Volume : 2 | Issue : 2 | Feb 2013 • ISSN No 2277 - 8179

Research Paper

Economics

KEYWORDS : Cotton, Bt Cotton, Commercial Cultivation

Biotechnology in Indian Agriculture: With Special Reference to Bt Cotton in Tamil Nadu – A Review

Dr. V. Mohanasundaram — Associate Professor, Department of Economics, PSG College of Arts & Science, Coimbatore – 641014

S. Saravanan — Assistant Professor, Department of Economics, PSG College of Arts & Science, Coimbatore – 641014

ABSTRACT

Cotton is one of the principal commercial crops of the country. More than seventy countries in the world cultivate cotton. Cotton production is crucial as the whole spectrum of textile sector depends on it. Further, the export performance of textile sector is also depends on the quality of cotton produced. To put it straight cotton plays an important role in terms of generating direct and indirect employment as well as earning foreign exchange. Over the years, the production of cotton in India has been reduced due to the pest attack. The main pest is cotton bollworm. To control the pest incidence, the farmers have applied more than recommended levels of pesticides. This has escalated the cost of cultivation and many farmers fezll in to the debt trap. This has led to suicides of cotton farmers in the states like Andhra Pradesh, Maharashtra, Karnataka and Orissa. In this context, it is advocated that Integrated Pest Management (IPM) is the best tool for minimizing the risk and problems in cotton cultivation. Further, inventions of cotton varieties that resist pest attach. One such technological breakthrough has been Bt cotton. The innovation in bio- technology in the form of Bt cotton controls the bollworms which has now occupied the centre stage.

Introduction

Cotton is one of the principal commercial crops of the country. More than seventy countries in the world cultivate cotton. Cotton production is crucial as the whole spectrum of textile sector depends on it. Further, the export performance of textile sector is also depends on the quality of cotton produced. To put it straight cotton plays an important role in terms of generating direct and indirect employment as well as earning foreign exchange. Over the years, the production of cotton in India has been reduced due to the pest attack. The main pest is cotton bollworm. To control the pest incidence, the farmers have applied more than recommended levels of pesticides. This has escalated the cost of cultivation and many farmers fell in to the debt trap. This has led to suicides of cotton farmers in the states like Andhra Pradesh, Maharashtra, Karnataka and Orissa. In this context, it is advocated that Integrated Pest Management (IPM) is the best tool for minimizing the risk and problems in cotton cultivation. In the meantime so much of research has been conducted, worldwide to find out cotton seeds which resist pest attach, especially the bollworms. One such technological breakthrough has been Bt cotton. The innovation in bio- technology in the form of Bt cotton controls the bollworms which has now occupied the centre stage.

Bt cotton

Bt cotton is a genetically engineered form of natural cotton. Bt cotton seed is produced by inserting a synthetic version of a gene from the naturally occurring soil bacterium, Bacillus thurngiensis (Bt) in to cotton. This bacteria was first discovered by Japanese bacteriologists in 1901 and subsequently in 1915 a German Scientist isolated the crystal toxin in Thüringen region of Germany.

Adoption of Bt cotton

In the history of Bt cotton, the toxin gene of bacterium was isolated in 1981 and in 1990 the first Bt protected cotton crop was field tested in USA. After the verification and examination of the safety and suitability of this crop by various government regulatory agencies of USA, Bt cotton was cultivated on 1.8 million hectares acre in 1995. In 2001, the area under cultivation of Bt cotton in USA was 16.79 million hectares a nine fold increase in with six years. In 1997, China took up the cultivation of Bt cotton followed by 13 other countries . In March 2002, cultivation of Bt cotton was allowed in India for large scale cultivation with certain conditions. The most important aspect of Bt cotton cultivation is the availability of Bt cotton seeds to the cultivators. At present USA and China have successfully developed Bt cotton seeds indigenously but only USA have commercialised the seed distribution to other countries of the world through its major seed company, Monsanto.

After the successful cultivation in USA in 1996. The cultivation of Bt cotton has spread to other countries due to positive reports from the growing countries in terms of economic, environmental, and social benefits. USA has the largest adoption of Bt cotton at global level followed by Brazil and Argentina. India has the fourth largest adopter of bio-tech crop and it has increased from 3.8 million hectare in 2006 to 10.6 million hectares in 2011 (Table 1).

Table 1 Global area of Adoption of Biotech Crops (million hecatres)

S. No	Country	2006	2007	2008	2009	2010	2011
1	USA	54.6	57.7	62.5	64.0	66.8	69.0
2	Brazil	11.5	15.0	15.8	21.4	25.4	30.3
3	Argentina	18.0	19.1	21.0	21.3	22.9	23.7
4	India	3.8	6.2	7.6	8.4	9.4	10.6
5	Canada	6.1	7.0	7.6	8.2	8.8	10.4
6	China	3.5	3.8	3.8	3.7	3.5	3.9
7	Paraguay	2.0	2.6	2.7	2.2	2.6	2.8
8	South Africa	1.4	1.8	1.8	2.1	2.2	2.3

Source : Clive James (2011)

Bt cotton in India

The commercial cultivation Bt cotton in India was approved on March 27, 2002. Cotton became the first bio-tech crop in India. The government has approved only three hybrid varieties - Bt MECH 162, Bt MECH 184 and Bt MECH 12. These varieties are grown under rain-fed as well as irrigated lands, mostly in Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu and Gujarat.(Table 2)

Table 2. Area under Bt cotton hybrids approved in 2002 -03

State	MECH-12	MECH - 162	MECH - 184	Total (ha)
Andhra Pradesh	44	5,564	-	5,608
Gujarat	76	4,136	4,642	8,854
Madhya Pradesh	60	404	1,756	2,220
Karnataka	-	3,828	80	3,908
Maharashtra	112	9,300	5,334	14,746
Tamil Nadu	-	2,042	660	2,702
Total	292	25,274	12,472	38,038

Source : www.ikisan .com

State-wise Adoption of Bt cotton in India

Over the years, the area under Bt cotton cultivation has been on

Volume : 2 | Issue : 2 | Feb 2013 • ISSN No 2277 - 8179

the increase (Table 3). In 2002, the area under cultivation was 50,000 hectares, and it has been reported that 9.4 million hectares were under Bt in 2010. In 2008 about 250 hybrids were recommended for commercial cultivation. Mostly all these varieties were produced by the private seed companies. Among the major Bt cotton growing states Maharashtra was a leading state in India, its area under cultivation increased from 200 ha in 2004 to 3710 hectares in 2010 ,followed by other states like Gujarat, Andhra Pradesh, Madhya Pradesh, Karnataka and Tamil Nadu.

Table 3 State-wise Adoption of Bt Cotton in India from 2002-2010 (000'ha)

State	2002	2003	2004	2005	2006	2007	2008	2009	2010
Maharashtra	25	30	200	607	1840	2800	3130	3396	3710
Andhra Pradesh	8	10	75	280	830	1090	1320	1049	1650
Gujarat	10	36	122	150	470	908	1360	1682	1780
Madhya Pradesh	2	13	80	146	310	500	620	621	610
Northern Region	-	-	-	60	215	682	840	1243	1162
Karnataka	3	4	18	30	85	145	240	273	370
Tamil Nadu	2	7	5	27	45	70	90	109	110
Other	-	-	-	-	5	5	5	8	8
Total	50	100	500	1300	3800	6200	7605	8381	9400

Source: Clive James, 2010

Bt cotton in Tamil Nadu

Cotton, at present, is not a very important crop for Tamil Nadu in terms of production and is grown on a very small area, compared to the national cotton land acreage (TN hovers around 2% to 3% of India's cotton land and frequently, less than that too, as cotton land is expanding in other parts of the country). However, consumption of cotton is the highest by the cotton mills of Tamil Nadu amongst all states.

Nearly 45% of the crop cultivated is under irrigated conditions, which are a higher proportion than several other states and the national proportion. For cotton grown in rain-fed conditions, the quantum of South West monsoon rains has a significant influence.

Three Bt cotton hybrids with Monsanto's proprietary technology were first allowed to be cultivated in Tamil Nadu in 2002, when an approval was provided for cultivation in the south zone states. In 2004, a Bt cotton hybrid of Raasi Seeds was allowed. By 2010 growing season, there were 444 Bt cotton hybrids/ brands covering six genetic "events" from 35 companies that were on sale in South Zone including Tamil Nadu. However, it is worthwhile to note that in Tamil Nadu, like elsewhere in the country, Monsanto's proprietary technology related to Bt cotton has a monopolistic control over the seed market. The adoption of Bt cotton began growing dramatically in Tamil Nadu from 2005 growing season onwards and is estimated to have reached more than 95% by now. Area under Bt cotton hybrids, in lakh hectares, over the years (the first year saw around 3000 hectares planted to Bt cotton, in 2002-03), has been found as progressively increasing from 2.8 percentage in 2003-04 to 46.5 in 2007-08 and to 58.4 of the total cotton area in 2009-10.

Table 4 Bt Cotton expansion in Tamil Nadu (lakh hectares)

Year	Total Area	Bt Cotton	%age of total area
2003-04	0.977	0.027	2.8
2004-05	1.293	0.110	8.5
2005-06	1.097	0.178	16.2
2006-07	1.003	0.442	44.1
2007-08	0.990	0.460	46.5
2008-09	1.140	0.750	65.8
2009-10	1.370	0.800	58.4

Source: Department of Agriculture, Tamil Nadu (2009-10)

To sum up

Bt cotton expansion in India as well as in Tamil Nadu found as steadily increased. The confidence that the biotechnology can provide adequate safeguards to the interests of farmers has been proved by the review of literature on this topic.

REFERENCE

1. Ahuja S L (2007) "Indian GM Cotton Experience in 2005". International NGO Journal, 2(4). pp 78-81. | 2. Bennett et al (2004) "Economic Impact of Genetically Modified Cotton in India", AgBioForum, 7(3) pp 1-5. | 3. Bhagirath and Kadambini Gaur (2009), "Agri- Biotech in India", A New Surge Biotech News, 4 (12), April. pp 30-33 and 66. | 4. Brooker, Graham and Peter Barfoot (2005), "GM Crops: The Global Economic and Environmental Impact- The First Nine Years 1996-2004", AgBioForum, 8(2&3), pp. 187-196. | 5. Gandhi P Vasant and Nanboodiri (2006), "The Adoption and Economics of Bt Cotton in India : Preliminary Results from a Study", Paper presented at the IAAE 2006 Syiposia: The First Decade of Adoption of Biotech Crops –A World Wide View, at the Conference of the International Association of Agriculture Economics (IAAE), Gold Coast, Australia, August 12-18,2006. | 6. Loganathan R, Balasubramanian R, Mani K and Gurunathan S (2009), "Productivity and Profitability Impact of Genetically Modified Crops – An Economic Analysis of Bt Cotton Cultivation in Tamil Nadu, Agricultural Economics Research Review Vol. 22 (Conference Number) pp 331-340. | 7. Meenachi and Indumathy (2009), "Land Utilization and Cropping Pattern in Tamil Nadu", Indian Journal of Agricultural Economics, 64(1), Jan-March, pp 144-153. | 8. Ramaswami, Bharat, Milind Murugkar and Mahesh Shelar (2006) : " Liberalisation, Biotechnology and the Private Seed Sector : The Case of India's Cotton Seed Market", Discussion Paper in Economics, Indian Statistical Institute, New Delhi, January. | 9. Revolution in Indian Cotton (2009), Ministry of Agriculture, Government of India, March. |