



Impacts of Bt Cotton

This editorial analysis is based on the article [The twisted trajectory of Bt cotton](#) which was published in The Hindu on 10th of September 2020. It analyses the impact of the Bt. Cotton on Indian farming and farmers.

[Genetically modified \(GM\) cotton](#), the plant containing the pesticide gene from the bacteria *Bacillus thuringiensis* (Bt), has been grown in India for about twenty years now. This pesticide, now produced in each Bt plant cell, ought to protect the plant from bollworm, thereby increasing yields and reducing insecticide spraying on the cotton plant. However despite finding huge favour in India, the GM crop has only brought modest benefits according to several studies.

History of Bt. Cotton

- Cotton has been woven and used in India for thousands of years.
- Cotton fabric from around 3,000 BCE has been excavated from the ruins of Mohenjo-daro, and archaeological findings in Mehrgarh, Pakistan, show that cotton was used in the subcontinent as far back as 5,000 BCE.
- Much of the cotton cultivated until the 20th century in India was of the indigenous 'desi' variety, *Gossypium arboreum*.
- From the 1990s, hybrid varieties of *G. hirsutum* were promoted.
- These hybrids cannot resist a variety of local pests and require more fertilizers and pesticides. Cotton suffers from plenty of infestation from moth pests such as the Pink Bollworm (PBW) and sap-sucking pests such as aphids and mealy bugs.
- Rising debts and reducing yields, coupled with increasing insect resistance, worsened the plight of cotton farmers.
- It was in this setting that Bt cotton was introduced in India in 2002.

Adoption of Bt. Cotton

- According to the Ministry of Agriculture, from 2005, adoption of [Bt cotton](#) rose to 81% in 2007, and up to 93% in 2011.
- Many short-duration studies examining Bt cotton, in the early years, pronounced that Bt was a panacea for dwindling yields and pesticide expenses.

Has Bt. Cotton been really successful?

Discrepancy Between Yields And Bt Cover

- There are discrepancies between yield and the deployment of Bt cotton.
- For instance, the Bt acreage was only 3.4% of the total cotton area in 2003. However the increase in yield in 2003-2004 was 61% so it is not sufficient to credit the Bt. cotton for that. Similarly Bt coverage by 2005 was only 15.7 but increase in yield increases were over 90% over 2002 levels.
- While Bt cotton adoption corresponded to a drop in spraying for bollworms, the study states, that countrywide yields stagnated after 2007 even as more farmers began to grow Bt.

- By 2018, yields were lower than in the years of rapid Bt adoption.
- Many State's Figure Correspond To Same
 - Individual State data are more helpful in understanding subnational trends.
 - In Maharashtra, yields climbed in the decade after 2000, with no change in the rate of increase when Bt cotton was introduced.
 - In Gujarat, Andhra Pradesh and Madhya Pradesh as well, there is no correlation between the adoption of the variety and increase in yields.
 - For instance, Gujarat's surge in cotton yields was 138% in 2003, even as Bt cotton was used only for 5% of land under cotton.
 - Similar findings are seen in Punjab, Haryana and Rajasthan, where yield increase is incongruous with the spread of Bt cotton

Low Productivity

- India's productivity (yield per unit area), is much lower than other major cotton-producing countries.
- This means that a much larger area is used for [cotton](#) production and hence the Bt. Cotton has failed to increase yield.

Market Capture

- Commercial Bt hybrids have overshadowed the market, accompanied by the rollback of public sector cottonseed production.
- Hence, the Indian cotton farmers are left with little choice but to use Bt hybrid seed produced by private seed companies.

Farmers Distress

- Due to the combination of high input and high risk, [agricultural distress](#) is extremely high among hybrid cotton cultivating farmers.
- Compact varieties (plant is sown at high density for a small period of time) would have significantly reduced this distress as well as increased yield.

Way Forward

Impact Assessment

- Before extending GM technology to increase food crop yield it is mandatory to assess its [impact](#) on livelihood, agrarian distress, etc. Hence, the outcome of deploying a technology must be evaluated in a particular context.
- If the technology does not prioritize the needs of the principal stakeholders (farmers), it can have significant negative fallouts, especially in India which has a high proportion of marginal and subsistence farmers.

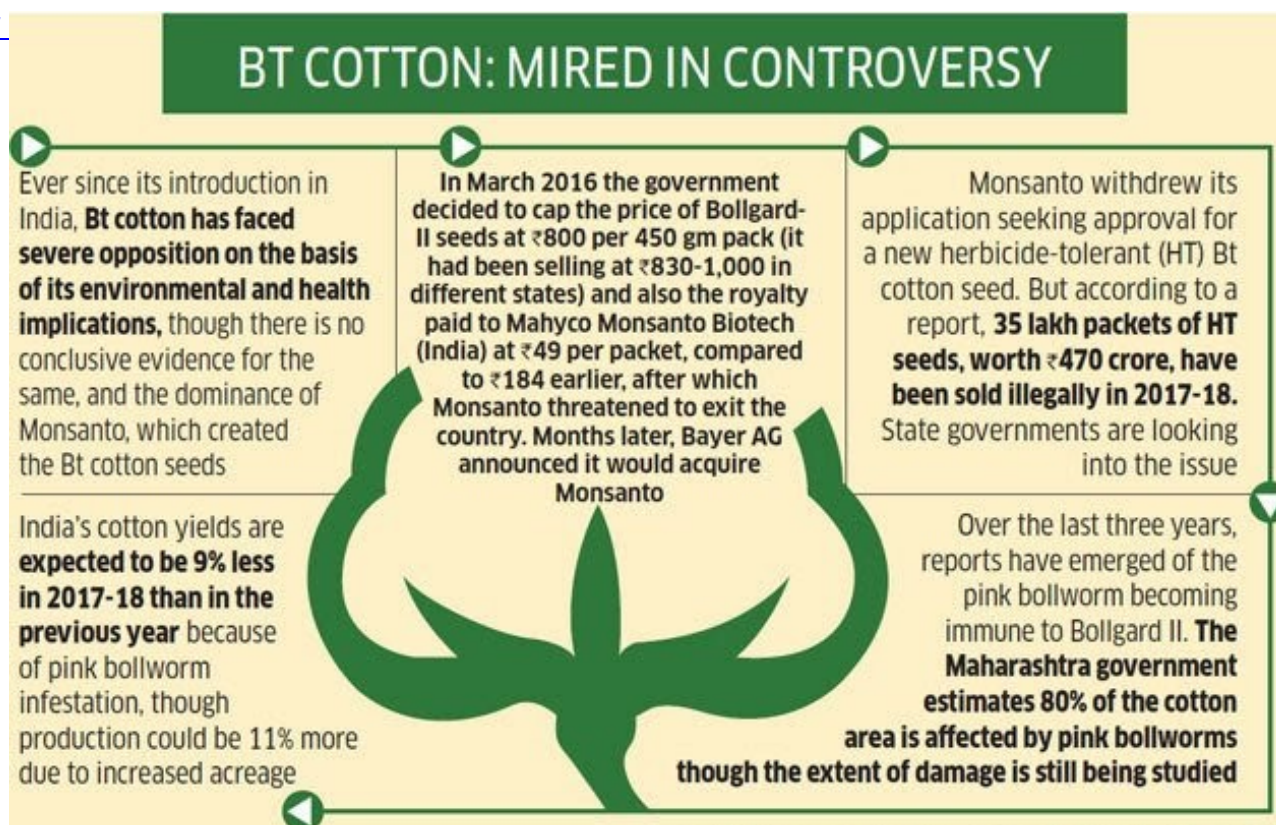
Change In Cropping Pattern

- There are two patterns of [cotton plantation](#).
 - One is compact and short term where the plant is sown at high density for a small period of time.
 - The other is for longer duration and not that dense.
- India prefers longer duration with less density method.
- However, hybrids in India are bushy, long duration and planted at a ten-fold lower density but cotton is a dryland crop and 65% of the area under cotton in India is rain-fed.
- Farmers with insufficient access to groundwater in these areas are entirely dependent on rain. Here, the shorter duration variety has a major advantage as it reduces dependence on irrigation and risk.
- Particularly late in the growing season when soil moisture drops following the monsoon's withdrawal.
- This period is when bolls develop and water requirement is the highest.

Focus On Indigenous Breeds

- Before the advent of British in India, different varieties of cotton indigenously developed over a long period of time, were grown in different parts of the country, each being suited to the local soil, water and climate.
- Indian cotton fabrics dominated the world trade during the succeeding millennia and were exported to many places, including Greece, Rome, Persia, Egypt, Assyria and parts of Asia.
- The cost of ignoring 'desi' varieties for decades has been high for India.
- These varieties resist many pests and don't present the problems faced with hybrids.
- Research suggests that with pure-line cotton varieties, high density planting, and short season plants, cotton yields in India can be good and stand a better chance at withstanding the vagaries of climate change.
- Government backing for resources, infrastructure and seeds is essential to scale up 'desi' varieties.

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Drishti Mains Question

“Despite finding huge favour in India, the GM crop has only brought modest benefits”. In the light of statement critically analyse the use and impact of hybrid cotton seed in India.

This editorial is based on [“Vaccine for all: On COVID-19 vaccine policy”](#) which was published in The Hindu on September 9th, 2020. Now watch this on our Youtube channel.