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Effects of Bt Cotton on Indian Economy

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Abstract:

In this paper we have discussed about the advantages of Bt cotton, its impacts on Indian farmers and how it can ameliorate farmers' welfare. In India, performance of Bt cotton has been quite impressive. Being the first biotech crop to be launched, it has improved the cotton cultivation to a great extent by increasing cotton yield significantly. It has also reduced pesticide and prevented further environmental degradation. Bt cotton can be undoubtedly considered as the foremost reason behind the stupendous transformation of cotton industry in India. Earlier, India used to be a net importer of cotton. Today, India has become a net exporter, thanks to the introduction of the genetically modified crop. There are infinite ways in which genetically modified technology can improve the other sides of agricultural sector in India also. Use of genetically modified technology can prove to be most efficient in sustaining cotton performance in India.

Keywords: Bt cotton, genetically modified technology.

1. Introduction

A chronic theme throughout this subject matter is about the vital role play of the developed nations in basic fundamental research and technological development in almost every field of science. These nations have sustained their high rates of growth by the complex interaction between massive applications of new technological innovations. In these nations, the substitution of existing technology by the new technology is due to rapid elevation in the accumulation of the scientific knowledge. As a result, despite the emergence of developing countries such as China and India, they seem to be highly dependent on the developed nations.

In India, cotton is one of the important cash crops that has potential threat from various pests resulting in poor yields. One of the major threats to cotton farmers is the bollworm, an insect pest that causes damage to the crop and eventually damaging the farmers' livelihoods as well. In the early 1990s, farmers started using pesticides in heavy scale to fight against bollworm. Hence a significant amount of pesticide consumption was being spent on the cultivation of just one crop –cotton.

Introduction of the Bt cotton in India, has increased productivity of cotton in the country. It has also lowered production costs, thus yielding higher profits to farmers. The genetically modified crop has also reduced excessive usage of pesticide to a large extent. Bt cotton has not only benefitted the large farmers but also helped the small farmers from going into the vicious cycle poverty. The farmer has the freedom to choose between cash crops and food crops. Cash crops are more profitable to produce. However, unlike the food crops, cash crops are more susceptible to diseases.

On the other hand, bollworms started developing pesticide resistance. Thus pesticides were not enough for preventing bollworm attack on the cotton seeds. The production of cotton declined drastically making the farmers worse off. This led the Monopolistic and Restrictive Practices (MRTP) commission to permit commercial cultivation of 'genetically modified' Bt (*Bacillus thuringiensis*) cotton with the help of collaboration between a US firm, Monsanto and an Indian firm, Maharashtra Hybrid Seed Company (MAHYCO) in 2002.

MMB sells genetically modified seeds to the seed providing companies. Again, seed providing companies provide seeds to the farmers. In order to avail the new gene, cotton seed providing companies would now have to pay a onetime license fee and a royalty fee to Mahyco-Monsanto Biotech (MMB).

Bt cotton became the first agricultural biotech crop to be commercialized in India. The specialty of Bt cotton lies in its genes. The genes contain one kind of soil bacterium, *Bacillus thuringiensis* (Bt). The gene further produces a protein that is toxic to bollworm. Moreover, introduction of Bt cotton has not only benefitted the large farmers but also helped the small farmers from going into the vicious cycle poverty.

Area under cotton (Lakh ha)					
YEAR	GUJARAT	MAHARASHTRA	ANDHRA PRADESH	PUNJAB	ALL INDIA
1999- 2000	15.39	32.54	10.39	4.75	87.31
2001- 2002	16.87	29.80	10.02	6.00	87.30
2003- 2004	16.47	27.66	8.37	4.52	76.30
2005- 2006	19.06	28.75	10.33	5.57	86.77

Table 1: Trends in cotton area in major states in India, 1999-2000 to 2005 - 2006.

Source: Compiled from Cotton Corporation of India.

The yields of Bt cotton are found to be significantly higher in all the states under both irrigated and rain-fed conditions. The states that incurred highest profit from production of Bt cotton was Maharashtra followed by Gujarat in the second and Andhra Pradesh in the third place.

From Table 1. and Table 2, we can see that the cotton area in these states has no relevant impact on the cotton production over the years. If we take Maharashtra for example, in 1999-2000, 32.54 lakh hectares of cotton area produced 27.50 lakh bales of cotton. While in 2001-2002, 29.80 lakh hectares of cotton area produced 32.50 lakh bales. In Maharashtra's case, decrease in cotton area from 32.54 lakh hectares to 29.80 lakh hectares didn't decrease, rather increased cotton production from 27.50 lakh bales to 32.50 lakh bales.

Production (in Lakh bales of 170 kgs)					
YEAR	GUJARAT	MAHARASHTRA	ANDHRA PRADESH	PUNJAB	ALL INDIA
1999 -2000	7.85	27.50	38.00	22.50	156.00
2001 -2002	9.25	32.50	34.25	26.75	158.00
2003 -2004	10.35	50.00	31.00	27.40	179.00
2005 -2006	20.00	89.00	35.00	33.00	241.00

Table 2: Trends in production of cotton in major states in India, 1999 - 2000 to 2005 - 2006.

Source: Compiled from Cotton Corporation of India.

In Table 2. We can see that there is a continuous increase in cotton production over the years, in all states except in Andhra Pradesh probably due to high seed prices.

The graph in Fig 1. shows that cotton cultivation in India as a whole, has increased significantly from 1999-2000 to 2005-2006 irrespective of the high price of seeds. Thus, making it clear that whatever be the price, a new technology especially in agricultural field is bound to raise the yield at least for some period of time.

Today, various advantages of cultivating Bt cotton such as reduction in pest incidence and pesticide cost on one hand and increase in cotton quality and yield on the other has led almost all farmers to cultivate the genetically modified crop more and more. There are still many limiting factors that affect the cultivation of the transgenic crop such as high seed cost, diverse ecological system etc. Hence, there is a strong urge for further research and development to come up with and technology much advanced than before.

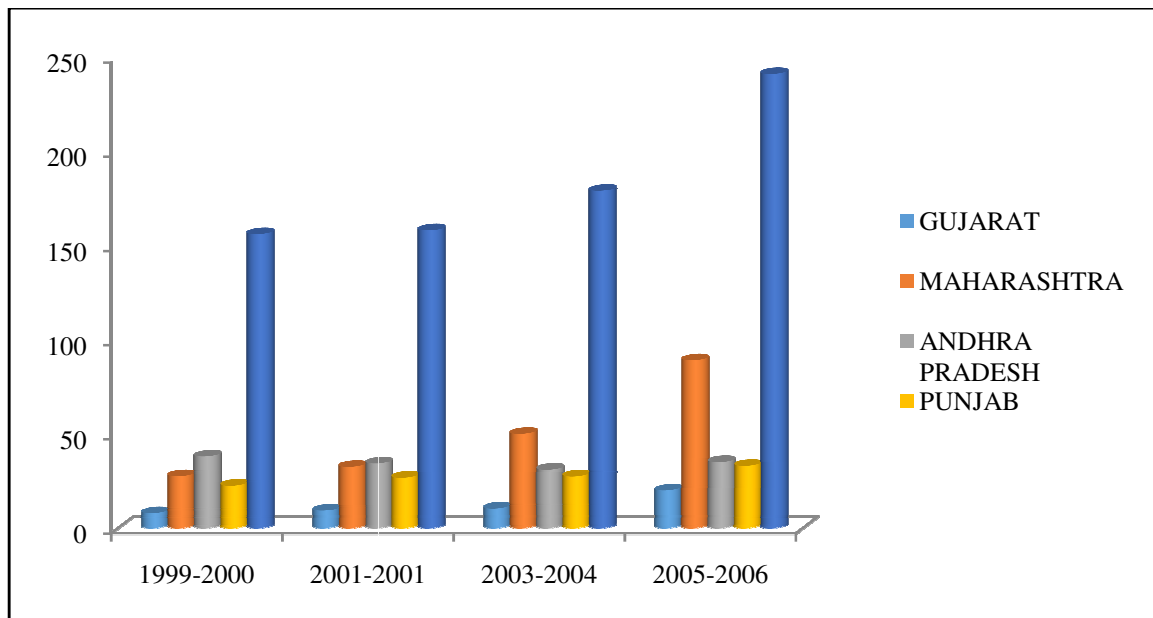


Figure 1: Trends in Cotton Cultivation Shown Graphically

Earlier, India used to be a net importer of cotton. Survey shows that more than 90% of the country's cotton growing areas grow Bt cotton now, resulting in substantial increase in the production of cotton over the past decade. Hence, the introduction of Bt cotton has not only increased quantity but also the quality of cotton. As a result, India has now become a net exporter of cotton.

2. Price Control on Bt Seeds and its Implications on Stakeholders

Global reports clearly show that cultivation of Bt Cotton has more conveniences than inconveniences. Farmers would not have chosen to use Bt Cotton than regular Cotton had it been otherwise. "Even though the results of the field trials haven't been made fully public, they have been reported as positive by both agronomic and environmental measures. Bt Cotton provides control against the American Bollworm, Spotted Bollworm, Spiny Bollworm and Pink Bollworm. Also, the average use of chemical sprays has decreased from 9-12 units to 0-2 units" (Dutt Kunal, 2001).

Here, mainly farmers and seed providing companies are the stakeholders. India's bio safety laws give a measure of protection as a patent protection to MMB for its gene. Hybrids that incorporate MMBs gene but are not approved of the biosafety process are considered to be illegal and also detrimental to the environment. After some years, MMB being the main technological provider in India soon has become a technological monopoly and started controlling the seed market.

As a result, in the cotton market, price of Bt cotton seeds due to its rare technology, have risen eventually. Due to this, many farmers today cannot afford to buy the seeds. They then go on to buy the 'illegal' Bt cotton seeds at a lower price. In order to stop the black marketing of illegal Bt cotton seeds and ensure farmers' welfare, the Monopolies and Restrictive Trade Practices Commission (MRTPC) stated that state governments can use price control as a tool from 2006 onwards. Here, price control meant that the government imposes a price ceiling below the prevailing market price so that farmers could buy the seeds at the price lower than the prevailing market price. For example, Andhra Pradesh imposed a price ceiling of 750 rupees on Bt cotton seeds. Farmers of Andhra Pradesh could now easily afford the seeds. Other states also imposed a price ceiling of 750 rupees on the seeds. Price control policy is mainly effective in Andhra Pradesh, Gujarat, and Maharashtra. The demand for the illegal seed declined after imposition of price ceiling on seeds for now farmers could easily avail the genetically modified seeds.

However, price control on Bt cotton seeds affected biotech companies as well as seed providing companies in the long run. The seed providing companies' revenues started to fall down. The profit shares declined for both seed firms and technological providers like MMB substantially after the imposition of price ceiling. This further reduced their incentive to invent new modified seeds in the future. In this way, foreign companies as well as existing technology providers were no more interested in investing for development of the product in India because of lower returns. Though the government managed to cure the monopoly and effects of high prices, but yet failed again in securing lives of cotton farmers because now, it was the seed providing companies and technology providers who became reluctant to compromise with their profits.

3. Policies and Politics

"The developed countries also typically enjoyed relatively stronger political stability and more flexible social institutions with broader access to mobility. States typically emerged more organically over a longer period of time in the developed regions, and consolidation as nation states generally occurred before the industrial era" (Todaro Smith, 2012).

The business houses would like to invest only if their objective of profit maximization is fulfilled. In this case, technology provider companies and seed distributors are not independent. These two interact with each other in cause - effect approach. Here we are referring to the existing GM technology of Bollgard I as running technology.

Two questions arise. Firstly, why hunt for new technology and secondly, the significance of new technology in terms of profit generation. In the process of transition, the new gene, Bollgard II took over the existing Bollgard I.

The venture of new invention is extremely costly, they mainly take place in the research and development laboratories of the developed countries. Another thing is that corresponding to one success, there are plenty of failures making the cost of invention extremely expensive. Generally, carrying out these inventions is a prerogative of rich nations because these technology provider companies who come forward to invent are the first to reap from its benefit, making a quantum jump in their profits. It is for this reason that they behave like a monopoly.

"Poor plan performance and the wide gap between plan formulation and plan implementation are also attributable to a lack of commitment and political will on the part of many developing country leaders and high level decision makers" (Waterson, 1965).

"Plans are often overambitious. They try to accomplish too many objectives at once without consideration that some of the objectives are competing and even conflicting" (Todaro Smith, 2012).

The MRTPC act on genetically modified cotton shows that it considered only the well-being of the farmers. By imposing price ceiling, the state governments managed to improve farmers' well-being in the short run but seed proving companies and technology providing companies were hurt in the long run. As a result, the production of cotton became stagnant and declined eventually.

"With price controls in 2006, a much larger share (about 90%) of the benefits went to farmers, while the shares of biotech providers and seed companies declined. After price controls were implemented in 2006, biotech and seed companies continued to make profits, but profits were dramatically lower than they were in 2005. The technology providers did not reach their 2005 profit levels again until 2008, while the seed companies still have not returned to their previous profit levels. Both economic theory and empirical research make it clear that price controls on the sale of new technology by private companies will reduce their investments in R&D and innovation" (Pray and Nagarajan, 2010).

There is a stigma regarding the discovery of genetically modified technology in the Indian society. Rather than a powerful invention, it is often considered as a source to biohazard. The policymakers should widen their gaze in this aspect. India has a population of over 1.3 billion people. For a large developing country, the technology of Genetically Modified Organism in the agricultural sector can prove to be a breakthrough for provision of food in ample amounts. A cotton manufacturing firm can either license an already approved gene from a seed provider, or develop its own Bt gene through research and development. Rather than just imposing price ceiling, the government of India should subsidize its own research and development labs. This will increase the competition in the technology market. Because of the increased competition, seed prices will decline. In this way, both farmers and seed providing companies will be benefitted.

“Areas of immediate concern includes *inter alia*:

- a) Development or strengthening of existing R&D systems in the cotton sector to make the technology work efficiently for the benefit of about 4 - 5 million cotton farmers in the country; b) Regulation of input markets with proper legislations and administrative systems;
- c) Developing financial support systems, like crop insurance against crop loss caused by germination failure (seed companies to be implicated for this), pest infestations, drought or floods” (Viswanathan*, P. K. and Lalitha, N, 2010)

In the paper, Institute of Development Studies University of Sussex Brighton BN1 9RE, the transgenic crop has been said to be criticized for its potential in guarantying in sustained cultivation of the crash crop.

Its high time for the NGOs and the political leaders who think genetically modified crop to be unfavorable for both human lives and environment. They have to change their mindsets and embrace the opportunity of elevating the farmers’ lives.

Genetically modified technology can also work wonders in case of food crops. For this to happen, the government should encourage in building up their own research and development labs rather than relying on foreign countries’. This will lead to easy availability of the crop in the market. Both the farmers and the consumers would be relieved. This may further lead to complete eradication of the thing called ‘vicious cycle of poverty’. Of course, the procedure is not as much easy as it seems. Several tests may have to be run in the research and development labs along with the implementation of safety precautions in order for the genetically modified crops to be compatible with the environment before introducing them in the market. In this way, there will be no scope for environmental degradation.

The way Bt cotton has transformed the cotton industry in India, we can easily conclude that introduction of GM technology in agriculture can be one of the most efficient ways in increasing productivity of not just cotton but other crops as well.

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