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SOCIO ECONOMIC IMPACT OF BT COTTON IN ANDHRA PRADESH, INDIA: A COMPARATIVE STUDY

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ABSTRACT: This paper explores the economic performance of Bt cotton and consequent perceived social benefits accrued for the technology adopters. Introduction of Bt cotton reduced number of sprays on cotton from 8.9 to 4.6 and the share of plant protection from 32.16 to 11.84 percent in total costs. Productivity increase is significant that 51.16 percent more yield with the introduction of Bt cotton. The percentage increase in net returns is 291 resulted in relief from debts, more spending on education, health and social functions. The amount of time spent in the field reduced. This makes them perceive better life after Bt introduction.
Key words: Bt Cotton, Andhra Pradesh, Comparitive study

INTRODUCTION

India is an important grower of cotton on a global scale. It ranks third in global cotton production after the United States and China; with 8-9 million hectares grown each year, India accounts for approximately 25% of the world's total cotton area and 16% of global cotton production. Most of the cotton in India is grown under rainfed conditions, and about a third is grown under irrigation (Sundaram et al 1999). However, yields of cotton in India are low, with an average yield of 300 kg/ha compared to the world average of 580 kg/ha.

Cotton is a very important cash crop for Indian farmers and contributes around 30% to the gross domestic product of Indian agriculture. However, as with many cotton growing areas of the world, a major limiting factor is damage due to insect pests, especially the bollworm complex (American bollworm, *Helicoverpa armigera*; Spotted bollworm, *Earias vittella*; Pink bollworm, *Pectinophora gossipiella*). Sucking pests such as aphids (*Aphis gossypii*), jassids (*Amrasca bigutulla*), and whiteflies (*Bemisia tabaci*) are also a problem in terms of direct damage to the plant and the transmission of viruses.
In March 2002, the Indian government permitted commercial cultivation of genetically modified Bt (*Bacillus thuringiensis*) cotton. The Bt gene produces a protein that is toxic to bollworms. Bt cotton has now been produced in India for 6 seasons—2003 and 2008. In 2002, some 5608 hectares were planted with Bt cotton in the state of Andhra Pradesh (APCoAB 2006).

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Given the scale of the cotton industry in India and the current global debates over advantages/disadvantages of GM technology, it is not surprising that there has been considerable and vigorous debate regarding the agronomic and economic performance of Bt cotton in India with various reports claiming both successes and failures.
Many studies have shown potential gains to producers from growing Bt cotton in a number of developing countries (James, 2002), including South Africa (Bennet et al 2003; Ismael et al 2002), Argentina (Qaim & De Janvry, 2002), Mexico (Traxler et al 2001), Indonesia (Manwan & Subagyo, 2002), China (Pray et al 2002), and India (Naik, 2001; Qaim & Zilberman, 2003, Bennet et al 2004).

This paper presents an analysis of data collected from sample of farmers grown conventional (1998-2003) and adopted Bt cotton under real commercial field conditions over five seasons (2003 to 2008) since Bt cotton has been licensed for commercial use in India. The analysis concentrates on addressing the question as to whether Indian farmers have experienced economic gains from growing Bt hybrids over years. This paper explores the economic performance of Bt cotton and consequent perceived social benefits accrued for the technology adopters.

METHODOLOGY

The study was conducted in 2 villages each of 10 mandals and 5 farmers from each village covering three districts namely Krishna, Guntur and Prakasam districts in Andhra Pradesh, India. Mandal is a sub district unit. Data was collected from 100 Bt cotton farmers from Veldurthi, Prattipadu, Gurazala, Amaravathi ,Tadikonda, Sattenapalli and Nadendla mandals of Guntur district; Chandarlapadu,Verullapadu mandals of Krishna ditrictt and Yuddanapudi mandal of Prakasam district. Mandals and villages were purposively selected based on area of Bt cotton as per data provided by Department of agriculture. The data was collected during November and December 2008. The respondent farmers were asked to provide information on each aspect based on their remembrance for 10 years i.e., 1998- 2008. The data were collected with help of pre tested specially designed schedule. Appropriate statistical tools were used to analyse data and interpreted the results.

RESULTS

The socio- economics aspects of Bt and Non Bt cotton over years were studied and the results are given below.

Economics of Bt Vs Non Bt cotton
The total costs were Rs 39824/ha in Bt and Rs 27526/ha in Non Bt cotton (Table 1). The fixed costs were Rs 15230.60/ha in Bt and Rs 8557.40/ha in Non Bt cotton. The Bt farmers recorded 10.55 q/ha more yield when compared to Non Bt cotton farmers resulted more net returns i.e Rs16532.1/ha .The cost of production Rs1277.66/qtl in Bt and Rs1334.91/qtl in Non Bt cotton.

Table 1.Factor sharing pattern in cotton

S. No	Particulars	Before Bt (1998-2003)	After Bt (2003-08)	Added/ Reduced cost or Added/ reduced returns
1	Fixed Cost	8557.40(31.09)	15230.60 (38.24)	6673.20
2	Ploughing Cost	1425.32(5.18)	2717.48(6.82)	1292.16
3	Seed &Sowing Expenditure	1767.68(6.42)	2566.54(6.44)	798.86
4	Intercultural Operation & Weeding	1842.03(6.69)	3055.91(7.68)	1213.88
5	Fertilizer & Application	2061.10(7.49)	2545.52(6.39)	484.42
6	Plant protection cost with application cost	8851.36(32.16)	4714.30(11.84)	-4137.06
7	Picking cost	187415(6.81)	6892.25(17.32)	5018.10
8	Marketing and Transport charges	640.37(2.32)	1369.32(3.43)	728.95
9	Interest on working capital	506.61(1.84)	732.97(1.84)	226.36
10	Total Cost	27526.02	39824.89	12298.87

Note: Figures in parenthesis indicates percentage of indicative item cost to total costs

The cost of plant protection accounts 32.16 percent to total costs during 1998-03 (i.e before Bt cotton technology), where as it accounts 11.84 percent during 2003-08 i.e After Bt Cotton technology, which shows significant reduction in pesticide sprayings. The cost of plant protection was 87.75 percent less during 2003-08 (i.e after Bt cotton technology) when compared to during 1998-03 i.e before Bt cotton technology) due to less incidence of pests. The number of sprayings also decreased from 8.9 to 4.6 due to Bt technology

Table 2. Factor sharing pattern in cotton on major aspects

S. No.	Particulars	Before Bt (1998-03)	After Bt (2003-08)	% Change
1	Plant Protection costs (Rs/ha)	8851.36	4714.30	-87.75
2	Material costs(Rs/ha)	11125.00	10404.00	-6.48
3	Labour costs(Rs/ha)	7843.60	14190.29	80.92
	Variable costs(Rs/ha)	18968.6	24594.29	29.65
4	Fixed costs(Rs/ha)	8557.40	15230.60	77.98
	Total costs (Rs/ha)	27526.02	39824.89	44.68

The Bt farmers recorded 51.16 percent more yield, realized 70.26 percent more gross returns and 291.45percent more net returns because of Bt technology in the cotton varieties (Table 2).

These results are in congruence with results of ACNielson ORG MARG (2004). The incremental benefit cost ratio was 1.34 for Bt cotton. The area for Bt cotton 31.5 %was increased by the farmers due to its secured yield and net returns. The expenditure on education, health, functions was drastically increased due to secured income from Bt cotton .Almost 90 percent of the farmers opinioned that the quality of life and standard of living of the cotton farmers has improved by getting more income by adopting the Bt technology in their fields. The labour costs were 80.92 percent increased during After Bt technology period when compared to Before technology period due to labour wages are almost doubled

Table 3. Economic analysis of cotton

S. No.	Particulars	Before Bt (1998-03)	After Bt (2003-08)	% Change
1	Yield (q/ha)	20.62	31.17	51.16
2	Cost of Production (Rs/q)	1334.91	1277.66	-4.28
3	Price (Rs/q)	1610.00	1990.00	23.60
4	Gross returns(Rs/ha)	36429.70	62028.30	70.26
5	Net Returns (Rs/ha)	5672.20	22204.30	291.45
6	Benefit cost ratio	0.20	0.55	
7	Incremental benefit cost ratio		1.34	
8	No. of Sprays	8.9	4.6	-48.31

The average number of sprays on Bt cotton was 4.6 during 2003-08 (i.e after Bt cotton technology) against 8.9 sprays in Non Bt Cotton during 1998-03 (i.e before Bt cotton technology) (Table 3).The plant protection expenses were as Rs 4714.30/ha in Bt against Rs 8851.36/ha in Non Bt cotton. The seed cost was Rs 2566.54/ha in Bt against Rs1767.68/ha in Non Bt cotton.

Perceived socio economics benefits of Bt cotton

Majority of the farmers (76%) perceived life is better after introduction of Bt (Figure 1). Great majority (86%) expressed that income increased; tension is reduced (89%) and spent less time in the field (84 %) with Bt cultivation. Majority expressed that, Bt cotton cultivation helped in get rid of debts (70%) and consequent increase in expenditure on children education (78 %) and health (56%). An interesting finding that 42 per cent increased area under cotton, 39 per cent expressed that their spending on social function is increased.

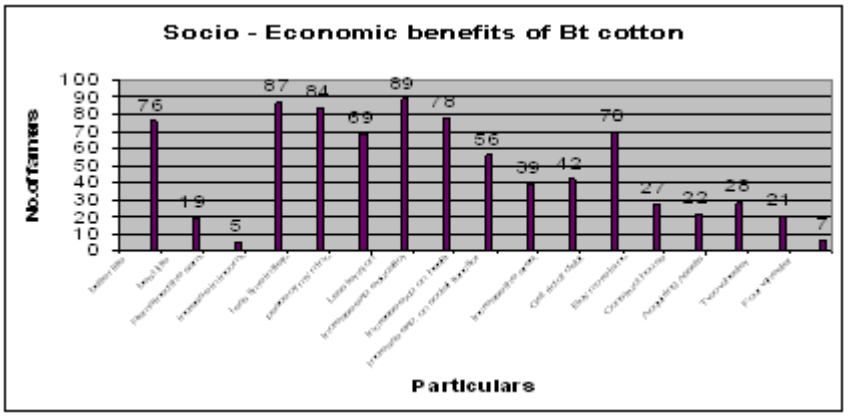

Figure 1. Perceived Socio economic benefits of Bt cotton cultivation

Conclusions

Introduction of Bt cotton resulted the cost of plant protection was 87.75 percent less during 2003-08 (i.e after Bt cotton technology) when compared to during 1998-03 i.e before Bt cotton technology) due to less incidence of pests.and reduced number of sprays on cotton from 8.9 to 4.6 resulted to farmers to spend more time on cultivation of other crops i.e chillies,Pulses etc. Consequent reduction in the share of plant protection from 32.16 to 11.84 per cent in total costs. Productivity increase is significant that 51.16 per cent more yield with the introduction of Bt cotton. The percentage increase in net returns is 291 which resulted in relief from debts, more spending on education, health and social functions. The amount of time spent in the field is reduced. This makes them perceive better life after Bt introduction.

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