THE FAILURE OF MONSANTO'S BT COTTON

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India's entry into the GM era was marked by the approval given to three varieties of genetically modified cotton using Monsanto's Bt cotton technology. Permission for commercial cultivation of Bt cotton was given for the six states of Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamil Nadu. The Genetic Engineering Approval Committee (GEAC) has laid down certain conditions for the cultivation of these Bt varieties, which are supposed to protect against the pest bollworm. The most important condition is that Bt cotton must be grown with an 'insect refuge' of 20 % non-Bt cotton. This means that fields of Bt cotton have to be surrounded by non-Bt cotton. This is essential so that the bollworm can feed partly on non-poisonous, normal cotton and remain susceptible to the Bt toxin. Otherwise, like the mosquitoes developed resistance to DDT, the bollworm will quickly become resistant to Bt toxin and the crop will fail.

The first crop of Monsanto's Bt cotton was harvested in the early summer of 2003. Gene Campaign had conducted a field study in Andhra Pradesh and Maharashtra to assess the performance of Bt cotton and found that Bt cotton had performed very poorly. Subsequent reports showed that the crop was a failure practically everywhere it was grown.

The Bt cotton was found to be a shorter duration crop (90-100 days) than the non-Bt cotton (100 to 120 days) but the plants showed less vigorous growth, with fewer branches and smaller leaves. The bolls were smaller in size and a common complaint was that the bolls dropped off before maturing. This resulted in lower yields. The Gene Campaign study also found that farmers also had to suffer losses because of the poor quality of the Bt cotton.

Yields of Bt cotton were found to be by and large lower compared to their non-Bt counterparts. In fact local hybrids which are not Bt, usually performed better than the Bt cotton. These non-Bt cotton varieties yielded about 15 to 17 percent more than the Bt cotton. Average yield of Bt cotton was found to be lower in all categories of land holdings, whether they were irrigated, good quality soils or poor quality red soils in the rainfed areas.

Demand in the market was higher for non-*Bt*. cotton than for *Bt*. cotton because of better quality. Consequently non Bt cotton fetched a higher price, ranging from Rs. 2,200 per quintal to Rs. 2,350 per quintal whereas Bt cotton fetched only Rs. 2,000 to Rs. 2,100 per quintal

One thing that emerges very clearly is that the economics of cultivating Bt cotton is not in favour of farmers, primarily because the seed is very expensive. The seed is about four times more expensive than the good local cotton hybrids available to the farmers. The difference in the price of seed worked out to approximately Rs. 1200 per (450 gm) bag

which is needed to plant an acre. As against this outlay, savings on pesticide as recorded by the Gene Campaign study were meagre, averaging Rs. 217 per acre.

The investment per acre is much higher for Bt cotton than for non-Bt cotton varieties. The Bt cotton farmer had to invest about Rs. 1000 more per acre than his non-Bt counterpart. On the other hand, yield of Bt cotton was lower than non-Bt cotton and the cotton was of poorer quality thus fetching a lower price per quintal. Because of the shorter fibre length, Bt. cotton was graded as B and C, fetching on an average Rs. 300/quintal less on the market than Non-*Bt*. cotton which was graded as A and B quality. Net profit from Bt cotton was lower per acre compared to non-Bt cotton in all types of fields (low to high yielding). In fact, *60 % of the farmers cultivating Bt cotton were not even able to recover their investment and incurred losses averaging Rs. 80 per acre*.

The first GM cotton harvest clearly shows that Bt cotton does not protect against the main cotton pests as was promised by Monsanto. Bt cotton varieties grown in all six states were attacked by a variety of pests so the farmer had to keep spraying pesticides to control the pests. This is the reason there was no great saving in pesticide use as Monsanto was claiming all along.

Bt cotton was never developed for the agriculture of the tropics. It was developed for countries like the US where pests are limited, - chiefly one kind of bollworm, the green bollworm, against which the Bt toxin works. Bt toxin has no effect on the other bollworm, the pink bollworm, which is a major cotton pest in India. In addition, unlike the US, there are several other kinds of pests in India which are a problem for cotton farmers and against which Bt offers no protection, so it does not seem very likely that Bt cotton will work in India in the long run.

Why the Monsanto cotton failed

A number of factors are responsible for the failure of Monsanto's Bt cotton. The first is the poor quality of the cotton varieties used. It is known that MECH 162 and MECH 184, which were transformed to Bt 162 and Bt 184, are poor to modest performers. A better variety would give better Bt cotton so the GEAC must answer why it approved this Bt cotton when better quality Bt cotton hybrids belonging to Indian companies are in the pipeline.

Because of the expensive seeds and modest pesticide saving, the economics of the Bt crop is not favourable for the farmer. Tilting the balance further is the fact that Bt cotton must be grown with a refuge, necessary for resistance management. This is recommended as 20 % of the cultivated area by the GEAC. "Wasting" 20 % of the land on managing resistance makes the Bt cotton even more nonviable, especially for small farmers.

A further problem is the fact that Bt cotton does not protect against the pink bollworm, which is a significant cotton pest in India. If this is indeed the case as the study demonstrates, then the Bt strategy for cotton is likely to fail because if the Bt toxin

protects only against the green bollworm and not against the pink bollworm, then farmers will have to continue pesticide sprays.

These are several questions the Government has to answer and be held accountable for. We need to know from the GEAC why the Bt cotton varieties belonging to Monsanto were given approval when these are known to be poor in performance. The Government must also answer how approval for commercial cultivation in Andhra Pradesh and Maharashtra was granted when no State and District level committee was set up as is required by the law. The GEAC must also fix responsibility for the failed cotton crop and make Mahyco-Monsanto compensate those farmers who have suffered losses. This is required under the Indian law, the Protection of Plant Variety and Farmers Rights Act 2001.