

Attitude of Farmers towards Bt Cotton Cultivation

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ABSTRACT

An attempt is made to construct a scale to analyse the attitude of farmers towards Bt cotton cultivation using summated rating scale. The attitude scale developed was found to be reliable and valid. The scale developed is useful in explicitly analysing the attitude of farmers towards Bt cotton cultivation. One hundred and sixty rainfed Bt cotton farmers were interviewed from four districts of Northern Dry Zone (Zone 3) in Karnataka State. The results revealed that a greater majority of farmers (71.25%) possessed more favourable attitude towards Bt cotton cultivation. It was also found that family size, land holding, annual income, risk orientation, scientific orientation, market orientation, economic motivation and extension contact of farmers had a positive and highly significant relationship with their attitude towards Bt cotton cultivation.

Keywords : Attitude, Bt. cotton cultivation, reality, validity, extension personnel

THURSTONE (1946) defined attitude as the degree of positive or negative aspects associated with some psychological object like symbol, person or idea towards which people can differ in varying degrees. Likert (1932) defined attitude as the degree of positive or negative disposition / association towards an innovation, object, programme etc. There is no limit to the topics about which people may have attitudes. Hence, it can be persuasively argued that everything in life depends on attitude (Jayanta Roy *et al.*, 2012). The success and failure of any improved technology mainly depends upon the people's mindset or attitude towards a particular technology, hence the attitude of a farmer plays an important role in accepting or rejecting the technology at any stage of the adoption process.

Cotton occupies an enviable place amongst the commercial crops of our country. It is grown in the country under diverse agro-climatic conditions and contributes nearly 65 per cent of the total raw material needs of the textile industry. It plays a major role in India's economy, both in terms of providing employment directly or indirectly to about 60 million people and the cotton earns a foreign exchange for the country to the tune of ₹ 60,000 crores (Anon., 2011). India ranks first in global scenario with respect to the area-wise cultivation of cotton occupying about 33 per cent of the world cotton area. However, in respect of production, India ranks second next to China. In India, the cotton was cultivated on an area of 11.16 m ha with an annual production of 31.20 million bales of

seed cotton during 2010-11. Its average productivity in India was 494 kg lint / ha, which was low as compared to the world average of 725 kg lint / ha (Anon., 2011).

Bt Cotton is a transgenic variety of cotton genetically modified to contain a gene of *Bacillus thuringiensis* (Bt). Bt Cotton was first developed by Monsanto – a US registered Multinational Corporation. The company claimed that the seeds are resistant to bollworm infestations, thus reducing insecticide use resulting in reducing the cost of production and increasing the crop yield. Though some of the top cotton-growing countries are adopting Bt Cotton, there is huge debate at international level regarding the sustainability of the crop. Along with certain benefits, there are various risks and uncertainties regarding Bt Cotton. These may be categorized as production, environmental, economic and social issues (Iyengar and Lalitha, 2002). Against this background, the present study was carried out with the following specific objectives:

1. To develop a standardized scale for analysing the attitude of farmers towards Bt cotton cultivation
2. To analyse the attitude of farmers towards Bt cotton cultivation
3. To find out the relationship between personal, socio-economic, and psychological characteristics of farmers and their attitude towards Bt cotton cultivation

METHODOLOGY

The present study was carried out in Dharwad, Gadag, Haveri and Koppal districts of Northern Dry Zone (Zone 3) in Karnataka state during 2016-17. Two taluks from each of the sampled four districts were purposively selected for the study. From each taluk, two villages and from each village ten rainfed Bt cotton farmers were selected for the study. Thus the total sample constituted 160 rainfed Bt cotton farmers. Ex-post-facto research design was followed in the present study. Information regarding 14 personal, socio-economic, and psychological characteristics (Table III) of farmers were collected using a structured schedule with suitable scales. The collected data was analysed using frequency, percentage, mean, standard deviation and correlation test.

RESULTS AND DISCUSSION

Development of scale to analyse the attitude of farmers towards Bt cotton cultivation

Attitude of Bt cotton growers is operationally defined in the present study as the mental disposition of an individual farmer about production, environment, economic and social dimensions / issues towards Bt cotton cultivation either positively or negatively. The method suggested by Likert (1932) and Edwards (1969) in developing summated rating scale was followed in the construction of attitude scale. The procedure followed in construction of the attitude scale is presented in the ensuing paragraphs:

Step 1- Collection of items: The first step in the construction of scale was to collect exhaustive statements / items pertaining to the farmers attitude towards Bt cotton cultivation. A tentative list of 71 statements pertaining to the attitude of farmers towards Bt cotton cultivation was prepared based on the available literature and discussion with the agricultural experts, These 71 statements were classified into production, environment, economic and social dimensions.

Step 2 - Editing of the items: The statements were edited as per the 14 criteria suggested by Edwards (1969) and Thurstone and Chave (1929). As a consequence, 11 statements were eliminated and the remaining 60 statements were included for the study.

Step 3 - Relevancy analysis: Sixty statements were mailed to 110 agricultural experts working in the Farm Universities, Indian Council of Agricultural Institutions and Karnataka State Department of Agriculture to critically evaluate the relevancy of each statement viz., Most Relevant (MR), Relevant (R), Somewhat Relevant (SWR), Less Relevant (LR) and Not Relevant (NR) assigning score of 5, 4, 3, 2 and 1, respectively. The judges were also requested to make necessary modifications (additions or deletion of statements), if they desire so. A total of 61 judges returned the questionnaire duly filled. From the data gathered, 'Relevancy Weightage' and 'Mean Relevancy Score' were worked out for all the 60 statements. Using these two criteria, the statements were screened for their relevancy using the following formulae.

$$\text{Relevancy Weightage} = \frac{(\text{MR} \times 5) + (\text{R} \times 4) + (\text{SWR} \times 3) + (\text{LR} \times 2) + (\text{NR} \times 1)}{\text{Maximum Possible score}}$$

$$\text{Mean Relevancy Score} = \frac{(\text{MR} \times 5) + (\text{R} \times 4) + (\text{SWR} \times 3) + (\text{LR} \times 2) + (\text{NR} \times 1)}{\text{Number of Judges responded}}$$

Accordingly statements with Relevancy weightage of 0.73 and above, and 'Mean Relevancy Score' of 3.65 and above, were considered for final selection. Forty one statements were retained after relevancy test. These statements were suitably modified and written as per the comments of the judges, wherever applicable.

Step 4 - Item analysis: To delineate the items/statements based on the extent to which they differentiate the attitude items/statements about Bt cotton cultivation as more favorable or less favorable, item analysis was carried out on the items/statements selected in the first stage. For item analysis, statements were arranged in ascending order based on the relevancy score. Twenty five per cent of the statements with the highest total score and twenty five per cent with the lowest total scores were selected. These two groups provided the criterion groups for which item analysis was conducted and critical ratio was calculated by using the following formula:

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\sum(X_H - \bar{X}_H)^2 + \sum(X_L - \bar{X}_L)^2}{n(n-1)}}$$

Whereas,

$$\sum (X_H - \bar{X}_H)^2 = \sum X_H^2 - \frac{(\sum X_H)^2}{n}$$

$$\sum (X_L - \bar{X}_L)^2 = \sum X_L^2 - \frac{(\sum X_L)^2}{n}$$

\bar{X}_H = The mean score on a given statement for the high group

\bar{X}_L = The mean score on a given statement for the low group

$\sum X_H^2$ = Sum of squares of the individual score on a given statement for high group

$\sum X_L^2$ = Sum of squares of the individual score on a given statement for low group

$\sum X_H$ = Summation of scores on given statement for high group

$\sum X_L$ = Summation of scores on given statement for low group

n = Number of judges in low and high groups

t = The extent to which a given statement differentiate between the high and low groups.

Σ = Summation

Based on the item analysis ('t' value), 27 statements which were statistically significant at five and one per cent level of probability were finally

retained in the scale to measure the attitude of cotton farmers towards Bt cotton cultivation.

Step 5 - Reliability and validity of the scale: Split half method developed by Brown Prophecy was employed to measure the reliability of the attitude scale. The value of correlation coefficient was 0.8542 and this was further calculated by using Spearman Brown formula for obtaining the reliability coefficient of the whole test. The value of the scale was 0.9213, which was highly significant at one per cent level indicating high reliability of the scale.

The validity of coefficient of the scale was 0.9598, which was also statistically significant at one per cent level of probability indicating the higher validity of the developed scale. Hence, the scale is said to be valid.

Thus, the developed scale to measure the attitude of farmers towards Bt cotton cultivation was feasible and appropriate.

Step 6 - Administering the scale: The final attitude scale consisted of 27 statements classified as production (8 Nos.), environment (6 Nos.), economic (7 Nos.) and social dimensions (6 Nos.). These 27 statements (Table I) helps in analysing the attitude of farmers towards Bt cotton cultivation. Of which,

TABLE I
Scale to measure the attitude of farmers towards Bt cotton cultivation

Statements	SA	A	UD	D	SD
A Production dimension					
Suitable soil and adequate irrigation is a must for Bt cotton					
Timely intercultivation in Bt cotton has direct relationship with the productivity					
Intercropping in Bt cotton is not a good practice since Bt cotton perform well as a sole crop *					
Package of practices in Bt cotton are not labour intensive compared to conventional cotton					
Fertilizer requirement is more in Bt cotton cultivation than conventional cotton					
Previous crop plays an important role in deciding the productivity of Bt cotton					
Seedling growth/vegetative growth in Bt cotton is more than the conventional cotton cultivation					
Incidence of sucking pest attack is more in Bt cotton compared to conventional cotton					

Statements	SA	A	UD	D	SD
B Environment dimension					
Bt cotton cultivation has negative impact on the environment *					
Sustainable agricultural development could be achieved without affecting the soil and nature through Bt cotton cultivation					
Bt cotton enhances the yield without degrading the natural resources					
Agro-chemicals used in conventional cotton cultivation causes long term harmful effects to the environment					
Bt cotton reduces farmers exposure to health hazards					
Bt cotton has ill effects on bio agents and beneficial microorganisms *					
C Economic dimension					
Bt cotton cultivation is a boon to farmers					
Economic benefits in Bt cotton is more compared to the conventional cotton cultivation					
Bt cotton reduces the cost of cultivation by reducing the quantity of agricultural inputs required					
Bt cotton ensures sustainable income for the farmers					
Bt cotton yarn has more demand because of its quality					
Credit facilities helps to make Bt cotton farming more successful					
Marketing facilities helps to make Bt cotton farming more successful					
D Social dimension					
People visit my farm and appreciates me for growing Bt cotton					
Family will have a better quality of life by growing Bt cotton					
Sufficient information about Bt cotton farming is available in print and electronic media					
Fellow farmers will not object the cultivation of Bt cotton on my farm					
Advertisement of Multinational companies influences farmers to grow Bt cotton					
Extension personnel appreciates me for cultivating Bt cotton					

* Indicates negative statement

SA = Strongly agree; A = Agree; UD = Undecided; D = Disagree; SD = Strongly disagree

twenty four are positive statements and three are negative statements. The response could be collected on a five point continuum, *viz.*, strongly agree, agree, undecided, disagree, and strongly disagree with assigned score of 5, 4, 3, 2 and 1, respectively for positive statements and vice versa for negative statements. Thus, the minimum and maximum score one could get is 27 and 135, respectively. Higher the score indicates the more favourable attitude of farmers towards Bt cotton cultivation and lesser the attitude

score indicates less favourable attitude towards Bt cotton cultivation. The developed scale (Table I) was administered to 160 rainfed Bt cotton farmers to analyse their attitude towards Bt cotton cultivation.

Attitude of farmers towards Bt cotton cultivation

It is observed from Table II that a larger number (36.87%) of the farmers had more favourable attitude towards Bt cotton cultivation followed by 34.38 and 28.75 per cent of the farmers having favourable and

TABLE II

Attitude of farmers towards Bt cotton cultivation (n=160)

Category	Bt cotton farmers	
	Frequency	Per cent
Less favorable	46	28.75
Favorable	59	36.87
More favorable	55	34.38
Total	160	100.00

less favourable towards Bt cotton cultivation, respectively. It can be inferred that a greater majority (71.25%) of the farmers possessed more favourable attitude towards Bt cotton cultivation.

The probable reasons for a greater majority of farmers (71.25%) having more favourable to favourable attitude towards Bt cotton cultivation is due to the farmers' acceptance of Bt cotton for its high yield, good quality and low boll worm infestation. Similar perceptions were seen in Northern China. Less labour expenses, less pesticide use, higher yields and higher profits were the major reasons for farmers to cultivate Bt cotton in China (Yang *et al.*, 2004).

High cost of Bt cotton seeds as compared to non Bt cotton seeds and ineffectiveness of Bt cotton against sucking pests like jassids, aphids, whitefly etc., were the reasons for 28.75 per cent of the farmers for having less favourable towards Bt cotton cultivation.

Relationship between personal, socio-economic, and psychological characteristics of farmers and their attitude towards Bt cotton cultivation

The results in Table III reveals that age, education, innovative proneness, mass media participation, extension participation and cosmopolitanism of farmers had positive but non-significant relationship with their attitude towards Bt cotton cultivation, whereas family size, land holding, annual income, risk orientation, scientific orientation, market orientation, economic motivation and extension contact of farmers had positive and highly significant relationship with their attitude towards Bt cotton

TABLE III

Relationship between personal, psychological and socio-economic characteristics of farmers and their attitude towards Bt cotton cultivation (n=160)

Characteristics	Correlation value (r)
Age	0.042 NS
Family size	0.256 **
Education	0.019 NS
Land holding	0.217 **
Annual income	0.248 **
Innovative Proneness	0.133 NS
Risk orientation	0.361 **
Scientific orientation	0.366 **
Market orientation	0.556 **
Economic motivation	0.684 **
Mass media participation	0.141 NS
Cosmopolitanism	0.128 NS
Extension contact	0.379 **
Extension participation	0.078 NS

NS: Non-Significant; ** Significant at 1 per cent

cultivation at one per cent level. For every unit increase in the family size, land holding, annual income, risk orientation, scientific orientation, market orientation, economic motivation and extension contact of farmers, there will an increase in the development of favourable attitude towards Bt cotton cultivation.

The attitude scale developed was found to be reliable and valid, hence the scale developed could be used to analyse the attitude of farmers towards Bt cotton cultivation. Larger proportion (36.87%) of the farmers had more favourable attitude towards Bt cotton cultivation followed by 34.38 and 28.75 per cent of the farmers having favourable and less favourable attitude towards Bt cotton cultivation, respectively. It can be inferred that as high as 71.25 per cent of the farmers possessed more favourable

to favourable attitude towards Bt cotton cultivation. Farm scientists and extension personnel should popularise the cultivation of Bt cotton among farmers since it gives higher yield and income.

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