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The 'Organic Cotton' Argument

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

Is 'organic cotton' practical? For a commercial crop, the debate continues unabated. There are arguments on both sides of the divide. Those who believe that organic cotton is not just practical but more profitable, also vouch for sustainability. The proponents of conventional 'modern' agriculture emphasize that cotton cultivation without chemicals is very risky because the entire crop can be lost to insects if pesticides are not sprayed on time.

Organic Cotton

According to the Organic Trade Association (OTA) <http://www.ota.com/definition/quickoverview.html> "Organic cotton is grown using methods and materials that have a low impact on the environment. Organic production systems replenish and maintain soil fertility, reduce the use of toxic and persistent pesticides and fertilizers, and build biologically diverse agriculture. Third-party certification organizations verify that organic producers use only methods and materials allowed in organic production. Organic cotton is grown without the use of toxic and persistent pesticides and synthetic fertilizers. In addition, federal regulations prohibit the use of genetically engineered seed for organic farming. All cotton

sold as organic in the United States must meet strict federal regulations covering how the cotton is grown"

Further the OTA states that "Organic refers to the way agricultural products are grown and processed. It includes a system of production, processing, distribution and sales that assures consumers that the products maintain the organic integrity that begins on the farm... Organic production is based on a system of farming that maintains and replenishes soil fertility without the use of toxic and persistent pesticides and fertilizers.

Organically produced foods also must be produced without the use of antibiotics, synthetic hormones, genetic engineering and other excluded practices, sewage sludge, or irradiation. Cloning animals or using their products would be considered inconsistent with organic practices. Organic foods are minimally processed without artificial ingredients, preservatives, or irradiation to maintain the integrity of the food."

EXPERT'S Column



Dr K.R. Kranthi

Organic pest control?

Cotton insect pests, especially the American bollworm species were able to develop resistance to the most potent chemical pesticides discovered until date. Even deadly concoctions of pesticide cocktails failed to control the cotton insect pests. So, it is not surprising for organic farmers to be confronted with questions such as 'Can you really control the monstrous bollworm effectively with biological methods?'

It is commonly said that cotton crop is a 'haven' for more than 1326 species of insects. Interestingly, there are some insect species that

can barely survive without the cotton crop. The pink bollworm and spotted bollworm thrive mainly on unripe green bolls of cotton. They are found sometimes on the vegetable okra, but the main food is the green cotton boll. It is widely believed that under conditions favourable to them, these insects can damage almost the entire crop, especially many American cotton varieties. The desi Indian cotton species can still offer resistance to a reasonable extent. The argument therefore has been that for a crop species such as cotton which harbors so many insect species, can 'organic' cultivation be a viable option?

But, the 'proof of the pudding is in the eating'. Hundreds of farmers across India and many parts of the world have been cultivating 'organic cotton', not just sustainably but profitably as well. How then is pest control possible in organic cotton? What have the organic cotton farmers been doing across the world for cotton pest control?

Research needs and current status

Organic cultivation needs high quality science to make it sustainable. Studies show that the shortcuts offered by chemical farming offer short-term solutions and often lead to side-effect-problems, and thus are invariably unsustainable in the long term.

Organic cotton needs varieties that are innately tolerant to major insect pests such as the bollworms, jassids and whiteflies. Also practices such as early sowing of early maturing varieties also helps the crop to escape almost all the insect pests including the three species of bollworms. The desi species *Gossypium arboreum* offers excellent options for organic cotton. Some varieties developed recently have fiber traits that are better than most of the American cotton hybrids and are endowed with resistance to drought, diseases and insect pests.

Varieties that are ideally suited for low input conditions and that can tolerate abiotic and biotic stress conditions are best suited for organic farming. It needs highest quality of science for the development of such varieties.

So far organic cotton relies heavily on naturally occurring biological control that generally thrives better under no chemical interventions. In addition, biological herbal pesticides, microbial pesticides, predators and parasitoids are used for biological control of insect pests and diseases. It must be realised that such methods are scientifically demanding and need to be properly standardised for effective control.

It is estimated that about 7166 litres of irrigation water was used in North India to produce 1 kg cotton lint. In stark contrast just 504

litres of irrigation water was used per kg lint in Maharashtra where 97% of cotton is cultivated under rain-fed conditions. It is therefore appropriate to consider organic cotton cultivation under rain-fed conditions to minimize the usage of irrigation water and conserve water for other food crops. Additionally the technique of 'ridges and furrows' can be used for efficient moisture utilisation. Organic residue management, minimum tillage, crop residue mulches, green manure incorporation etc must be standardised to enable better soil texture and improvement in soil organic carbon reserves.

Status of Organic Cotton

Organic cotton is currently grown in 22 countries: Benin, Brazil, Burkina Faso, China, Egypt, Greece, India, Israel, Kyrgyzstan, Mali, Nicaragua, Paraguay, Pakistan, Peru, South Africa, Senegal, Syria, Tanzania, Turkey, Uganda, USA, and Zambia. The top ten organic cotton producing countries in order by rank are: India, Turkey, Syria, China, USA, Uganda, Tanzania, Peru, Egypt and Burkina Faso, with India taking over Turkey's long-time standing as the number one producer in 2007/08.

More than 70% of the world's organic cotton is grown in India. Over the past 6 years India has been the global leader in organic cotton production. During 2011-12 India grew organic cotton in 3.37 lakh hectares and produced 5.9 lakh bales at 72% of the global organic cotton. An estimated 219,000 farmers grow organic cotton across the globe, with an estimated 80% of them from India. About 93% of India's organic cotton area is in the three states of Madhya Pradesh (60%), Maharashtra (25%) and Rajasthan (9%). Earlier, India's contribution to global organic cotton production was about 10-15% until 2002. Suddenly the contribution increased to 33% (1.36 lakh bales) in 2006-07, 51% (4.34 lakh bales) in 2007-08 and 69% (11 lakh bales) in 2008-09.

Chemical intensive cotton production

Cotton farming is chemical intensive all across the world. According to the Croponosis, UK, cotton production accounted for 17.5% of world insecticide sales and 6.2% of the total plant protection chemicals in 2012. A recent ICAC report (2013) states that "an average of 16 cents were spent on insecticides themselves and their application on cotton per kilogram of lint in 20012-13. Expenditures on insect control in 2012/13 represented 11% of the net cost of cotton production".

Huge amount of synthetic fertilizers are used for conventional cotton production, especially

on hybrid cotton which occupies 95% of the total cotton area in India. The manufacturing process of one ton of nitrogen fertilizer emits nearly 7 tons of CO₂ equivalent greenhouse gases. It is estimated that organic cotton emits 40-60% less CO₂.

The U.S. Environmental Protection Agency considers seven of the top 15 pesticides used on cotton in 2010 in the United States as “possible,” “likely,” “probable,” or “known” human carcinogens (acephate, 1,3-dichloropropene, diuron, s-metolachlor, pendimethalin, tribufos, and trifluralin). In 1992, a massive bird kill occurred in Costa Rica after it was applied by plane in a cotton field. Methyl parathion has been implicated in the deaths of waterfowl in Spain and the acute poisoning of fish, birds, cattle and wild animals in the Sudan. There were 1,243 incidents involving methyl parathion between 1982-1991 in Brazil and hundreds of documented poisoning cases in laborers working in cotton fields of Nicaragua.

In India, cotton cultivation accounted for 1.0 to 1.5 kg insecticide per hectare per year almost for two decades prior to 2004 accounting for about 40-50% of the total insecticides used in India were for cotton pest management. Despite intensive insecticide applications, an estimated 15% of yield at least was lost each year. Cotton production was being rendered uneconomic in many regions of the country. The excessive use of insecticides, especially synthetic pyrethroids, led to further and worse problems of insecticide resistance in *Helicoverpa armigera* and *Spodoptera litura*, which further necessitated the repeated application of insecticides. Studies also show that many insecticides and crop varieties are actually responsible for ecological disruption that in turn leads to proliferation of existing pests or resurgence of new pests. Subsequent to 2004, when the area under Bt cotton increased to more than 30%, the usage reduced by 50% to 0.5 to 0.75 Kg per hectare per year.

Indian farmers continue to use insecticides, which are considered to be extremely hazardous to the environment and which have been severely regulated by the FAO (Food and Agricultural Organization), WHO (World Health Organization) and the UNEP (United Nations Environment Programme). Insecticides in the category of WHO Class 1a (extremely hazardous category; methyl parathion, phosphamidon & phorate) and WHO-Class 1b (highly hazardous; monocrotophos, dichlorvos, carbofuran, methomyl, triazophos and metasystox) are commonly recommended by many of the State Agricultural Universities in India for cotton pest control. Interestingly, diclorvos was never approved for use in cotton, but is being recommended by the Agricultural

Universities in Maharashtra and Gujarat. The three organophosphate insecticides (phosphamidon, methyl parathion and monocrotophos) belong to the category of either ‘banned or restricted use’ in India. But, it is a matter of immense concern that there has been a sudden increase in the use of these extremely hazardous category insecticides on cotton over the past 4-5 years for mealybug control. Methyl parathion and monocrotophos are banned or restricted use in 19 countries and phosphamidon in at least 12 countries. Monocrotophos is one of the most commonly used insecticides on cotton in India. Over the 25 years monocrotophos was used in Hungary, where it caused more damage to wild birds than did any other pesticide. Monocrotophos is also highly toxic to freshwater invertebrates. Effects reported in workers repeatedly exposed to methyl parathion include impaired memory and concentration, disorientation, severe depressions, irritability, confusion, headache, speech difficulties, delayed reaction times, nightmares, sleepwalking, drowsiness and insomnia. Medical effects include nausea, diarrhoea, blurred vision, and in severe cases, respiratory depression, convulsions and death.

The use of chemicals in cotton is not restricted to only the stage of crop production. It extends into processing as well. The OTA states that “During the conversion of cotton into conventional clothing, many hazardous materials are used and added to the product, including silicone waxes, harsh petroleum scours, softeners, heavy metals, flame and soil retardants, ammonia, and formaldehyde—just to name a few.... Many processing stages result in large amounts of toxic wastewater that carry away residues from chemical cleaning, dyeing, and finishing. This waste depletes the oxygen out of the water, killing aquatic animals and disrupting aquatic ecosystems. The North American Organic Fiber Processing Standards prohibits these and similar chemicals.”

Contamination with Bt cotton?

Since GM cotton is widespread in India, the possibilities of contamination either through bee-pollination or heavy winds or post harvest physical admixtures, make it relatively difficult to maintain the purity of GM-free organic cotton.

The Swedish fashion giant H&M with about 3000 stores, is the world’s largest user of organic cotton, followed by the Dutch retail chain C&A, Nike, Zara (Inditex) and Anvil Knitwear group. In 2010 an independent laboratory in Germany reported that 30% of the organic cotton tested from H&M, C&A and Tchibo was contaminated with Bt genes from GM cotton. Accusations were pointed

to India which was the main source of the organic cotton. Though the reports could not be confirmed scientifically, several precautionary measures were taken up to streamline the entire organic cotton production practices and to prevent physical contamination either at markets or processing mills. Currently certification procedures have also been standardised rigorously in India. There are 16 accredited certification bodies in India, but only a few of them have a major market share in the cotton value chain, especially in organic cotton. There are several national and international initiatives in India to maintain the integrity of organic cotton. The ICCO (Interchurch organization for development, Netherlands), Organic Exchange and Solidaridad have formed a group called the: 'Consortium on Integrity of Organic Cotton' to promote sustainable growth of the organic cotton sector and enhance the credibility of all the stakeholders. The Central Institute for Cotton Research assists organic cotton producing groups in seed production and detection of GM cotton.

Policy support in India

Two main Government bodies, the Organic Cotton Advisory Board (OCAB) and the

Agricultural and Processed Food Products Export Development Authority (APEDA) guide and oversee India's organic cotton industry. Through an internet based electronic service called 'Tracenet' the APEDA facilitates certification for export of organic products from India which comply with the NPOP (National Program for Organic Production) standards. TraceNet collects, stores and reports - forward and backward traces and quality assurance data entered by the operators / producer groups and certification bodies within the organic supply chain in India. The OCAB formed on Oct. 14, 2008 is headed by the textile commissioner. The OCAB has major objectives to foster a better understanding of the organic cotton industry, identify critical areas of action, facilitate synergy through efforts of various stakeholders and organise a well researched package of practice for organic cotton cultivation.

Conclusion

Organic cotton is certainly possible as a technology driven by high quality science. It can be developed in consonance with ecology and the environment to ensure long term sustainability.