

Treadmill of Magic Seeds and Broken Promises: Dismantling the Myth of Bt Cotton Success in India

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Political posturing aligned with commercial interests means that truth is becoming a casualty in the debate about genetically modified (GM) crops in India. The industry narrative surrounding Bt cotton is that it has been a great success. The current Modi-led administration is parroting this claim and argues its success must be replicated by adopting a range of GM food crops, amounting to what would be a full-scale entry of GM technology into Indian agriculture. Currently, Bt cotton is India's only officially approved commercially cultivated GM crop.

With the aim of putting the record straight, a media event took place on Friday, 6 September in New Delhi at the Constitution Club of India during which it was declared that Bt cotton has been a costly and damaging failure. Speakers included prominent environmentalists Aruna Rodrigues and Vandana Shiva who presented a good deal of information based on official reports, research papers and documents submitted as evidence to the Supreme Court on Bt cotton.

It was argued that even the government's own data contradicts its tale of Bt cotton success and that the consequences of irresponsibly rolling out various GM crops based on a false narrative would be disastrous for the country.

PR and broken promises

In the early 2000s, Bt cotton was being heavily promoted in India on the basis it would cut pesticide use dramatically, boost yields and contribute to the financial well-being of farmers. However, pesticide use is back to pre-Bt levels and yields have stagnated or are falling. Moreover, some 31 countries rank above India in terms of cotton yield and of these only 10 grow GM cotton.

As will be shown, farmers now find themselves on a chemical-biotech treadmill and have to deal with an increasing number of Bt/insecticide resistant pests and rising costs of production. For many small-scale cotton farmers, this has resulted in greater levels of indebtedness and financial distress.

Failure to yield

Over 90% of cotton sown in India is now Bt. Although initially introduced to the country in 2002, its adoption was only about 12 and 38% respectively in 2005 and 2006. A good deal

of data was contained in the media briefing that accompanied the event in Delhi. In it, **Aruna Rodrigues** and **Vandana Shiva** show that, even then (2005-2006), average yields had already reached the current plateau of about 450-500 kg/ha. Average all-India Bt cotton yields hovered around or below 500 kg/ha during the period 2005-2018.

What is particularly revealing is that cotton production for 2018-2019 will be the lowest in a decade, down to an estimated 420.72 kg/ha, according to a press release issued in July by the Cotton Association of India.

Furthermore, the argument is that increases in yields that may have occurred were in any case due to various factors, such as increased fertiliser use and high-yielding hybrid seeds, and not Bt technology.

The data presented by Rodrigues and Shiva shows that cotton yield in the pre-Bt era increased significantly from its 191 kg/ha low in 2002 to 318 kg/ha in 2004-2005, registering an increase of 66% in just three years (the baseline for Bt cotton is 2005-2006 as prior to this adoption rates were not significant). The two environmentalists say this was a result of increased acreage under hybrids and a new class of insecticides.

They note that the momentum of this upward swing carried into the Bt era and had nothing to do with that technology. Their argument is that Bt cotton has failed but is being trumpeted as a success under the cover of increased fertiliser use, hybrid seed trait yield (not attributable to Bt technology), better irrigation and insecticide seed coating.

Biotech treadmill and ecological disruption

Bt technology was used in conjunction with high-yielding hybrids (as opposed to pure line varieties) and has no trait for intrinsic yield. This, Rodrigues and Shiva argue, conveniently allowed a smudging of the yield data (isolating the precise impact of hybrid yield would prove to be difficult) and also provided a 'value-capture' mechanism for Monsanto: the introduction of these hybrids disallows seed saving, forcing farmers to buy new expensive hybrid Bt cotton seed each year (hybridisation gives one-time vigour).

Prior to Bt cotton, the extensive use of insecticides to cope with the Pink Bollworm (PBW), which is native to India, had become a problem. Spraying for PBW caused outbreaks of the American Bollworm (ABW). The ABW is a secondary pest that was induced by extensive insecticide use and became the target for Bt cotton.

Although Bt cotton was supposed to control both species of bollworm, PBW resistance to Bt toxin has now occurred and the ABW is also developing resistance. Moreover, post 2002, new pests have appeared, such as whitefly, jassids and mealybugs.

However, Rodrigues and Shiva note that resistance in PBW now occurs to both Monsanto's Bollgard I and Bollgard II Bt cotton (BGI and BG II). BGI was replaced by BG II as early as 2007-8, just six years after its introduction because the PBW had developed resistance. The ABW is also now developing resistance to stacked Bt toxins in BG II.

Irresponsible roll out

Hybrids are input intensive and are sown at suboptimal wide spacing. Unlike in other countries that grow Bt cotton, they are long season cottons and are thus more susceptible to pest build-up. With this in mind, Rodrigues and Shiva refer to Dr K R Kranthi, former

director of the Central Institute for Cotton Research, who says:

“Insecticide usage is increasing each year because of resistance development in sucking pests to imidacloprid and other neonicotinoid insecticides—by 2012 insecticide usage was at 2002 levels and will continue to increase inducing further outbreaks of insecticide and Bt resistant pests.”

Bt cotton hybrids also require more human labour and perform better under irrigation. However, 66% of cotton in India is cultivated in rain fed areas, where yields depend on the timing and quantity of highly variable monsoon rains. Unreliable rains, the high costs of Bt hybrid seed, continued insecticide use and debt have placed many poor (marginal) smallholder farmers in a situation of severe financial hardship.

In fact, **Professor [A P Gutierrez](#) argues that** Bt cotton has effectively put these farmers in a corporate noose: [his research](#) has noted a link between Bt cotton, weather, yields, financial distress and farmer suicides.

Monsanto's profiteering

Rodrigues and Shiva note that Monsanto was allowed a 'royalty' on Bollgard I seed without having a patent on it. Drawing on conservative estimates (by K R Kranthi), on average, the additional expenditure on seeds (compared to non-Bt seeds) was at least Rs 1,179 per hectare and the Indian farmer may have spent a total extra amount of Rs 14,000 crores (140 billion) on Bt cotton seeds during the period 2002-2018. The trait value charged (2002-2018) is around Rs 7,000 crores. This excludes royalties accruing to Mahyco-Monsanto, which were illegal on Bollgard I (first generation Bt cotton) and yet allowed by the regulators.

Overall net profit for cotton farmers was Rs 5,971/ha in 2003 (pre-Bt) but plummeted to average [net losses](#) of Rs 6,286 in 2015, while fertiliser use kg/ha exhibited a 2.2-fold increase. As Bt technology was being rolled out, costs of production were thus increasing. And these costs were increasing in the face of stagnant yields.

Why GM anyway?

At this point, it is worth broadening the scope of this article by noting that in 2010, an indefinite moratorium was placed on Bt brinjal, which would have been India's first GM food crop. Despite the current push for a full-scale entry of GM into Indian agriculture, the moratorium is still in place: the conflicts of interest, secrecy, negligence and lack of competence inherent in the GM regulatory process that were acknowledged at that time [remain unaddressed](#).

It would therefore be grossly irresponsible to roll out GM. If the experience of Bt cotton tells us anything, it would also be extremely unwise to proceed without carrying out independent health, environmental and socio-economic risk assessments.

Of course, establishing the need for GM – crops that outperform current non-GM options currently available – is paramount but totally absent. With this in mind, Rodrigues and Shiva [cite evidence](#) that traditional plant breeding and newer methods outperform GM agriculture at much less cost, release fewer carbon emissions and earn much greater profits for farmers.

Given this situation (the [fraud](#) of GM and its [dubious track record](#) aside), anyone could be forgiven for thinking that the plan to get GM into Indian agriculture is solely driven by ideology and commercial interest. Instead of drawing on proven [traditional knowledge and practices to ensure food security](#), the strategy seems to be to [place farmers on biotech-chemical treadmills](#) for the benefit of corporate interests.

Green Revolution to ‘gene revolution’

If we look at the Green Revolution, it too was also sold under the guise of ‘feeding the world’. But in India, according to [Professor Glenn Stone](#), it merely led to more wheat in the diet, while food productivity per capita showed no increase or actually decreased. Nevertheless, there have been [dire consequences](#) for the Indian diet, the environment, farmers, rural communities and public health.

More generally, the Green Revolution dovetailed with an international system of chemical-dependent, agro-export mono-cropping and big infrastructure projects (dams) linked to loans, sovereign debt repayment and World Bank/IMF directives, the outcomes of which included a displacement of the peasantry, the [consolidation of global agri-food oligopolies](#) and the transformation of many countries into food deficit regions.

Often regarded as Green Revolution 2.0, the ‘gene revolution’ is integral to the plan to [‘modernise’ Indian agriculture](#). This means the displacement of peasant farmers, further corporate consolidation and commercialisation based on industrial-scale monocrop farms incorporated into global supply chains dominated by transnational agribusiness and retail giants. It would also mean the undermining of national food security.

GM-based agriculture is key to what would amount to a wholesale corporate capture of the agri-food sector: a sure-fire money spinner that would dwarf the amount drained from India courtesy of Monsanto’s ‘royalties’ on Bt cotton.

Agroecological solutions

This wholesale shift to industrial agriculture would have devastating impacts on the environment, rural communities, public health, local and regional food security, seed sovereignty, nutritional yield per acre, water tables and soil quality, etc. Industrial agriculture has massive [health, social and environmental costs](#) which are borne by the public and taxpayers, certainly not by the (subsidised) corporations that rake in the massive profits.

It is no surprise, therefore, that an increasing international consensus is emerging on the role of agroecology. In this respect, smallholder farmers are not to be regarded as residues from the past but as being crucial to the future.

And this is not lost on Rodrigues and Shiva who note the vital importance and productivity of small farms (which outperform industrial-scale enterprises and feed most of the global population) and the advantages of agroecological farming. They refer to the recent [UN FAO High Level Panel of Experts which concludes that agroecology](#) provides greatly improved food security and nutritional, gender, environmental and yield benefits compared to industrial agriculture.

Furthermore, according to Rodrigues and Shiva, regenerative organic farming can draw down excess carbon from the atmosphere and put it in the soil, thereby reversing climate

change and making agriculture climate resilient. They argue that organic systems are competitive with conventional yields and leach no toxic chemicals. As for cotton, they state that 'desi' species of cotton varieties are highly amenable to low-cost organic farming, providing an excellent opportunity for India to emerge as a global leader in organic cotton.

The take-home message is that if GM food crops are to be rolled out – based on a narrative about Bt cotton that relies more on industry spin than actual facts – it would be disastrous for India. Given the evidence, it's a warning that should not be taken lightly.

An eight-page briefing was issued to coincide with the media event and contains relevant references, additional data and numerous informative charts. It can be accessed [here](#).

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