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Dependency, Distress and No Durable Agronomic Benefits: The Story of Bt Cotton in India

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In the early 2000s, genetically modified (GM) Bt insecticidal cotton was being heavily promoted in India on the basis that it would cut pesticide use dramatically, boost yields and contribute to the financial well-being of farmers. Private sector Bt cotton hybrids now cover over 90% of the area under cotton.

Supporters of Bt cotton have wasted little time in claiming that GM technology has increased cotton yields, reduced pesticide use and has been of enormous benefit to farmers due to increased crop profitability. If we consider Prof Glenn Stone's 2012 paper 'Constructing Facts: Bt Cotton Narratives in India', however, it becomes clear that such claims are too often weaved from flawed data and studies and merely serve to bolster vested interests.

In an attempt to shed further light on the role of Bt cotton in India, Glenn Stone (Washington University in St Louis) and his colleague K R Kranthi (International Cotton Advisory Committee) have jointly authored a new paper – 'Long-term impacts of Bt Cotton in India' – that appears in the journal Nature Plants (March 2020). Unlike previous assessments, the paper is quite unique as it is based on a long-term analysis that spans a period of 20 years.

While proponents of Bt cotton say that GM technology is responsible for tripling cotton production between 2002 (when Bt cotton was commercialised in India) and 2014, Stone argues that the largest production gains came prior to widespread GM seed adoption and must be viewed in line with changes in fertilisation practices and other pest population dynamics.

Stone says:

> "There are two particularly devastating caterpillar pests for cotton in India, and, from the beginning, Bt cotton did control one of them: the (misnamed) American bollworm. It initially controlled the other one, too – the pink bollworm – but that pest quickly developed resistance and now it is a worse problem than ever."

He adds that Bt plants were highly vulnerable to other insect pests that proliferated as more and more farmers adopted the crop.

According to Stone:

> "Farmers are now spending much more on insecticides than before they had ever heard of Bt cotton. And the situation is worsening."

Although yields in all crops jumped in 2003, the increase was especially large in cotton.

However, Stone says:

> "… Bt cotton had virtually no effect on the rise in cotton yields because it accounted for less than 5% of India's cotton crop at the time."

Stone argues that any changes in productivity have more to do with huge increases in insecticides and fertilisers and that farmers in India are now spending more on seeds, more on fertiliser and more on insecticides.

So, what has been the overall impact of Bt cotton in India?

Stone says that Bt cotton's primary impact on agriculture will be its role in making farming more capital-intensive, rather than any enduring agronomic benefits. And this conclusion appears to confirm what others have been saying in recent years.

During a September 2019 media event in Delhi, for instance, Aruna Rodrigues and Vandana Shiva showed that pesticide use is back to pre-Bt levels and yields have stagnated or are falling. Moreover, they noted that some 31 countries rank above India in terms of cotton yield and of these only 10 grow GM cotton. They concluded that farmers now find themselves on a (capital-intensive) chemical-biotech treadmill and have to deal with an increasing number of Bt/insecticide resistant pests and rising costs of production.

Their data indicated that overall net profit for cotton farmers in the pre-Bt era had plummeted to average net losses in 2015, while fertiliser use kg/ha had exhibited a 2.2-fold increase. As Bt technology was being rolled out, costs of production were thus increasing. And these costs have increased in the face of stagnant yields. They too indicated that increased fertiliser and insecticides along with high-yielding hybrid trait value (independent of Bt technology) and increased acreage under cotton cultivation were responsible for any increase in productivity.

In fact, based on his own research, Prof A P Gutierrez argues that Bt cotton has effectively put many farmers in a corporate noose. Although Bt cotton hybrids perform better under irrigation, 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.

Based on extensive field research in India, cultural anthropologist Andrew Flachs argues that independent cultivators have become dependent on corporate products, including off-farm commodified corporate knowledge. In the past, they cultivated, saved and exchanged seeds; now, as far as cotton cultivation is concerned, they must purchase GM hybrid seeds (and necessary chemical inputs) each year.

While Bt cotton farmers are losing their traditional knowledge and skills due to increasing market dependency, they are now trapped in a scenario of debt and rising input costs. In the meantime, maybe one in four seasons a farmer will attain a good enough yield to break even. Flachs notes that negotiating risk and gambling on seeds, weather and pesticide use have become an integral part of the corporate cotton seed and chemical treadmill.

It all begs the question: just who has benefitted from Bt cotton? For the answer to this, let us turn to Imran Siddiqi from the Centre for Cellular and Molecular Biology in Hyderabad, who notes that India opted to use hybrids seeds for Bt technology. Hybrids are made by crossing two parent strains having different genetic characters and the plants have more biomass than both parents and capacity for greater yields. But they also require more inputs, including fertiliser and water, and require suboptimal planting (more space).

Siddiqi notes that all other cotton-producing countries grow cotton not as hybrids but varieties for which seeds are produced by self-fertilisation. He argues that the advantages of non-hybrids are considerable: twice the productivity, half the fertiliser, reduced water requirement and less vulnerability to pest damage due to a shorter field duration. He concludes that agricultural distress is extremely high among Indian cotton farmers and the combination of high input and high risk has likely been a contributing factor.

The introduction of hybrids disallowed seed saving, forcing farmers to purchase new, expensive hybrid Bt cotton seed each year, as hybridisation – unlike pure line varieties – affords one-time vigour. The use of hybrids in India gave pricing control to seed companies and Monsanto that issued licenses for the technology, while ensuring a continuous market.

When viewed in this light, Bt hybrid cotton technology has been integral to what veteran rural reporter P Sainath terms the 'predatory commercialisation of the countryside' by corporate interests. Its main role from the outset has been value capture and the creation of market dependency. It this respect, Bt cotton has been an outstanding success.

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