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TECHNOLOGICAL GAP IN ADAPTATION OF RECOMMENDED *Bt* COTTON PRODUCTION TECHNOLOGY IN PRAKASAM DISTRICT OF ANDHRA PRADESH

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ABSTRACT

The present investigation was carried out in Prakasam District of Andhra Pradesh during the year 2015-16. An ex-post-facto research design was used to analyze technological gap in *Bt* cotton production technology. One hundred and twenty farmers from eight villages of four major *Bt* cotton growing mandals represented the sample of the study. Majority (57.60%) of the *Bt* cotton farmers were with medium technological gap followed by 24.00 per cent in high and 18.00 per cent low technological gap categories. Major technological gap was recorded in the time of application of P fertilizer (64.73%) followed by seed treatment (63.89), micronutrient management (60.56%), irrigation (56.83%), pest and disease management (54.88%), time of K application (51.67%) and manure application (51.39%). Major correlates of technological gap were education, extension contact, innovativeness, trainings undergone and mass media use and they were negatively correlated with technological gap. Major training needs identified were high yielding *Bt* cotton hybrids (92.50%), weed management (81.67%), sucking pest management (74.17%), drought management (64.17%), fertilizer management (57.50%) and compatibility of insecticides and fungicides (55.00%). Major constraints expressed by farmers in *Bt* cotton production were sucking pest incidence (82.50%), increased micro nutrient deficiencies (70.00%), terminal moisture stress (67.50%), wilt (63.33%), poor yields(59.17%), continuous mono cropping (55.83%), high seed cost (54.17%) and increased cost of cultivation (51.67%).

KEY WORDS: *Bt* cotton, technological gap, training needs

INTRODUCTION

India continued to maintain the largest area under cotton and second largest producer ofcotton next to China with 35.29 per cent and 24 per cent of world cotton area and production,respectively. India also sustained the position of being the second largest consumer andexporter of cotton and is expected to export 7.5 million bales and expected to consume 23million bales in 2013 14. In India, cotton contributes about 85 per cent raw material to textile industry, occupying an area of 115.53 lakh ha with a production of about 375 lakh bales. (Anonymous, 2013-14).Cotton, the 'White gold' occupies an enviableplace amongst commercial crops of our country and being a cash crop, it is of great economic importance for Indian farming community.

Severe pest and disease incidence and increased cost of cultivation were the two major factors making cotton cultivation non remunerative. Agood crop with minimum pest attack brings prosperity, whilea severe pest attack brings misery.Pests also became resistantto chemical pesticides and cause significant increase croplosses. Pesticides do not provide lasting control and soneeded repeated applications. Continued use of pesticidesbuilds up high level of toxic residues in food, ground waterand air.Excess use of insecticides also increases cost of cultivation.Indiscriminate use of chemical fertilizers was the major factor contributing for increased cost of cultivation.This is more so in the rainfed areas whereopportunities for growing alternative crops are limited due tomarginality of the production environment.The reason of poor performanceof the *Bt* cotton could be huge technological gap existing among the *Bt* cotton farmers. In Prakasam district of Andhra Pradesh cotton is principal cash crop traditionally grown by the farmers in about 54,393 ha over the normal area of 39,682 ha, with an average kapas yield of 653 kg ha^{-1}. Hence a need was felt to analyze technological gap in *Bt* cotton cultivation with the following specific objectives.

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1. To analyze Technological gap in *Bt* cotton cultivation
2. To ascertain correlates of technological gap in *Bt* cotton production technology
3. To identify training needs of farmers in *Bt* cotton cultivation and
4. To analyze the constraints in *Bt* cotton production

MATERIALS AND METHODS

Ex-post facto research design was adopted for the study. The study was conducted during 2015-16 in Prakasam district of Andhra Pradesh. Considering maximum area under *Bt* cotton cultivation as criteria, four mandals *viz.*, Marturu, Parchuru, Inkollu, and Karamchedu, were selected. From each mandal two villages having highest area under *Bt* cotton cultivation were selected purposively. From each selected village, 15 farmers growing *Bt* cotton were selected by simple random sampling procedure, thus, making the total sample size 120. All the *Bt* recommended package of practices recommended by Acharya N G Ranga Agricultural University, Andhra Pradesh were included in the schedule were administered to the respondents after pre-testing and the responses were obtained on a three point continuum as fully adopted, partially adopted and not adopted and scores of 3, 2 and 1 were assigned, respectively. Any remarkable deviation from adoption of normal recommendation was treated as partial adoption. The maximum score that a respondent could obtained was 57 and minimum was 19. The actual score was deducted from maximum score of the respondents to find out the technology gap of recommended practice of individual. Technology gap has been defined as the proportion of gap in the adoption of practices recommended and it expressed in percentage (Ray *et al.,* 1995).

The technological gap of a particular practice expressed in percentage was:

$$\text{Technological gap} = \frac{\text{Maximum possible score} - \text{Actual score obtained}}{\text{Maximum possible score}} \times 100$$

The data on adoption of technological gap of *Bt* cotton farmers were collected by using pre tested schedule employing personal interview method. The respondents were divided into three categories *viz.*, low, medium and high based on their mean technological gap and standard deviation. The responses were scored, quantified, categorized, tabulated and analyzed using mean, standard deviation, frequencies and percentage. Correlation analysis was carried out to assess the relationship between profile characteristics of farmers and their technological gap. Each cottonfarmer was also interviewed by posing open ended questions so as to unearth training needs and constraints he/she has experienced and analyzed by calculating frequencies and percentages.

RESULTS AND DISCUSSION

TECHNOLOGICAL GAP IN *Bt* COTTON PRODUCTION TECHNOLOGY

A critical look at the Table 1 revealed that almost sixty per cent (57.60%) respondentswere in medium technological gap followed twenty four per cent in high and eighteen per cent low technological gapcategories. The major reasons for this medium and high technological gap were top dressing of complex fertilizers, non adoption of seed treatment and micronutrient management, partial adoption of N and K fertilizers management, irrigation and pest and disease management.These findings are in conformity with the findings of Sable and Kadam *(*2012).

It was worthy to note from Table 2 that there was no technological gap with respect to land preparation, sowing time, method of sowing, seed rate, varieties/ hybrids, spacing, and harvesting. Being commercial crop, farmers were cultivating high yielding hybrids recommended to their areas. Further, farmers as a result of their farming experience have themselves realized the usefulness of these practices also; hence most of the respondents were convinced about the profitability and practicability of these recommendations. More technological gap was observed in the time of application of P fertilizer (64.73%), seed treatment (63.89), micronutrient management (60.56%), irrigation (56.83%), pest and disease management (54.88%), time of K application (51.67%), manures (51.39%), quantity of N applied (45.83%), quantity of K fertilizer used (44.45%), time of application of N fertilizer (40.27%) and weed management (38.00%).

Majority of the farmers had applied nitrogen, phosphorus and potassium fertilizers more than recommended quantity and throughout the crop growth period. The reason given by the respondents for this behavior was that application more quantity of chemical fertilizers continuouslywould give more yields. Also many respondents did not have the correct knowledge about the recommended fertilizer dosage. Possible reason for over adoption of all the three (N, P and K) fertilizers might be 'lack of knowledge', most of them believed that application of recommended quantity of N,P,K fertilizer was not sufficient to get the expected yield and hence over adoption. Similar result was reported by Sable and Kadam *(*2012).Seed treatment was not adopted by the farmers because of their assumption that *Bt* cotton seed was treated against all pests and diseases. Lack of knowledge to diagnose micro nutrient deficiencies with that of disease symptoms was the major reason for increased technological gap of micronutrient management. Rainfed cotton cultivation and insufficient rains were the reasons for technological gap in irrigation management. Indiscriminate and scheduled sprays contributed for technological gap of pest and disease management. Farmers were unable to use recommended manure as it was a costly affair and insufficient quantities available to them. It was observed in the study area that cattle population was declining over the years due to high cost of their maintenance, hence resulting in reduced availability of FYM. The produced FYM might not be sufficient to meet the individual's requirement. Considerable gap was recorded with respect to weed management this was because of insufficient knowledge of the farmers on post emergence herbicides.

RELATIONSHIP BETWEEN PROFILE CHARACTERISTICS OF *Bt* COTTON FARMERS AND THEIR TECHNOLOGICAL GAP

It was noticed from table 3 that out of 10 variables innovativeness, trainings undergone and mass media use had significant negative correlation with technological gap at 0.01% level. Extension contact and education were found to have significant negative correlation at 0.05 % level. Remaining variables *viz.*, age, land holding, farming experience, social participation and economic motivation were found to have non significant correlation with technological gap in *Bt* cotton cultivation. Innovativeness motivates farmers to learn new technological gap in *Bt* cotton cultivation. Innovativeness motivates farmers to learn new technological interventions and to adopt. Training undergone impart knowledge and skill to the farmers on latest management practices. An individual who receives training become more knowledgeable, skilful and develop rationale and adopt improved farming practices which helped in reaping higher harvests. Mass media use facilitates farmers to update their knowledge. Hence more will be the innovativeness; trainings undergone and mass media exposure lesser will be the technological gap in *Bt* cotton cultivation. Education and extension contact help the farmers to get acquainted with the technological developments easily in the field of agriculture. This finding is in line with the findings of Raghavendra (2010), Singh *et al*. (2010), Sable and Kadam *(*2012) and Kiranmayi *et al.* (2016)

TRAINING NEEDS OF *BT* COTTON FARMERS

It could be inferred from table 4 that majority of the *Bt* cotton farmers expressed that high yielding *Bt* cotton hybrids (92.50%), weed management (81.67%), sucking pest management (74.17%), drought management (64.17%), fertilizer management (57.50%) and compatibility of insecticides and fungicides (55.00%) were the major training areas. Almost fifty per cent of the farmers felt micronutrient deficiency identification and management (47.50%) anddisease management (46.67%) were the areas where trainings need to be emphasized. Some of the farmers required training on critical stages of irrigation (42.50%), pink boll worm management (40.00%) and ETLs for pest and diseases (36.67%). This training need analysis clearly indicated the knowledge and adoption gaps of the farmers in terms of fertilizer management, pest and disease management which ultimately leading to increased cost of cultivation of *Bt* cotton. Hence there is a need to emphasize on these identified training areas to make *Bt* cotton cultivation more remunerative and profitable. Similar training needs were identified by Rajput and Supe (2007).

CONSTRAINTS IN *Bt* COTTON CULTIVATION

It is evident from Table 5 that majority of the *Bt* cotton farmers expressed sucking pest incidence (82.50%), increased micro nutrient deficiencies (70.00%), terminal moisture stress (67.50%), wilt (63.33%), poor yields(59.17%), continuous mono cropping (55.83%), high

seed cost (54.17%) and increased cost of cultivation (51.67%) were their major constraints. Below fifty per cent of the farmers felt increased pink boll worm incidence (49.17%), poor seed quality (45.83%), indiscriminate use of pesticides and flower and boll drop (40.83%) were the other constraints experienced by them in *Bt* cotton cultivation. Similar constraints were reported by Muhammad *et al*. (2007) and Ramasundaram*et al*. (2007)

It could be concluded that majority of the farmers were in medium technological gap category and major gaps were recorded in terms of N, P, K and micronutrient management, seed treatment, weed management and pest and disease management. The major correlates of technological gap were education, extension contact, innovativeness, trainings undergone and mass media exposure. Training needs identified were reemphasizing inadequate knowledge of the farmers on high yielding cotton hybrids, weed management, sucking pest management, drought management, fertilizer management and compatibility of insecticides and fungicides. Hence the training programmes organized by the Department of Agriculture, Krishi Vigyan Kendra (KVK), District Agricultural Advisory and Transfer of Technology Centre (DAATTC) need to be emphasized on these identified training needs in order to bridge the gap existing in *Bt* cotton production technology.

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Table 1: Distribution of respondents according to their overall technological gap (n=120)

Category	Frequency	Percentage
Low(<28.07)	22	18.33
Medium(28.07-36.19)	69	57.50
High(>36.19)	29	24.17
	120	100.00
	Mean=32.13	**SD=4.06**

Technological gap in *Bt* cotton production in Prakasam District of Andhra Pradesh

Table 2: Technological gap in adoption of recommended Bt cotton cultivation practices (n=120)

S. No	Recommended practices	Technological gap
1.	Land preparation	0.00
2.	Sowing time	0.00
3	Method of sowing	0.00
4	Seed rate	0.00
5	Variety/Hybrid	0.00
6	Seed treatment	63.89
7	Spacing	0.00
8	Manures	51.39
9	Fertilizer management	
i.	N management	
a.	Time of application	40.27
b.	Quantity	45.83
ii.	P management	
a.	Time of application	64.73
b.	Quantity	47.22
iii.	K Management	
a.	Time of application	51.67
b.	Quantity	44.45
iv	Micronutrients	60.56
14	Weed management	0.00
15	Irrigation	56.83
16	Pest and disease management	54.88
17	Harvesting	0.00

Table 3: Correlation of profile characteristics of *Bt* cotton farmers with technological gap (n=120)

S. No.	Independent variable	"r" value
1	Age	0.106
2	Education	-0.238*
3	Land holding	0.129
4	Farming experience	0.189
5	Mass media use	-0.364**
6	Innovativeness	-0.573**
7	Social participation	0.171
8	Economic motivation	0.158
9	Extension participation	-0.206*
10	Trainings undergone	-0.531**

** Significant at 1 per cent * significant at 5 per cent

Table 4.Training needs of *Bt* cotton farmers N=120

S. No	Training need	Frequency	Percentage
1	High yielding *Bt* cotton hybrids	111	92.50
2	Weed management	98	81.67
3	Sucking pest management	89	74.17
4	Drought management	77	64.17
5	Fertilizer management	69	57.50
6	Compatibility of insecticides and fungicides	66	55.00
7	Micronutrient deficiency identification and management	57	47.50
8	Disease management	56	46.67
9	Critical stages of irrigation	51	42.50
10	Pink boll worm management	48	40.00
11	ETLs for pest and diseases	44	36.67

Table 5: Constraints expressed by the farmers in *Bt* cotton production (n=120)

S. No.	Constraints	Frequency	Per cent
1	Sucking pests	99	82.50
2	Micronutrient deficiencies	84	70.00
3	Terminal moisture stress	81	67.50
4	Wilt problem	76	63.33
5	Poor yields	71	59.17
6	Mono cropping	67	55.83
7	High seed cost	65	54.17
8	Increased cost of cultivation	62	51.67
9	Pink boll worm incidence	59	49.17
10	Poor seed quality	55	45.83
11	Indiscriminate use of pesticides	49	40.83
12	Flower and boll drop	49	40.83