Fine	32mm	3.5-4.9	31	10292 (36600)	10264 (36500)	10236 (36400)	10179 (36200)	10151 (36100)	10151 (36100)
20	M(P)/K/T	ICS-107	Fine	34mm	3.0-3.8	33	13863 (49300)	13779 (49000)	13694 (48700)	13638 (48500)	13610 (48400)	13610 (48400)

(Note: Figures in bracket indicate prices in Rs./Candy)