The Pharma Innovation

Socio-economic characteristics of Bt cotton producers in Parbhani district of Maharashtra

Hatagale RK, Rede GD and Nagargoje SR

Hatagale RK
Department of Agricultural
Economics, College of
Agriculture, VNMKV, Parbhani,
Maharashtra, India

Rede GD
Department of Agricultural
Economics, College of
Agriculture, VNMKV, Parbhani,
Maharashtra, India

Nagargoje SR
Department of Agricultural
Economics, College of
Agriculture, VNMKV, Parbhani,
Maharashtra, India

Abstract
In the present study the socio-economic characteristics of Bt cotton producers have been assessed. This was based mainly on primary data which was collected through personal interview method with the help of pre-tested schedules. An investigation was conducted in the Parbhani district of Maharashtra purposively. Multistage sampling technique was used for selection of district, tehsils and villages. Two Bt cotton hybrids Ajeet-199 Bt and Rashi-779 Bt cotton were selected for present study. Data were analyzed with the help of simple tabular analysis by using statistical tools like mean, percentage, frequency and percentage. Area under Ajeet-199 Bt cotton was more (1.40 ha) followed by Rash-779 Bt (1.34 ha).Overall middle age cotton growers >36 to <50 years old) i.e. 43.75 percent were mostly engaged in Bt cotton cultivation and most of them (46.87 percent) acquired education of primary level. More than 76.56 percent Bt cotton growers had agriculture as main occupation. In case of social-economic factors, farmers opined that there was a positive and significant contribution of Bt cotton on their yield and reducing cost on inputs thereby increase in farm income, standard of living, educational level, employment and equity.

Keywords: Bt cotton, socio-economic, Parbhani, etc

1. Introduction

The major cotton producing countries are India, china, United States, Pakistan, Brazil, Turkey. The production during 2015-16 was 6.4 million metric tons in India, 6.5 million metric tons in china, 3.6 million metric tons in United States, 2.3 million metric tons in Pakistan, 1.5 million metric tons in brazil, 0.8 million metric tons in turkey. (USDA FEB.2016). More than 5 million farmers in India plant nearly 8 M ha of Bt cotton in the country, equivalent to 82 percent of the total cotton area (Kiresurand Manjunath 2011) [11]. In India cotton is grown all over the country, Maharashtra ranks first in area. The Maharashtra, Telangana, Andhra Pradesh, Karnataka are important cotton producing state in India. Cotton is considered to be the main crop in the state of Maharashtra which is the largest cotton growing state in India with an area of about 38.27 Lakhs hectares and production around 75.00 lakh bales. The cotton crop is grown in the state except Kokan and Eastern Maharashtra. Nearly 54 percent of the total pesticides are used for the control of pests in cotton alone, out of which about 60 percent are used for the control of bollworms. Indiscriminate use of pesticides has adversely affected pest control and profit to the farmers. Under these circumstances, Bt cotton has emerged as an attractive option for the cotton farmers (Singh and Kaushik, 2007) [23]. The main reason for choosing this crop is that it is one of the major crop from which farmers can generate cash income to feed themselves. Experiences from developed and developing countries indicate that farmers' access to good quality information has benefited them in terms of increased agricultural production and reduction in the cost of production (Goyal, 2010; Olajide, 2011) [8, 15]. The objective was to study social-economic characteristics of Bt Cotton growers in study area.

2. Methodology

Multistage sampling design was adopted for present study. In the first stage, Parbhani district was purposively selected for present study because of its predominance in area under cotton. The district contributes about 25.90 percent of cotton area to its net cultivated area of 5.20 lakh hectares scattered over its nine tehsils. In the second stage two tehsils *viz*; Parbhani and Selu were randomly selected. In the third stage list of all villages in Parbhani and Selu tehsils were obtained and four villages from each tehsil were selected in such a manner where the two Bt cotton hybrids that is Ajit-199 Bt, Rashi-779 Bt, were sown by the farmers predominantly.

Corresponding Author:
Rede GD
Department of Agricultural
Economics, College of
Agriculture, VNMKV, Parbhani,
Maharashtra, India

The selected villages from Parbhani tehsil were *viz*. Pedgaon, Pingli, Zari, Jamb, and from Selu tehsil were Moregaon, Kundi, Dhengali pimpalgaon, Walur. In the fourth stage, from each selected villages four Bt cotton hybrid growers of each hybrids i.e. Ajit-199 Bt and Rashi-779 Bt. Bt cotton were selected from each village Thus, size of sub-sample for each of the variety was thirty-two. In this way total sample size contributed was sixty-four for the present study. Cross sectional data were collected from the sampled Bt-cotton growers by personal interview method with the help of pre-tested schedule. The schedules were designed to collect all of the relevant information pertaining to the investigation's objectives. The data were related to various socio-economic characters such as farmer's details, family members, age, education, and occupation, size of holdings, inventory resources, income and expenditure of the selected farmers, cropping patternetc., have been collected. Data pertained to the Agricultural year 2015-16. The data thus collected were further processed, tabulated and analyzed for presenting the results. Simple tabular analysis was used to analyze the data in the present study. Tabular analysis comprised of arithmetic mean, percentage and ratio. The objective to study social-economic characteristics of Bt Cotton growers in study area was achieved by application of simple tabular analysis.

3. Results and Discussion
The study was undertaken with view to study the socio-economic status of Bt cotton growers in Parbhani district of Maharashtra state. General information involved with socio-economic status, land utilization pattern, average position of livestock, average position of farm implements and machinery and cropping pattern of Bt cotton growers is as follows.

3.1 Socio-economic status of Bt-Cotton growers
Frequency and percentage distribution of Bt cotton growers in regard to socio-economic status were calculated and are presented in Table 1. It was observed that most to the Bt cotton growers were in middle age group (>36 to <50 years). Proportion of middle age Bt cotton growers was 43.75 and 71.87 for Ajeet-199 Bt, and Rashi-779 Bt respectively. At an overall level the proportion of middle age cotton growers was 18.50.The highest number of Bt cotton growers of all varieties were educated up to above high school level. On an average basis 46.87 percent were educated up to primary level. Average family size was with 5 to 7 members. The highest proportion of family was 62.50 percent in case of Ajeet-199 Bt and 56.25 in case of Rashi-779 Bt cotton growers. at overall level it was 59.37 percent. In regard to occupational level agriculture as main occupation and its percent share was 81.25 in case of Rashi-779 Bt cotton growers followed by 71.87 percent of Ajeet-199 Bt cotton growers. At an overall level it was 76.56 percent. The results revealed that the Ajeet-199 Bt cotton growers are more in young age group and they give more importance to education as compare to other Bt cotton growers. The similar results were observed by the studies conducted by Dodamani and Guledgudda (2010) [6] and the above results are also in conformity with Kauthekar *et al*. (2012) [10].

Table 1: Socio-economic statuses of Bt cotton growers

Sr. No.	Particulars	Bt Cotton Hybrids		Overall
		Bt Ajeet-199	Bt Rashi-779	
1)	Age			
i.	Young (≤35 years)	6 (18.75)	4 (12.50)	5.00 (15.50)
ii.	Middle (>36 to <50 years)	14 (43.75)	23 (71.87)	18.50 (57.81)
iii.	Old (≥50 years)	12 (37.50)	5 (15.62)	8.50 (26.56)
2)	Education			
i.	Illiterate	10(31.25)	12 (37.50)	11.00 (34.37)
ii.	Primary	16(50.00)	14 (43.75)	15 (46.87)
iii.	High school	4 (12.50)	2 (6.25)	3.00 (9.37)
iv.	Above high school	2 (6.25)	4 (12.50)	3.00 (9.37)
3)	Family size (members)			
i.	1 to 4	7 (21.87)	5 (15.62)	6.00 (18.74)
ii.	5 to 7	20 (62.50)	18 (56.25)	19.00 (59.37)
iii.	8 and above	5 (15.62)	9 (28.12)	7.00 (21.87)
4)	Occupational level			
i.	Agriculture	23 (71.87)	26 (81.25)	24.50 (76.56)
ii.	Business	5 (15.62)	4 (12.50)	4.50 (14.06)
iii.	Service	4 (12.50)	2 (6.25)	3.00 (9.37)

(Tables in parentheses indicate the percentage to the respective cotton growers)

Land utilization pattern
Details regarding total holding uncultivated area, net cultivated area, rainfed and irrigated areas were calculated and are presented in Table 2. As per the table, total holding of Ajeet-199 Bt cotton farm was 2.62 hectares, in which uncultivated area was 2.67 percent, while net cultivated area was 96.18 percent. It was observed that 27.09 percent area was under irrigated condition and 70.22 percent under rainfed condition. In Rashi-779 Bt cotton farm, total holding was 3.02 hectare, in which un- cultivated area was 3.31 percent, whereas, net cultivated area was 96.68 percent and share of irrigated area was 22.84 percent and 73.84 percent under rainfed area. It was observed that total farm holding was more in case of Rashi-779 Bt cotton growers than Ajeet-199 Bt cotton growers. The above results revealed that farmers now a days are utilizing maximum area and leaving very less uncultivated land. As cotton is cash crop now days it is grown commercially for earning more profit. Farmers in the study area on an average are growing Bt cotton under protective irrigation. The similar results were observed by the studies conducted by Gamangatti and Dodamani (2016) [7] and Sanjay Kumar, (2015) [21].

Table 2: Per farm land utilization pattern of Bt cotton growers (Area in ha)

Sr. No.	Particulars	Bt Cotton Hybrids		Overall
		Bt Ajeet-199	Bt Rashi-779	
i.	Total land holding	2.62 (100.00)	3.02 (100.00)	2.82 (100.00)
ii.	Uncultivated area	0.07 (2.67)	0.10 (3.31)	0.085 (2.99)
iii.	Net cultivated area	2.52 (96.18)	2.92 (96.68)	2.72 (96.43)
iv.	Rainfed area	1.84 (70.22)	2.23 (73.84)	2.035 (72.02)
v.	Irrigated area	0.71 (27.09)	0.69 (22.84)	0.7 (24.96)

(Tables in parentheses indicate the percentage to the total holding)

Cropping pattern on Bt cotton farm
Cropping pattern on Ajeet-199 Bt and Rashi-779 Bt cotton farm were computed and are presented in Table 3. In case of Ajeet-199 Bt cotton farm gross cropped area was 4.22 hectares. In which share of Ajeet-199 Bt cotton was 33.17 percent. In kharif crops after cotton area under kharif jowar was more (6.63 percent) followed by tur (5.68 percent), soybean (5.45 percent), maize (3.31 percent), mung (2.84 percent), turmeric (0.71 percent).In rabi crops, area under gram was more (13.50 percent) followed by rabi jowar (7.10 percent),wheat (5.21 percent) and safflower (2.36 percent).Under summer crops area under groundnut was more (6.87 percent), followed by cattle grass (2.84 percent),and vegetable (1.42 percent). Under annual crops area of sugarcane was (1.18 percent)
In case of Rashi-779 Bt cotton farm, gross cropped area was 4.62 hectares. In regard to proportionate area of Rashi-779 Bt cotton was 30.30 percent. In kharif crops after cotton, area under kharif jowar was more (7.35 percent) followed by tur (5.41 percent), mung (5.19 percent), soybean (3.89 percent) and turmeric (1.94 percent). In rabi crops, area under wheat was more (12.45 percent) followed by rabi jowar (9.96 percent) gram (5.29 percent) and safflower (3.12 percent). Under summer groundnut area was 6.49 percent while area under cattle grass was 2.16 percent, and 1.08 percent under

vegetable. Further it was revealed that the cropping intensity of Ajeet-199 Bt and Rashi-779 Bt cotton growers were 168.98 and 155.15 percent respectively. At an overall level cropping intensity was 162.06 percent.

Table 3: Cropping pattern of Bt cotton farm (Area in ha)

Sr. No.	Particulars	Bt Cotton Hybrids		Overall
	Crops	Ajeet–199bt	Rashi -779 bt	
A) Kharif				
1.	Bt cotton	1.40 (33.17)	1.34 (30.30)	1.37 (31.73)
2.	K. jowar	0.28 (6.63)	0.34 (7.35)	0.31 (6.99)
3.	Soybean	0.23 (5.45)	0.18 (3.89)	0.20 (4.67)
4.	Tur	0.24 (5.68)	0.25 (5.41)	0.24 (5.54)
5.	Mung	0.12 (2.84)	0.24 (5.19)	0.18 (4.01)
6.	Maize	0.14 (3.31)	0.16 (3.46)	0.15 (3.39)
7.	Turmeric	0.03 (0.71)	0.09 (1.94)	0.06 (1.32)
	Total	2.44(57.81)	2.6(56.27)	2.52 (57.04)
B) Rabi				
1.	Wheat	0.22 (5.21)	0.22 (4.76)	0.22 (4.98)
2.	R. Jowar	0.30 (7.10)	0.24 (5.68)	0.27 (6.39)
3.	Safflower	0.10 (2.36)	0.11 (2.38)	0.105 (2.37)
4.	Gram	0.57 (13.50)	0.56 (12.12)	0.56 (12.81)
	Total	1.19 (45.02)	1.13 (24.45)	1.16 (34.74)
C) Summer				
1.	Groundnut	0.29 (6.87)	0.30 (6.49)	0.29 (6.68)
2.	Vegetable	0.06 (1.42)	0.05 (1.08)	0.05 (1.25)
3.	Cattle grass	0.12 (2.84)	0.10 (2.16)	0.11 (2.50)
	Total	0.47 (11.13)	0.45 (9.74)	0.46 (10.43)
D) Annual				
1.	Sugarcane	0.05 (1.18)	0.13 (2.81)	0.09 (1.99)
	Total	0.28 (6.63)	0.30 (6.49)	0.29 (6.56)
	Gross cropped area	4.22 (100.00)	4.62 (100.00)	4.42 (100.00)
	Cropping intensity (%)	168.98	155.15	162.06

(Tables in parentheses represent percentage to Gross cropped area)

The study inferred that the dominance of Kharif crops over Rabi and summer crops due to dependency on monsoon rains. In cropping pattern of Bt cotton cultivators average land holding was being utilized in Kharif season followed by Rabi and summer season. The close examination of cropping pattern indicated that more than 85.00 percent area was allocated for the cultivation of cereals, pulses and oil seeds. This is because of the dietary habit of the people of the region. The similar results were observed by the research conducted by Gamanagatti and Dodamani (2016) [7],

Kathpalia *et al*. (2018) [9] and Sharma *et al*. (2021) [22].

4. Conclusions
Due to adoption of Bt cotton, on an average, the yield has been increased in study area. So present study concluded that Ajeet-199 Bt cotton farm area was greater (1.40 ha) than Rashi-779 Bt (1.34 ha) cotton farms. Grossed cropped area was 4.22, and 4.62 hectares on Ajeet-199 Bt and Rashi-779 Bt cotton farms, respectively. About 43.75percent middle age cotton growers (>36 to <50 years old) were mostly engaged in Bt cotton cultivation. Overall About 46.87 percent of Bt cotton growers had education of primary level.

5. References
1. Almaszabeen Badekhan, Uma Devi K. The Socio-economic Status of Cotton Farmers and their Attitude Towards Pesticide Use. Economic Affairs. 2018;63(4):883-889.
2. Arjunan Subramanian, Matin Qaim. Rural Poverty and Employment Effects of Bt Cotton in India, Contributed Paper prepared for presentation at the International Association of Agricultural Economists (IAAE) Conference Beijing, China; c2009.
3. Barre Jyothsna Priyadarshini, Sinha DK, Nasim Ahmed, Singh KM, Mahesh Kumar, Singh SP. Socio-economic status of cotton farmers in Bhadradri Kothagudem district of Telangana. The Pharma Innovation Journal. 2022;11(3):1699-1703.
4. Bharamagoudar MV, Nagaraj MG, Kitturmath, Hanchinal SN. Socio-Economic and Psychological Characteristics of Bt Cotton Growers in Raichur District of Karnataka State. Trends in Biosciences. 2014;7(11):1027-1033.
5. Choudhary B, Gaur K. Biotech Cotton in India, 2002 to 2014. ISAAA Series of Biotech Crop Profiles. ISAAA: Ithaca, NY; c2015.
6. Dodamani MT, Guledgudda SS. Socio- economic dimensions of poverty among cotton growing farmers in Karnataka. Agric. Update. 2010;5(1&2):80-85.
7. Gamanagatti PB, Dodamani MT. Socio-economic conditions of Bt cotton growers across different farm size holders in northern transitional zone of Karnataka. International Research Journal of Agricultural Economics and Statistics. 2016;7(2):223-227.
8. Goyal A. Information, direct access to farmers, and rural market performance in Central India. American Economic Journal: Applied Economics. 2010;2(3):22-45.
9. Kathpalia J, Chander S, Kumari V. Impact of Bt. Cotton and Non Bt./Desi Cotton Growing on Socio-Economic Status of Farmers in Bhiwani District. Indian Journal of Health and Wellbeing. 2018;9(6):869-871.
10. Kauthekar PU, Pawar BR, Chivare SA, Mane AL. Costs, returns and profitability of cotton based farming system as a whole in Maharashtra, Internat. Res. J agric. Eco. & Stat. 2012;3(2):350-352.
11. Kiresur VR, Manjunath Ichangi. Socio-Economic Impact of Bt cotton Acase study of Karnataka. Agricultural Economics Research Review. 2011;24:67-81.
12. Morse S, Bernett R, Ismael Y. Inequality and GM crops: A case study of Bt cotton in India. Agbiofurum. 2007;10(1):44-50.
13. Chandrasekhara Rao N. Bt Cotton Yields and Performance: Data and Methodological Issues, Economic and Political Weekly. 2013;48(33):66-69.
14. Noonari S, Bhatti MA, Abdul SJ. Comparative economics of Bt cotton v/s Convential cotton in khairapur District Sindh, Pakistan. Int. J of Business and economics research. 2015;4(3):72-85.
15. Olajide BR. Assessment of farmers' access to agricultural information on selected food crops in Iddo District of Oyo State, Nigeria. Journal of Agricultural & Food Information. 2011;12(3-4):354-363.
16. Pawar DB, Pawar BR. Effect of cotton hybrids and farm sizes on economics of cotton production under rainfed condition. J Cotton Res. Dev. 2003;20(2):306-309.
17. Peshin R, Dhawan AK, Vatta K, Singh K. Attributes and Socio-Economic Dynamics of Adopting Bt Cotton. Economic and Political Weekly. 2007;42(52):73–80.
18. Prakash Sadashivappa. Socio-economic Impacts of Bt Cotton Adoption in India: Evidence from Panel Data, AgBioForum. 2015;18(2):193-208.
19. Rao C, Dev MS. Socio-Economic Impact of Transgenic Cotton. Agriculture Econ Res Rev. 2009;22:461-470.
20. Reddy MCK, Tirapamma GK, Reddy. Socio economic impact of Bt cotton in Andhra Pradesh, India A comparative study. Int. J of Plant and Environmental Sci. 2011;1(1):126-130.
21. Sanjay Kumar. Selected Personal and Socio-Economic Characters of Bt Cotton Growers, Plant Archives. 2015;15(2):1017-1020
22. Sharma Tanvi, Kathpalia Jatesh, Kumari Vinod, TyagiRashmi. Cropping Pattern and Adoption of Bt. Cotton among Bt. Cotton Growing Farmers in Haryana - A Sociological Study. Journal of Global Communication. 2021;14(1):53-59.
23. Singh J, Kaushik SK. Bt cotton in India - present scenario and future prospects. Indian Farm. 2007;56(11):26-28.
24. Veeraih R, Atkare P, Rao DV. Success stories of cotton farmers to study the adoption behaviour on IPM of cotton in Nalgonda district. Agric. Extn Rev. 2005;17(5):22-25.