



Research Article

CONSTRAINTS FACED BY THE FARMERS IN ADOPTION OF Bt COTTON PRODUCTION TECHNOLOGY IN BHILWARA DISTRICT OF RAJASTHAN

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Abstract- Cotton is grown chiefly for its fiber use in the manufacture of clothes and for the purpose like making threads for mixing in other fiber and extraction of oils from the cotton seeds. The present study was conducted in the purposely selected Bhilwara district of Rajasthan. There are total twelve tehsils in Bhilwara district of Rajasthan, out of which, two tehsil namely Mandalgarh and Asind have been selected on the basis of maximum area under cultivation of Bt cotton. Four villages selected from each tehsil were taken on the basis of maximum area under Bt cotton cultivation. The list so prepared, 5 marginal, 5 small and 5 large Bt growers were selected randomly from each identified village. Thus, in all 120 farmers (40 marginal, 40 small and 40 large farmers) were included in the sample of the study. The study revealed that 48.33 per cent of the total respondents were in low constraints group, whereas 26.67 per cent in medium and remaining 25.00 per cent respondents were observed in the group of high constraints in the study area.

Keywords- Cotton, Adoption, Constraints, Production and Technology

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Introduction

Cotton (*Gossypium spp.*) the "white Gold", is a very important commercial crop of India. Bt cotton is genetically engineered cotton, which contain gene taken from a soil bacterium (*Bacillus thuringiensis*) to produce toxins in the plants. It has promoter genes to create doses of the toxins, which are released in all parts of the plants during the entire span of the crop growth. The use of Bt cotton is a positive environmental protection because it makes possible the reduction of the insecticides load in the environment and reduced handling of such chemicals by farmers. On the other hand, genetic contamination, health impacts and compatibility to Indian environment are the most common arguments among the biodiversity experts against the Bt cotton technology. Adoption of Bt cotton production technology depends upon various factors which may either accelerate or inhibit adoption. It is an important on the part of extension functionaries to identify such factors so as to make the dissemination of the technology in line with the farmer's perception and need. Therefore the constraints which hinder the adoption of improved Bt cotton production technology was considered in the present study. The constraints under present investigation were considered as major impediments that restrict the farmers to adopt the Bt cotton production technology in their fields.[1]

Materials and Methods

The present study was conducted in the purposely selected Bhilwara district of Rajasthan. There are total twelve tehsils in Bhilwara district of Rajasthan, out of which, two tehsil namely Mandalgarh and Asind have been selected on the basis of maximum area under cultivation of Bt cotton. Further, a comprehensive list of all major Bt cotton growing villages was prepared in consultation with the personnel of revenue and agriculture department from the identified tehsil. Four villages

selected from each tehsil were taken on the basis of maximum area under Bt cotton cultivation. Thus, total eight villages were selected for the present investigation. For selection of respondents, a comprehensive list of Bt cotton growers was prepared with the help of village patwari and agriculture supervisor of respective villages. The list prepared, 5 marginal, 5 small and 5 large Bt growers were selected randomly from each identified village. So, in all 120 farmers (40 marginal, 40 small and 40 large farmers) were included in the sample of the study. Data were collected by personnel interview method through structured schedule. Thereafter, data were tabulated, analysed and conclusion were drawn in light of the objective. [2,3]

Statistics

In order to answer the research questions mentioned under hypothesis and to achieve the object of the study, investigator undertook appropriate and most pertinent statistical analysis. The following statistical methods were used in the present study:

Percentage and frequency

The percentage and frequency of each studied item was calculated and a comparison was made in interpreting the results.

Mean per cent score

It was calculated by multiplying total obtained score of the respondent by 100 and divided by the maximum obtainable score.

$$\text{Mean per cent score} = \frac{\text{Total score obtained}}{\text{Maximum obtainable score}} \times 100$$

Rank

Ranks were accorded in the descending order according to the mean per cent score obtained.

Standard deviation

The standard deviation was used for categorization of respondents in three group on the basis of observed age, education, income, knowledge, adoption and constraints of farmers about Bt cotton cultivation practices. The formula for standard deviation is as follows:

$$S.D. = \sqrt{\frac{\sum X_i^2}{n} - \frac{(\sum X_i)^2}{(n)^2}}$$

Where,

S.D. = Standard deviation

$\sum X_i^2$ = Sum of square of the observations

$\sum X_i$ = Sum of value of the observations

n = Number of respondents

Results and Discussion

The constraints under present investigation were considered as major impediments that restrict the farmers to adopt the Bt cotton production technology in their fields. The results are present in subsequent tables.

Distribution of respondents on the basis of their level of constraints

In this section an attempt has been made to know the level of constraints perceived by farmers in the adoption of technology. The respondents were grouped into low (< 54), (ii) medium (54 to 67) and (iii) high (> 67) group on the basis of calculated mean and standard deviation of the obtained constraints scores by the respondents. The distribution of respondents is given in [Table-1]. The data in [Table-1] depicts that 48.33 per cent of the total respondents were in low constraints group, whereas 26.67 per cent in medium and remaining 25.00 per cent respondents were observed in the group of high constraints in the study area. [4,5].

Table-1 Distribution of the respondents on the basis of level of constraints faced by the respondents in Bt cotton production technology n =120

S. No.	Constraints	Marginal farmers		Small farmers		Large farmers		Total	
		F	%	f	%	f	%	f	%
1	Low (<54 score)	6	15.00	21	52.50	31	77.50	58	48.33
2	Medium (54 to 67 score)	8	20.00	17	42.50	7	17.50	32	26.67
3	High (> 67 score)	26	65.00	2	5.00	2	5.00	30	25.00
Total		40	100.00	40	100.00	40	100.00	120	100.00

Analysis of data in [Table-1] show that 15.00, 52.50 and 77.50 per cent marginal, small and large farmers perceived low level of constraints respectively. Whereas, 20.00, 42.50 and 17.50 per cent marginal, small and large farmers were observed in the category of medium level of constraints respectively. Further it was found that 65.00, 5.00 and 5.00 per cent marginal, small and large farmers were reported high level of constraints group respectively. From the above matrix, it could be concluded that Bt cotton growers of the study area are experiencing hindrances in cultivation of crop. The intensity of constraints varies among the farmers of different category.

Category-wise constraints perceived by the respondents

In the present investigation the constraints were categorized in to five suitable categories viz., economic constraints, socio-cultural constraints, technical constraints, seed and supplies constraints and post-harvest constraints. The results pertaining to each category is presented in the subsequent [Table-2].

Economic constraints perceived by the respondents

The data incorporated in [Table-2] reveal that "Non availability of financial aids in time" was the important constraints for marginal, small and large farmers with 89.17, 87.50 and 85.00 MPS respectively.

Table -2 Economic constraints perceived by the farmers in adoption of Bt cotton production technology n =120

S. No	Economic constraints	Marginal farmers		Small farmers		Large farmers		Total	
		MPS	Rank	MPS	Rank	MPS	Rank	MPS	Rank
1.	Lack of money to purchase required requisite	83.33	6.5	70.83	6	48.33	7	67.50	7
2.	High cost of input	90.00	3	69.17	7	82.50	4	80.56	5
3.	More cost of the practice	94.17	1	89.17	1	70.83	5	84.72	3
4.	Non availability of financial aids in time	89.17	4	87.50	2	85.00	1	87.22	1
5.	High cost of insecticides and pesticides	92.50	2	85.00	3	83.33	2.5	86.94	2
6.	High cost of seed and planting material	85.00	5	82.50	4	83.33	2.5	83.61	4
7.	High wage rate of labour during sowing and harvesting time	83.33	6.5	73.33	5	62.50	6	73.06	6

MPS = Mean per cent score

Further analysis of [Table-2] reveals that "High cost of insecticide and pesticide" was also perceived as important constraints by marginal, small and large farmers with MPS 92.50, 85.00 and 83.33 respectively and it was ranked second by marginal, third by small farmers and ranked 2.5th by large farmers. Likewise, the constraints related to "More cost of the practice", "High cost of seed and planting material" "High cost of input", "High wage rate of labour during sowing and harvesting time", "Lack of money to purchase required requisite" were also realized as major constraints by the respondents and ranked, third, fourth, fifth, sixth and seventh in the priority of constraints with overall MPS was 84.72, 83.61, 80.56, 73.06 and 67.50 respectively.

Socio-Cultural constraints perceived by the respondents

The data presented in [Table-3] reveal that "Continuous adoption of traditional package of practices" was expressed as most important constraints by marginal, small and large farmers with 81.67, 67.50 and 72.50 MPS respectively and ranked first by marginal and large farmers and rank second by small farmers. Further analysis of table reveals that "Belief that high yield entirely depend upon god will rather than use of Bt cotton seed and fertilizers" was also confronting to marginal, small and large farmers with MPS 66.67, 69.17 and 27.50 respectively and it was ranked first by small farmers, fourth by the large and second by marginal farmers. Likewise, the constraints related to "Neighbors are not using the improved practices" and "Farmers tendency of non-using the practices until other

farmers in his social system to use the same" were also realized as major constraints by the respondents and ranked, third and fourth in the priority of

constraints with overall MPS was 47.50 and 40.00 respectively.

Table-3 Socio-cultural constraints perceived by the farmers in adoption of Bt cotton production technology n =120

S. No	Socio-cultural constraints	Marginal farmers		Small farmers		Large farmers		Total	
		MPS	Rank	MPS	Rank	MPS	Rank	MPS	Rank
1.	Farmers tendency of non using the practices until other farmers in his social system to use the same	62.50	3	21.67	4	35.83	2.5	40.00	4
2.	Neighbors are not using the improved practices	41.67	4	65.00	3	35.83	2.5	47.50	3
3.	Belief that high yield entirely depend upon god will rather than use of Bt cotton seed and fertilizers	66.67	2	69.17	1	27.50	4	54.44	2
4.	Continuous adoption of traditional package of practices	81.67	1	67.50	2	72.50	1	73.89	1

MPS = Mean per cent score

Technical constraints perceived by the respondents

The data presented in [Table-4] reveal that "Non availability of technical advice" was expressed as most important constraints by marginal, small and large farmers with 82.50, 82.50 and 65.83 MPS respectively and it was ranked first by marginal and small farmers and third by large farmers

Further analysis of table reveals that "Lack of knowledge about seed treatment" was also confronting to marginal, small and large farmers with MPS 75.00, 65.00 and 75.83 respectively and it was ranked third by the marginal, second by the small and ranked first by large farmers. Likewise, the constraints related to "Lack of knowledge about Bt cotton varieties, seed rate, spacing and date of sowing" was also confronting to marginal, small and large farmers with MPS 65.00, 59.17 and 69.17 respectively and it was ranked fourth by the marginal and small and ranked second by large farmers. Likewise, the constraints related to "Lack of

knowledge about major insect-pest and their control" was faced by marginal, small and large farmers with MPS 59.17, 62.50 and 55.00 respectively and it was ranked sixth by the marginal, third by the small and ranked fifth by large farmers. Likewise, the constraints related to "Lack of knowledge about soil borne insect-pest and other control" was also confronting to marginal, small and large farmers with MPS 60.83, 51.67 and 60.83 respectively and it was ranked fifth by the marginal, ranked sixth by small and fourth by the large farmers. Likewise, the constraints related to "Lack of knowledge about adequate quantity and methods of fertilizer application" "Lack of knowledge about critical stage of irrigation" "Lack of knowledge about weed & their control" were also realized as major constraints by the respondents and ranked seventh and eighth, in the priority of constraints with overall MPS was 56.11 and 32.78 respectively.

Table-4 Technical constraints perceived by the farmers in adoption of Bt cotton production technology n =120

S. No	Technical constraints	Marginal farmers		Small farmers		Large farmers		Total	
		MPS	Rank	MPS	Rank	MPS	Rank	MPS	Rank
1.	Lack of knowledge about Bt cotton varieties, seed rate, spacing and date of sowing	65.00	4	59.17	4	69.17	2	64.44	3
2.	Lack of knowledge about soil borne insect-pest and other control	60.83	5	51.67	6	60.83	4	57.78	5
3.	Lack of knowledge about adequate quantity and methods of fertilizer application	78.33	2	57.50	5	32.50	7	56.11	6
4.	Lack of knowledge about seed treatment	75.00	3	65.00	2	75.83	1	71.94	2
5.	Lack of knowledge about critical stage of irrigation	41.67	7	36.67	8	38.33	6	38.89	7
6.	Lack of knowledge about weed & their control	27.50	8	46.67	7	24.17	8	32.78	8
7.	Lack of knowledge about major insect-pest disease & their control	59.17	6	62.50	3	55.00	5	58.89	4
8.	Non- availability of technical advice	82.50	1	82.50	1	65.83	3	76.94	1

MPS = Mean per cent score

Seed and supplies constraints perceived by the respondents

The data presented in [Table-5] reveal that "Lack of adequate irrigation facilities"

was expressed as most important constraint by marginal, small and large farmers with 84.17, 45.83 and 58.33 per cent respectively and ranked first by large farmers and marginal and ranked fifth by the small farmers.

Table-5 Seed and supplies constraints perceived by the farmers in adoption of Bt cotton production technology n=120

S. No.	Seed and supplies constraints	Marginal farmers		Small farmers		Large farmers		Total	
		MPS	Rank	MPS	Rank	MPS	Rank	MPS	Rank
1.	Non-availability of Bt seed in time	59.17	5	48.33	1.5	57.50	2.5	55.00	4
2.	Fertilizer are not timely available	70.83	2	47.50	3.5	57.50	2.5	58.61	2
3.	Lack of adequate irrigation facilities	84.17	1	45.83	5	58.33	1	62.78	1
4.	Insecticides, pesticides, weedicides are not timely available	69.17	3	48.33	1.5	50.83	4	56.11	3
5.	Improved Implements and spraying instrument are not available in rural area	66.67	4	47.50	3.5	49.17	5	54.44	5

MPS = Mean per cent score

Further analysis of data in [Table-5] reveals that "Fertilizer are not timely available" was also perceived as important constraints by marginal, small and large farmers with MPS 70.83, 47.50 and 57.50 respectively and it was ranked second by marginal, 3.5th small and 2.5th large farmers. Likewise, the constraints related to "Insecticide, pesticide, weedicides are not timely available", "Non-availability of Bt seed in time", and "Improved implements and spraying instruments are not available in rural areas" were also realized as major constraints by the

respondents and ranked, third, fourth, and fifth, in the priority of constraints with overall MPS, 56.11, 55.00, and 54.44 respectively.

Post-harvest constraints perceived by the respondents

The data incorporated in [Table-6] reveal that "Un-healthy fluctuating marketing trends with poor support price to the farmer produce", hinders adoption among marginal, small and large farmers with 78.33, 84.17 and 88.33 per cent

respectively. This constraint was ranked second by marginal, ranked first by the small farmers and second by large farmers.

It can be further noted that "Non-availability of market at village" was also perceived as important constraints by marginal, small and large farmers with MPS 75.83, 72.50 and 89.17 respectively and was ranked third by the marginal farmers, ranked second by the small and ranked first by the large farmers. Likewise, the

constraints related to "Lack of storages facilities", "Mal practices in market like recording lesser than the actual weight" and "Difficulties in getting money immediately after sale.", were also realized as major constraints by the respondents and ranked third, fourth, and fifth in the priority of constraints with overall MPS 72.50, 35.56, and 30.56 respectively.

Table-6 Post-harvest constraints perceived by the farmers in adoption of Bt cotton production technology n =120

S. No.	Post-harvest constraints	Marginal farmers		Small farmers		Large farmers		Total	
		MPS	Rank	MPS	Rank	MPS	Rank	MPS	Rank
1.	Lack of storages facilities	80.00	1	65.83	3	71.67	3	72.50	3
2.	Difficulties in getting money immediately after sale	30.83	5	36.67	4	24.17	5	30.56	5
3.	Non-availability of market at village	75.83	3	72.50	2	89.17	1	79.17	2
4.	Un-healthy fluctuating marketing trends with poor support price to the farmer produce	78.33	2	84.17	1	88.33	2	83.61	1
5.	Mal practice in market like recording lesser than the actual weight	56.67	4	20.00	5	30.00	4	35.56	4

MPS = Mean per cent score

Overall constraints perceived by the Bt cotton growers

To get an overview of constraints perceived by the Bt cotton growers, the overall score for each category was pooled and results have been presented in [Table-7]. The data presented in [Table-7] reveal that among the selected constraints, economic constraints were up to greatest extent by the Bt cotton growers with

MPS 60.39 followed by post-harvest constraints with MPS 44.55 however, the extent of seed and supplies constraints with MPS 43.17, the extent of technical constraints with MPS 42.68 and socio-cultural constraints with MPS 40.47 faced by the Bt cotton growers in the study area.

Table-7 Overall constraints perceived by the Bt cotton growers n=120

S. No.	Constraints	Marginal farmers		Small farmers		Large farmers		Total	
		MPS	Rank	MPS	Rank	MPS	Rank	MPS	Rank
1	Economical constraints	66.16	1	59.73	1	55.27	1	60.39	1
2	Socio-cultural constraints	47.34	4	41.88	4	32.19	5	40.47	5
3	Technical constraints	45.94	5	42.58	2	39.53	4	42.68	4
4	Seed and supplies constraints	52.50	2	36.00	5	41.00	3	43.17	3
5.	Post-harvest constraints	47.40	3	42.40	3	43.85	2	44.55	2

MPS = Mean per cent score

Conclusion

The study revealed that 48.33 per cent of the total respondents were in low constraints group, whereas 26.67 per cent in medium and remaining 25.00 per cent respondents were observed in the group of high constraints in the study area. The study indicated that "Non availability of financial aids in time, continuous adoption of traditional packages and practices, non availability of technical advice, lack of adequate irrigation facilities and un-healthy fluctuating marketing trends with poor support price to the farmer produce were perceived as most important constraints by the Bt cotton growers of the study area.

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Abbreviations:

%	-	Per cent
f	-	Frequency
MPS	-	Mean Per cent Score
n	-	Number of respondent

Conflict of Interest: None declared

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