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Technological Gap of Bt *(Bacillus thuringiensis)* Cotton Growers in Northern Dry Zone of Karnataka

PRABHU ILIGER AND N. NARASIMHA
Department of Agricultural Extension, College of Agriculture, UAS, GKVK, Bengaluru-560 065
E-mail: ipbu4158@gmail.com

ABSTRACT

The focus of the study was to identify the technological gap of Bt cotton growers in Northern Dry Zone of Karnataka during 2016-17. The study was conducted in four Bt cotton growing districts of Karnataka, *viz.,* Dharwad, Haveri, Gadag and Koppal. It was observed that 35.00 per cent of the respondents belonged to low level of technological gap category followed by 33.75 and 31.25 per cent of the respondents belonged to high and medium technological gap category, respectively. In case of selected Bt cotton cultivation practices, crop protection measures, physiological disorder management, cotton based cropping system and integrated nutrient management (INM) practices were found medium to high level of technological gap. The low level of technological gap was observed in practices such as Bt hybrid selection, agronomic practices, sowing methods, post sowing operations and picking of cotton practice. The variable age had positive and significant relationship with technological gap.

Keywords: Technological gap, Bt cotton growers, integrated nutrient management

BT cotton is a transgenic variety of cotton genetically modified to contain a gene of *Bacillus thuringiensis* (Bt) foreign to its genome. Bt cotton was first developed by Monsanto – a US registered Multinational Corporation. The company claimed that the seeds are resistant to bollworm infestations. Though some of the top cotton-growing countries are adopting Bt cotton, still there is an international debate regarding the sustainability of the crop. Along with certain benefits, there are various risks and uncertainties regarding Bt Cotton. These may be categorized according to the three pillars of sustainability – environmental, economical and social issues. The most significant environmental risks of Bt cotton use are a loss of biodiversity, the development of pest resistance, impacts on non target beneficiaries and human risks, such as toxicity and allerenecity. The economic risks mainly accrue from the high seed costs. Negative social impacts may arise indirectly through these economic risks – where higher levels of investment are lost as a result of crop failures (Iyengar and Lalitha, 2002). On the other hand, supporters argue that Bt Cotton is beneficial as it has pest resistance. This means that pesticides are not required – reducing costs and giving higher yields, resulting in increasing farmers' profit, as well as increasing food security in developing countries.

The world cotton production was estimated at 105.72 million bales of 480 lb in 2016 17 (USDA, March, 2017), around 9.3 per cent more than last year. It is also indicated that the area under cotton declined to the tune of 1.28 million ha (4.18%) as compared to 2015-16. The estimates of USDA indicate that India continued to be the leading producer of raw cotton followed by China and the United States. India also maintains the largest area under cotton in the world and it is second largest exporter of cotton next to the United States. In India, the cotton production during 2016-17 is expected to produce 351 lakh bales of 170 kg from 105 lakh hectare with a productivity of 568 kg lint/ha. In Karnataka, during 2016-17, the area under cotton crop was 4.64 lakh ha with production of 19.90 lakh bales (Anon., 2016-17).

India has the largest cotton area in the world with 90 lakh hectares accounting for one-fourth of the global cotton area. Cotton contributes 29.90 per cent of the Indian agricultural gross domestic product and provides livelihood to nearly six crore people (Pratiyogitha Darpana, 2010). In Karnataka, cotton is grown on an area of 5.34 lakh hectares with the production of 10.00 lakh bales and productivity of 318 kg per hectare (Pratiyogitha Darpana, 2010). Since the introduction of hybrids, pest menace in cotton is

severe resulting in indiscriminate use of insectiside, increase in crop losses and reduction in productivity and income to farmers. In some of the area the Bt cotton cultivation was discontinued due to severe attack of insect pests.

The technological gap is the major problems in efforts to increase agricultural production in the country. A need of the day is to reduce technological gap between agricultural technology recommended by the scientists and its ultimate acceptance of the farmers on their field. Bt cotton crop as an economic venture, supports and improves the economics of farmers and helps in providing raw materials needs of the prestigious textile industry. Hence, the present study is taken up with the following specific objectives :

1) To analyse the technological gap in Bt cotton cultivation.

2) To find out the relationship between the farmers characteristics with technological gap.

Methodology

The study was conducted in Northern dry zone (Zone-3) of Karnataka. In this zone, four districts namely, Dharwad, Haveri, Gadag and Koppal and two talukas in each district were selected. From each taluka, two villages and from each village ten rainfed farmers were selected. Thus, the total number of respondents for the study was 160. The ex-post facto research design was employed. The data was collected with the help of structured interview schedule.

Technological gap is the gap between the technology or inputs being recommended by the agronomists or by research stations and the inputs being used in the farmers field. Technological gap was conceived as the gap between the level of recommendation and the extent of adoption (against recommendation) Tripathy (1977) and Sadamate (1978). The recommended technologies for the study have been selected by using the reports published by Central Institute for Cotton Research (CICR) and in consultation with research scientists and extension personnel working on Bt cotton crop. The Bt cotton cultivation practices were selected from the package of practices recommended by Central Institute for Cotton Research (CICR) for Karnataka state.

Results and Discussion

Practice-wise Technological Gap of Bt Cotton Growers

Table I depicts about practice wise technological gap. It was observed that 75.00 per cent were having low technology gap in selection of Bt hybrid followed by 15.63 and 6.37 per cent of the respondents belonged to high and medium technological gap category, respectively. Majority of the farmers were not aware about suitable Bt cotton in their locality that might be the reason for falling under low level of technological gap.

In case of agronomic practices, 53.75 per cent of the respondents were having low technological gap followed by 35.00 and 11.25 per cent of the respondents belong to high and medium technological gap category, respectively. Regarding sowing methods, 48.12 per cent of the respondents belong to low technological gap category followed by 43.13 per cent and 8.75 per cent of the respondents belong to high and medium technological gap category, respectively.

In case of Integrated Nutrient Management (INM) practices, 71.88 per cent of respondents were having medium level of technological gap followed by low (17.50%) and high level (10.62%) of technological gap.

Regarding post sowing operations, it was found that 68.75 per cent of respondents were having low level of technological gap followed by 20.00 per cent and 11.25 per cent of the respondents had high and medium technological gap, respectively. In case of cotton based cropping system, the crop rotation practice, 83.75 per cent of the respondents were having medium level of technological gap followed by 8.75 and 7.50 per cent respondents having high and low technological gap, respectively. With respect to intercropping practices, 76.25 per cent of the respondents were in medium level of technological gap followed by 18.13 and 5.62 per cent of the respondents belongs to high and low technological gap category, respectively. In the physiological disorder management practice, 64.38 per cent respondents belong to medium technological gap category followed by 21.25 and 14.37 per cent of the respondent belong to high and low technological gap category, respectively. The data

TABLE I

Practice-wise technological gap of Bt cotton growers (n=160)

Practices	Category	Bt cotton growers	
		Frequency	Per cent
Hybrids of Bt cotton	Low	120	75.00
	Medium	15	9.37
	High	25	15.63
Agronomic practices	Low	86	53.75
	Medium	18	11.25
	High	56	35.00
Sowing method	Low	77	48.12
	Medium	14	8.75
	High	69	43.13
INM	Low	28	17.50
	Medium	115	71.88
	High	17	10.62
Post sowing operations	Low	110	68.75
	Medium	18	11.25
	High	32	20.00
Cotton based cropping system			
a) Crop rotation	Low	12	7.50
	Medium	134	83.75
	High	14	8.75
b)Intercropping	Low	9	5.62
	Medium	122	76.25
	High	29	18.13
Physiological disorder	Low	23	14.37
	Medium	103	64.38
	High	34	21.25
Crop protection measures			
a) Diseases	Low	14	8.75
	Medium	116	72.50
	High	30	18.75
b) Pests	Low	9	5.63
	Medium	105	65.62
	High	46	28.75
Picking of cotton	Low	69	43.13
	Medium	52	32.50
	High	39	24.37

further revealed that most of the respondent's *i.e.,* 43.13 per cent possessed low level of technological gap about picking of cotton followed by 32.50 per cent and 24.37 per cent respondents having medium and high level of technological gap, respectively. It was found that out of nine practices four practices such as crop protection measures, physiological disorder management, cotton based cropping system and Integrated Nutrient Management (INM) practices were found medium to high level of technological gap. This reflects that there is scope for improvement by reducing the technological gap in Bt cotton growers by educating the Bt cotton farmers about recommended practices and improve their economic level.

In case of crop protection measures, it was found that majority (72.50%) of respondents had medium level of technological gap followed by high (18.75%) and low (8.75%) level of technological gap with respect to diseases management. Regarding pest management practices, it was observed that 65.62 per cent of the farmers belong to medium level of technological gap followed by 28.75 and 5.63 per cent had high and low technological gap, respectively.

The technological gap in major cultivation practices, especially in crop protection measure deserves attention. It was found that farmers are using over dose or under dose of plant protection chemicals than the recommended. This resulted in pest resurgence. The results are in close agreement with the findings of Jaiswal and Duboliya (1994), and Ray *et al*. (1995), Jaiswal and Rathore (1985), Mahawer *et al*. (1995), Patil and Deshmukh (1995) and Singh and Chauhan (1996). In some cases the respondents are not aware of proper time of application. This was mainly due to lack of knowledge on use of chemicals. The results and observations of the study point to the need for better education of farmers in this regard.

Distribution of farmers based on their technological gap in Bt cotton cultivation

The results in Table II revealed that over one third of the respondents (35.00 %) were found in the low category of technological gap. There were 33.75 per cent of the respondents who had high level of technological gap and 31.25 per cent of the respondents had medium level of technological gap. The probable reasons for technological gap among Bt cotton growers is due to lack of knowledge about technical know-how and they could not get the information on improved recommended practices intime The findings are conformity with the findings of Bhairamkar *et al.* (2005).

TABLE II

Distribution of farmers based on their technological gap in Bt cotton cultivation

(n=160)

Category	Bt cotton growers	
	Frequency	Per cent
Low	54	33.75
Medium	50	31.25
High	56	35.00
Total	160	100.00

Mean = 31.40; S.D= 9.17

TABLE III

Relationship between personal, psychological and socio-economic characteristics of Bt cotton growers and their technological gap

Variables	Correlation co-efficient (r)
Age	0.241**
Family size	0.082 NS
Education	0.116 NS
Land holding	0.145 NS
Annual income	0.125 NS
Innovative Proneness	0.025 NS
Risk orientation	-0.125 NS
Scientific orientation	-0.014 NS
Market orientation	-0.062 NS
Economic motivation	-0.068 NS
Mass media participation	-0.135 NS
Cosmopoliteness	0.032 NS
Extension contact	0.086 NS
Extension participation	0.010 NS

** Significant at 0.01 per cent level;
* Significant at 0.05 per cent level; NS: Non-significant

Relationship between personal, psychological and socio-economic characteristics with their technological gap

The data in Table III revealed that variables such as family size, education, land holding, annual income, innovative proneness, risk orientation, scientific orientation, market orientation, economic motivation, cosmopoliteness, mass media participation, extension contact and extension participation had non-significant relationship with the technological gap of Bt cotton cultivation. Whereas, variable age of the respondents had positive and significant relationship at one per cent level with the technological gap. With increase in age there was corresponding increase in technological gap. The findings are similar with the findings of Anchule (2000).

The study revealed that medium to high level of technological gap was observed in Bt cotton cultivation practices such as integrated nutrient management (INM), crop rotation, inter cropping, physiological disorder management and crop protection measures needs attention. The extension personnel should conduct educational activities to increase the respondents knowledge on improved Bt cotton cultivation practices to minimise the technological gap for getting sustainable yield and income.

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