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Breaking News: Path-Breaking or Back-Breaking?

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Last month has been full of breaking news on cotton, not just in India, but across the world. But, much of the breaking news was actually 'back-breaking' for some and 'path-breaking' for others. For instance, the Government slashed royalty by 70.0% and seed prices by 14.0%. Monsanto threatened to leave India. Farmers cheered more since it wasn't just the relief on seed prices, but cotton commodity prices had suddenly started booming by the end of April. Further, Indian cotton exports could boom further, with the WTO recommendation of ending export subsidies on cotton. This could be good news for traders and farmers. Three other headlines that caused concerns to GM technology supporters and brought some cheer to 'anti-GM activists' were - 'Burkina Faso bans Bt cotton'; 'Genetically modified (GM) crop acreage dipped for the first time in history' and 'Pink bollworm developed resistance to Bollgard-II in India'. Needless to mention, many of the headlines were sensational. But as the 17th century proverb says "one man's meat is another man's poison", it would be interesting to look at what these headlines mean to different stakeholders.

Global GM acreage dips

In the third week of April 2016, headlines in New York Times, China Post and Southern Times Africa, pointed out that for the first time in 20 years after introduction, the global GM crop area declined. The global area under GM crops in 2015 declined to 1797 lakh hectares from 1815 lakhs hectares in 2014. This slow down has happened for the first time in 20 years which were characterised by a steady growth rate.

Experts opined that low commodity prices of the four main GM crops (cotton, maize, soybean and canola) may have reduced the area. There were other factors though, that influenced the slow-down in different countries.

GM crops are being cultivated for the past 20 years in the world since 1996. An estimated 180 lakh farmers cultivated GM crops in 2015. Till date, 12 crops have been genetically modified and commercialised in 28 countries. But only four crops cotton, maize, soybean and canola with Bt and herbicide resistance traits occupy 99.2% of the total global area. Soybean is the leading GM crop occupying 50% area, followed by maize 30% area, cotton 14% area and canola 5%. Five countries cultivate 91% of the GM acreage. USA has 40% of the worlds GM area with Brazil at 25%, Argentina at 14%, India and Canada at 6% each. In the US alone, the GM acreage decreased in 2015 by 22 lakh hectares. In South Africa, the area fell from 30 lakh hectares in 2014 to 23 lakh hectares in 2015. Drought is cited as the main reason for this decline. The African country

**EXPERT'S
Column**



Dr. K.R. Kranthi

Burkina Faso which cultivated Bt-cotton in about 6.25 lakh hectares has now declared its intentions to revert back to non-Bt cotton citing poor quality of Bt-cotton as the main reason. The declaration of Round-Up herbicide (glyphosate) as a probable cancer causing chemical by WHO (World Health Organization) in March 2015 is yet another factor that may strongly influence public opinion against GM crops across the world which could lead to reduction in the global GM area.

Five insect species have been declared to have developed resistance to Bt crops across the world. This factor is likely to bring down the area under GM crops. These five species are the cotton bollworm *Helicoverpa zea* to Bt-cotton in the USA, pink bollworm resistance to Bt-cotton in India; maize root worm *Diabrotica virgifera* to Bt-maize in USA; African maize stem borer *Busseola fusca* resistance to Bt-maize in South Africa and Amyworm *Spodoptera frugiperda* resistance to Bt-maize in Puerto Rico.

The efficacy of Bollgard-II Bt-cotton on pink bollworms in India is on the decline, which is likely to have a significant impact on the area in the coming years. Bt-cotton was introduced into India in Central and South India in 2002 and in North India in 2006. During the first four years after the introduction of Bt-cotton, the yields increased initially by 67% and insecticide usage decreased by 33%. The subsequent introduction of other technologies such as Bollgard-II, JK-Bt and Nath-Bt in 2006 did not cause any positive changes. On the other hand, data show that the yields started declining despite the increase in fertilizer usage by 70% and increase in insecticide usage by 92% after 2006. The increase in insecticide usage was primarily to control sap-sucking pests such as leaf hoppers and whiteflies. Farmers resorted to repeated applications of the major chemical insecticides, unaware of the loss of pesticide efficacy on these species due to the development of pest resistance to insecticides. Pink bollworm resistance to Bollgard-II will necessitate further usage of insecticides, which takes away the advantage conferred by Bt-cotton. In 2002, Indian farmers used 0.88 kg insecticide per hectare, mostly for bollworm control. After the introduction of Bt-cotton, insecticide usage dropped to 0.5 kg in 2006. However, by 2013, insecticide usage increased to 0.97 kg per hectare. Insect resistance to insecticides and Bt toxins makes cotton cultivation expensive and less sustainable. Thus the demand for Bt-cotton and the area under cultivation in India may come down in the immediate following years.

Burkina Faso bans Bt-cotton

Several African news agencies (Headlines in Nigeria Today, Daily News & Analysis and Yarns

and Fiber April 24, 2016) stated that Burkina Faso, the world's 10th largest cotton producer was enforcing a ban on Monsanto's Bollgard-II Bt-cotton as it had proved uneconomical. The Bloomberg news stated "Africa's biggest cotton grower is reducing the acreage for genetically modified cotton this season until it's completely phased out in 2018 and replaced by conventional cotton," The Inter-professional Cotton Association of Burkina (AICB) which comprises of three cotton companies and the national cotton farmers union (UNPCB) alleged that introduction of Bollgard-II trait into the local varieties caused considerable drop in the fibre quality especially with increased percentage of short fibres in the long staple cotton. The association demanded 48.3 billion CFA francs (\$83.91 million equivalent to Rs. 550 crores) from the multinational giant Monsanto as compensation for the significant reduction in market value of cotton. Reuter reports claimed that "the company acknowledged that recent changes concerning fiber length had been observed, but added that fiber quality is influenced by both environmental conditions and genetic background." Yields fell by 18.0% during 2015. Experts attributed the yield decline to poor weather. A few reports also pointed out to the possibility of influence by chemical pesticide lobbies in creating a negative propaganda against Bt-technology. The banning of Bt-cotton in Burkina Faso had a significant impact all across the cotton growing countries in Africa. Exports from competing countries such as Mali and Ivory Coast increased due to the cotton quality decline in Burkina Faso.

Government panel proposes 70% reduction in royalty on Bt-cotton BG-II. Monsanto threatens to quit India.

All through March and April 2016, the issue of BG-II seed prices and royalty was highlighted in the headlines of almost all the newspapers in India to state that "The agriculture ministry recommended that the BG-II trait royalties will be capped at 49 rupees (73 U.S. cents) per 450-gram pack of so-called Bt cotton seeds, a 70 percent reduction from current levels while setting the maximum sale price at 800 rupees." Monsanto responded by stating that "such a move would cause it to re-evaluate its business in the country." The Government decisions are being contested in courts.

Though the threat came as a surprise, it was debatable whether Monsanto would really leave the largest business opportunity such as the one in India. India has the largest cotton area in the world at 120 lakh hectares. Next are China, USA, Pakistan and Brazil with 34, 33, 28 and 13 lakh hectares respectively. All other countries have less than 10

lakh hectares. Undoubtedly, the pink bollworm resistance to Bollgard-II, mainly in Gujarat, caused instability and uncertainty to the seed business. Since Bt-cotton is meant to control bollworms and was effective thus far, any slack in bollworm-control efficacy will be contested by farmers who pay additionally for the trait. But, with good integrated pest management practices based on short season crop and conservation of biological control, the efficacy of Bt-cotton can still be sustained over the next few years.

Governments of Telangana and Andhra Pradesh and VNSSM committee of the Maharashtra government dissuade farmers from cotton cultivation

During the last part of April 2016, newspaper headlines reported that in order to circumvent the problem of the 'Bt-resistant pink bollworm', the Andhra Pradesh state agriculture department would take up a massive campaign to create awareness among farmers against sowing Bt-cotton in red and light soil regions to reduce the Bt-cotton crop area from 6.7 to 4.5 lakh hectares. The campaign stated that there was a high risk of pink bollworm pest spreading if the crop was continued beyond 150 days. The Telangana Government and the Vasantrya Naik Sheti Swavlamban Mission (VNSSM) set up by the Maharashtra Government announced their plans to discourage farmers from cultivation of cotton in these states in favour of pulse and oilseed crops. The government's decision also comes in the wake of fluctuating and falling prices of cotton in recent times.

Cotton is one of the most resilient crops. It does face weather related problems and pest infestations. But, most of the insect pest, disease and crop physiological problems in cotton farms are man-made, generally induced by improper application of water and chemicals. Alternate crops such as sorghum, maize, green grams, red gram, black gram, soybean, etc., can run the risk of poor and uncertain productivity. However, it would be a good idea to identify high yielding cotton production systems in specified agri-eco-zones for concentrated production. About 40% of the current area under cotton in the country can actually be diverted to pulses and oilseeds, without compromising on the overall production of cotton.

WTOs elimination of cotton export subsidies

In the third week of April 2016, Indian news agencies and newspapers such as Money Control and Business Standard, highlighted the clarification of the Ministry of Commerce and Industry of India on Wednesday with regard to export subsidies for cotton,

which said that the WTO decision would benefit Indian farmers because of the level playing field. The World Trade Organisation's Nairobi Ministerial committee took a decision on Cotton and Export Competition, which was adopted on 19 December, 2015, to eliminate export subsidies on cotton. India is not entitled to export subsidies since it did not have export subsidies during 1986 to 1988, as per the Uruguay Round Agreement on Agriculture (AOA). But the country can provide subsidies to reduce the cost of marketing, transportation costs, handling and processing costs without circumventing the export subsidy reduction commitments. It remains to be seen how these changes would affect the global trends of exports from India, and how it eventually influences the profitability and prosperity of Indian farmers.

Government supports 'Bt-variety initiatives'

All through April 2016, The Times of India, Indian Express, Outlook, India Today and several major newspapers covered news on the 'Bt-variety initiatives of the Government'. In a meeting held on 4th April 2016 in the Ministry, it was decided that 'Bt-cotton varieties shall be tested in multilocation trials across the country during Kharif 2016 to identify the best Bt-varieties most suited for each of the cotton growing states. The results will be presented before the EBAM (Event Based Approval Mechanism) sub-committee of the GEAC (Genetic Engineering Appraisal Committee) for approval. The ICAR-CICR has developed 'Bt-cotton varieties using public sector elite varieties. In addition, MPKV Rahuri, PAU Ludhiana, OUAT Bhanuipatna and SIMA have also developed 'Bt varieties'. A total number of 20 Bt-varieties will be tested during Kharif 2016 in multilocation trials to be conducted at 15 locations of nine cotton growing states in the country. The Bt-varieties in high density will be compared with Zonal BG-II check hybrid at recommended spacing.

Doubts are being raised whether the single gene Cry1Ac based Bt-varieties would give better yields and can still be effective in bollworm control especially in the wake of pink bollworm resistance to Bt-cotton. Studies conducted by ICAR-CICR showed that Bt-varieties had promising potential for high yields and were more effective in bollworm control as compared to the current Bt-hybrids. The Bt-varieties have the advantage of Cry1Ac being expressed in all seeds of the bolls unlike the Bt-hybrids, wherein at least 25% of the seeds in bolls on the single gene based Bt-cotton F-1 hybrid plants did not contain Cry1Ac. Because of narrow flowering window plus homozygous Cry1Ac, the attack of the American bollworm, *Helicoverpa armigera* is grossly minimised and because of the short duration, the

varieties escape the pink bollworm, which is a late season pest. Like in other parts of the world, short duration Bt-varieties when grown in high density give high yields. Majority of the Bt-varieties developed by ICAR-CICR are indeterminate but of short duration, early maturing with a narrow flowering window, tolerant to sucking pests and suitable for high density planting. Most importantly, as mentioned in my earlier articles, I would like to point out again that under rainfed conditions, with high density short duration crop, the narrow flowering and fruiting window crop gets comfortable access to soil moisture and nutrients thus resulting in high yields.

New Desi cotton variety alternatives

On 27th April, Hindustan Times ran the headlines 'Punjab govt., and PAU promote Desi cotton varieties, but seeds not available'. The paper stated that "After the extensive loss to cotton crop owing to the whitefly attack last season, both the state government and Punjab Agricultural University (PAU) had appealed to farmers to sow PAU-recommended Desi cotton varieties—FDR-124 and LDR-949—in the coming kharif season" On 23rd April, The Times of India ran a story on "Desi solution for cotton farmers to tackle climate change, replace Bt". The report said "With the aim of giving more options to farmers, especially with reference to climate change, the Indian Council of Agricultural Research (ICAR) is taking up the country's first-ever planned effort for testing Desi cotton varieties (mainly short duration and long staple or lint size) and making them available to farmers at the earliest. And if the trials yield expected results, it will be the first such experiment in the world where only indigenous varieties can compete with any other varieties. Ten different Desi cotton varieties developed by various agriculture universities and the Central Institute for Cotton Research (CICR) will be tested at 15 different locations in the country under the All India Coordinated Research Project (AICRP) this season with sowing scheduled for May in North India and till September / October in other parts of the country. These varieties are also being looked as a new alternative to Bt cotton which is developing resistance to pink boll worm."

Several questions were being raised as to what is so new about the native Desi cotton varieties of the *Gossypium arboreum* species which were being grown for thousands of years in the country? The new Desi cotton varieties developed under the ICAR-CICR AICRP (All India Coordinated Research Project) are special. These were developed with a vision over the past 10-12 years. The duration was shortened significantly to 5 months from the long 7-8 months. All the earlier Desi cotton varieties were of short staple (18-24 mm) by default. The textile

industry never preferred such fibre for spinning. The new Desi varieties have bigger bolls and long staple of 28 to 30 mm with good fibre strength. Thus for the first time in history, farmers would have the option of growing the innately robust Desi varieties with short, medium and long staple premium fibre qualities.

Towards chemical-free cotton farming

Chemical-free cotton farming. Are we there as yet? Not quite. But the path is emerging. 'Sustainability' is the watch-word. The dream is to increase India's average yields by four-fold at half of the current cost of production. The dream is to do this in tandem with natural ecosystems, without the need for chemicals. Improbable as it may sound, but 'impossible' it is not. Desi cotton holds the secrets for India's sustainable cotton future. It has the keys to India's ultimate dream of chemical-free cotton farming. The new long staple Desi varieties developed recently will be the game-changers for the country's future generation farmers. How are we going to walk the talk?

The ICAR-CICR has been meticulously working on the road-map for the past 7-8 years. Currently 95% of India's cotton area is under Bt-cotton hybrids. Changing the farmer preferences is a major challenge. In the short term, the immediate challenge is to wean away, at least half of the 80 lakh cotton farmers from the long duration, expensive, input-intensive Bt-hybrids. Moving in the direction, we developed sucking pest tolerant, short duration (150 days) Bt-cotton varieties for rain-fed and medium duration (180 days) for irrigated varieties, that farmers can quickly adopt as alternative options to replace Bt-hybrids. However, this solution may last only for the next 4-5 years, because of the impending wide-spread resistance of bollworms to Bt-cotton. In the medium term, we are planning for ultra-short duration (120 days) premium quality non-Bt American cotton and Desi varieties for high density planting with integrated pest management systems. For 'long term sustainable cotton cultivation systems in consonance with ecosystems and environment' Desi cotton alone has the answers. Desi cotton varieties are resilient to biotic and abiotic stress factors and need least chemical input interventions for high yields. The Desi cotton varieties are tolerant to insects, diseases and climate induced stress. They need significantly less water, fertilizers and chemicals. For long term sustainability, India will have no other choice but to depend on the climate resilient widely adaptable short duration Desi cotton varieties with short, medium and long staple category fibres, to be intercropped with legume crops (pulses and oilseeds) under organic systems.

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