

Bt Cotton in India Is a GMO Template for a 'Monumental Irreversible Catastrophe'

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Global Research, September 29, 2020

Region: [Asia](#)
Theme: [Biotechnology and GMO](#)

Cotton is the only genetically modified (GM) crop that has been officially approved in India and has been cultivated (illegally then legally) in the country for more than 20 years. Although GM mustard has been approved for commercial cultivation by India's apex regulatory body for GM crops (the Genetic Engineering Appraisal Committee, GEAC), a public interest litigation led by Aruna Rodrigues is before the Supreme Court challenging that decision and commercialisation of the crop is on hold.

The push to drive GM food crops into India has been happening for many years. Back in February 2010, the government placed an indefinite moratorium on the release of Bt brinjal after numerous independent scientific experts from India and abroad had pointed out safety concerns.

Minister Jairam Ramesh therefore rejected the commercialisation of Bt brinjal. He imposed a moratorium on its release till such time independent scientific studies establish the safety of the product from the point of view of its long-term impact on human health and the environment, including the rich genetic wealth existing in brinjal in India.

The moratorium has not been lifted and the conditions Ramesh set out have still not been met. Regulatory processes have been shown to lack competency, possess endemic conflicts of interest and demonstrate a lack of expertise in GMO risk assessment protocols, including food safety assessment and the assessment of environmental impacts.

Not to be deterred by any of this, the GEAC is now facilitating final-stage trials of a new Bt brinjal (event 142). It also seems dismissive of the Supreme Court-appointed Technical Expert Committee (TEC) Final Report in 2013 which was scathing about the prevailing regulatory system for GM crops. As a result, the TEC recommended a 10-year moratorium on the commercial release of all GM crops.

Immediately after the 2010 moratorium was announced, the GEAC carried on regardless and went straight ahead and sanctioned fresh trials for the new Bt brinjal. It appears that developers-cum-lobbyists were actually sitting on regulatory bodies as event 142 was proceeding, granting biosafety clearance and claiming all tests are complete, despite data being kept out of the public domain.

I recently contacted **Aruna Rodrigues** to discuss the current situation.

Colin Todhunter: The government has asserted that hybrid insecticidal Bt cotton in India has been an outstanding success and argues that it is a template for the introduction of GM

food crops.

Aruna Rodrigues: The metric used to pronounce the grand success of hybrid Bt cotton is adoption/total production data as opposed to the real measure of performance, which is yield expressed as kg lint/ha and for the farmer, total net income/ha. The error is so basic that it is embarrassing that supposedly leading public sector scientists can err in such manner. But this is deliberate because the official agenda to promote GMOs is being openly espoused without any factual data or science to back a decision of such profound importance and irreversible ramifications.

They want to use hybrid Bt cotton as the model to introduce other Bt crops, principally food crops. And indeed, thousands of field trials of Bt crops have never been stopped, not even when the central government overturned the commercial approval of Bt brinjal a decade ago and imposed an indefinite moratorium.

CT: Renowned international experts have argued that we now have definitive evidence of the failure of Bt cotton in India, not least in terms of stagnant yields, pesticide use that is back to pre-Bt era levels, increasing pest resistance and rising input costs.

AR: The scientific evaluation of Bt cotton is the work of eminent scientists: Prof Dr Andrew Gutierrez, with Dr Hans Herren (World Food Prize Laureate), Dr Peter Kenmore (former head of FAO Plant Protection) and Dr Keshav Kranthi (former Director of the Central Institute of Cotton Research, India's apex cotton institute). Together, they have nailed the data and analyses of hybrid Bt cotton to provide conclusive proof of its definitive failure. (See 'International scientists highlight failure of GM Bt cotton in India' on GMWatch.org and 'International Webinar on Bt Cotton in India: Myths & Realities' on [YouTube](https://www.youtube.com/watch?v=...))

The use of hybrids has played an important role in the failure of hybrid Bt cotton, the development of the yield plateau in India, high production costs and low productivity. The data show that suicides increase with economic distress, (Gutierrez et al; 'Bioeconomics of hybrid Bt cotton and suicides' in the process of being published by Environmental Sciences Europe) – low yield, rising costs and low net income. The low yield is related to inappropriate hybrid Bt varieties and low planting densities and falling net revenues due to stagnant yield, unstable cotton prices and escalating costs of production.

Also entering this equation are insecticide-induced pests and insecticide resistance, increasing resistance in pink bollworms to Bt toxins and the vagaries of weather on hybrids. American bollworm resistance is also increasing. By 2013, pre-Bt era of 2002 levels of insecticide use were surpassed. It should be noted that reducing insecticide use was the *raison d'être* for the Bt technology; it has no trait for yield.

Most hybrid cottons are long season of 180-200 day duration that increases the opportunities for pest resurgence and outbreaks. Additionally, hybrids require stable water and more fertiliser.

In 13 years, the cost of cultivation increased 302%. In 15 years, there was a 450% increase in labour costs. Costs of hybrid seed, insecticide and fertiliser increased more than 250 to 300%. And net profit was Rs. 5971/ha in 2003 (pre-Bt) but plummeted to net losses of Rs. 6286 in 2015 ([Kranthi](#)).

CT: How does the performance of Bt cotton in India compare with elsewhere?

AR: Hybrid Bt cotton was designed to increase yield and quality, but India's global rank is 36 in terms of yield out of the 75 cotton growing countries. This ranking leaves India behind at least 21 major producing countries, including many in Africa, which do not employ GM cotton and cultivate only open pollinated varieties. The top eight producers use high density plantings of appropriate varieties that are approximately six-fold higher than commonly used in India. Herein lies the solution for India in the potential of high-density short-season cotton.

CT: The use of long-season hybrids in India seems unique. You and others have argued that the only reason to combine GM technology with hybrids was to serve as a value capture mechanism: for the seed companies to extract profit at the expense of farmers because in India international property rights on seeds cannot be enforced like they are in the West through signed contracts. But there have been other implications. Can you say something about these hybrids?

AR: The use of hybrid cotton is unique to India, being sold as a value-capture mechanism to enable seed companies to safeguard their profit and side-step intellectual property rights concerns. The hybrid technology disallows seed saving by millions of small farmers who cannot be controlled by threats of lawsuits. There is no other reason why hybrid technology was used; but it added significantly to the failure of Bt cotton.

Non-hybrid cotton varieties in other cotton growing countries are grown at densities of more than 100,000 plants per hectare, which is at least five times higher than India's national average density of 18,500 plants per hectare.

Scientific trials conducted with non-Bt varieties in all the cotton growing states of India and in more than 6,894 demonstrations in farmer fields by government agencies during 2012 to 2016 unequivocally show that high density planting results in higher yields compared to the most popular high priced Bt cotton hybrids.

Furthermore, long staple desi cotton varieties also give consistently high yields above the national average of Bt cotton hybrids. The high price of hybrid Bt seed engenders low planting densities in India that contributes greatly to low yields.

High-density short-season planting of non-GM straight line varieties of desi cotton and American cotton species that interrupt the lifecycle of the pink bollworm is required. This simple insight has important implications and provides the basis for a proven solution against pests.

CT: Bt is a toxin encoding gene. And yet the proposal is to incorporate it in brinjal, a vegetable that is eaten across all sections of Indian society. Can you say a little about Bt toxicity and the implications for brinjal?

AR: The question of the toxicity of Bt proteins is circumvented by the regulators accepting a discredited version of cry toxicity based on a Monsanto myth that Bt toxins are only toxic to alkaline gut systems of insects, not the acidic stomachs of mammals. There is plenty of proof that Bt proteins are indeed toxic to both humans and animals (Schubert letter of Nov 2009 to Minister Jairam Ramesh, when he called for a scientific review of Bt brinjal). Failed Bt cotton is indeed the model for hybrid Bt brinjal and for monumental catastrophe.

CT: Bt brinjal has been sanctioned for final-stage field trials. If, in 2010, Hybrid Bt brinjal was

deemed unsuitable for India, given that these trials are going ahead, what if anything has changed?

AR: Nothing has changed. The Bt gene is still a Bt gene and it is a toxin. It is worth reading an excerpt from the letter Prof David Schubert wrote to Jairam Ramesh in 2009:

“It is virtually certain that within the vast Indian population a large number of people eating Bt brinjal are going to be or will become allergic to this foreign protein; this number cannot be predicted and some of the immune responses will likely be severe, causing anaphylaxis and possibly fatalities. Since there will be no way of tracking these adverse reactions within the population, and since once Bt brinjal is commercially grown, its genetic presence within a major calorie source for the Indian population is irreversible, a simple decision has to be made. Is the negligible benefit of Bt brinjal worth the clear risk? My conclusion is that it is not worth the risk and that it would be a profound disservice to India if Bt brinjal were allowed to enter her food supply.”

We now have the immeasurable advantage of the definitive assessment of the failure of hybrid Bt cotton across all relevant measures. We must use this knowledge to the benefit of our nation and Indian agriculture. Bt Brinjal Event 142 is also planned in hybrids that will increase seed costs and prevent seed saving.

One thing is crystal clear and it is worth repeating for warning and emphasis: hybrid Bt cotton is a negative model for hybrid Bt brinjal; for a monumental irreversible catastrophe.

Virtually no safety testing/risk assessment protocols were carried out for Bt brinjal more than 10 years ago. It stands as the only test case where the raw data was subsequently assessed by several eminent international scientists. They found a virtual vacuum. None of this engenders confidence in the regulators as responsible or trustworthy.

Furthermore, GMO contamination in what is a centre of diversity is of paramount importance. Our regulators have an uncanny ability to focus on two crops (mustard and brinjal) of great genetic diversity. There are about 9,000 accessions of mustard in our gene banks and India is a centre of origin/diversity of brinjal with the richest germplasm in the world.

I only have questions of our regulators because the things they do are fundamentally in error. And the list is endless. They also want to open up Indian agriculture to the second front of GM technology, herbicide tolerant crops, when chemicals (e.g., glyphosate) are documented to pose serious environmental and health risks.

The only option is to stop all environmental release of GMOs, because we are at serious risk from our own regulators. This is not just petitioners' stance in the Supreme Court. Four official reports support the petitioners and two of them belong to the Parliamentary process in India of Parliamentary Standing Committees (PSCs), which are appointed across party lines. Both PSCs were unanimous that Indian regulation is seriously awry, both for a lack of expertise and an endemic conflict of interest. Both PSCs recommended a moratorium on GMOs.

CT: Given the vast genetic diversity of mustard and brinjal in India, developed over millennia, it is clear that 'need' has not been established for these (or any other) GM crops. Why is the government pushing so hard for GMOs?

We don't have independent regulation in India, not just in the sense of the regulators themselves, but also attendant ministries and institutions are rife with conflicts of interest. They promote GMOs. The glaring example is the regulatory body called the Review Committee on Genetic Manipulation of the Department of Biotechnology, in the Ministry of Science and Technology (DBT). In this case, the DBT funds GM mustard development and also promotes it. The GEAC has historically had a serious conflict of interest with the line between the regulators and the regulated difficult to distinguish and partly explains why the government is pushing GMOs so hard.

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