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Assessment of innovativeness and risk orientation among Bt. cotton growers in Buldhana district of Maharashtra

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Abstract
The present study examines the innovativeness and risk orientation of Bt. cotton growers in the Buldhana district of Maharashtra, a key region within Vidarbha known for cotton cultivation. Introduced in 2002, Bt. cotton revolutionized cotton farming in India by offering resistance against bollworm pests and enhancing yields. This study involved 120 randomly selected Bt. cotton growers from three tahsils - Sindakhed Raja, Deulgaon Raja and Chikhli. Findings revealed that a majority of growers exhibited a medium level of innovativeness (65.83%) and risk orientation (65.83%), indicating a cautious yet open attitude toward adopting new agricultural technologies. A smaller but significant portion showed high innovativeness (19.17%) and high risk orientation (21.67%), reflecting the presence of progressive growers. Many growers remained undecided on certain innovation and risk-related statements, suggesting hesitancy in adopting unproven practices without visible benefits. The study concludes that while Bt. cotton growers in the region are moderately receptive to innovations and risk, targeted efforts in awareness-building, demonstration, and farmer-to-farmer communication can further enhance adoption. These findings align with earlier studies and underscore the importance of supportive interventions to promote responsible and sustainable use of Bt. cotton technology in Indian agriculture.

Keywords: Bt. cotton cultivation, innovativeness, risk orientation, Maharashtra

Introduction
Bt. cotton, a genetically modified crop containing *Bacillus thuringiensis* genes, was introduced in India in 2002 to control bollworm pests and improve yield (James, 2002) [6]. Its adoption led to a 24% increase in yield and a 50% rise in profits for cotton farmers (Kathage & Qaim, 2012) [7]. Today, over 90% of India's cotton area is under Bt. varieties, making it the largest global user of this technology (ISAAA, 2020) [5]. Farmers with higher innovativeness tend to adopt Bt. cotton early and use it efficiently (Kumar *et al*., 2021) [8]. Access to credit and information strongly influences adoption, particularly among small and marginal farmers who see Bt. cotton as a way to maximize income under resource constraints (Mal *et al*., 2013; Anik *et al.,* 2017) [9, 1]. Social learning also shapes behaviour, as farmers often rely on peers or dealers when deciding to adopt new technologies (Flachs, 2019) [3]. Understanding these traits is crucial for promoting responsible and widespread adoption of Bt. cotton, ensuring both productivity and sustainability in Indian agriculture (Qaim, 2020) [11].

Methodology
The current study was conducted in the Vidarbha region of Maharashtra state, particularly in the Buldhana district. Three tahsils - Sindakhed Raja, Deulgaon Raja and Chikhli were chosen for the study based on their Bt. cotton cultivation out of the 13 tahsils in the Buldhana district. This study utilized an exploratory social research investigate and included 120 growers in total.

Results and Discussion

Innovativeness: Innovativeness in this study refers as the degree to which an individual Bt. cotton grower adopts new ideas regarding cotton production in agriculture relatively earlier than others. The scale developed by Singh (1972) [14] is used to measure the innovativeness. There are six statements in the scale. Out of six statements in the scale, Statement 1, 4 and 5 are positive and statement 2, 3 and 6 are negative. It was measured on five point continuum namely strongly agree, agree, undecided, disagree, strongly disagree.

The distribution of Bt. cotton growers according to their responses towards innovativeness statement is presented in Table 1.

Table 1: Distribution of Bt. cotton growers according to their responses towards innovativeness statements

SI. No.	Innovativeness	SA	A	UD	DA	SDA
1	I feel restless till I try out a new Bt. cotton production practice I have heard about.	29 (24.17%)	25 (20.83%)	32 (26.67%)	27 (22.50%)	7 (05.83%)
2*	I try to keep myself up to date with information on new Bt. cotton practices regarding cultivation but that does not mean that I try out all new methods on my farm.	8 (06.67%)	14 (11.67%)	36 (30.00%)	41 (34.16%)	21 (17.50%)
3*	I talk of many new practices regarding Bt. cotton production these days but who know whether they are better than old ones.	16 (13.33%)	10 (08.33%)	37 (30.83%)	40 (33.34%)	17 (14.17%)
4	I am cautious about trying a new practice regarding Bt. cotton production.	36 (30.00%)	31 (25.83%)	36 (30.00%)	15 (12.50%)	2 (01.67%)
5	From time to time, I have heard of several new practices regarding Bt. cotton production and I have tried out most of them in last few years.	7 (05.83%)	12 (10.00%)	36 (30.00%)	46 (38.34%)	19 (15.83%)
6*	After all our fore father were in their old practices and I don't see any reason for changing these old methods.	26 (21.67%)	29 (24.17%)	32 (26.66%)	25 (20.83%)	8 (06.67%)
(SA - Strongly agree, A - Agree, UD - Undecided, DA- Disagree, SDA- Strongly Disagree)						

Table 1 show about one fourth of the growers (26.67%) were undecided about feeling restless until they try out a new Bt. cotton practice they have heard about. More than one third (34.17%) disagreed with the statement that they keep themselves updated about new Bt. cotton practices but do not necessarily adopt all of them. Similarly, over one third (33.34%) disagreed with the idea that new practices may not be better than the old ones. Nearly one third (30.00%) were either strongly in agreement or undecided about being cautious before adopting a new practice. A considerable proportion (38.34%) disagreed with the claim that they have tried out most of the new Bt. cotton practices they have come across in recent years. Additionally, 26.66 percent were undecided and 24.17 percent agreed that there is no reason to change the traditional methods followed by their forefathers.

The data regarding innovativeness in growing Bt. cotton is presented in Table 2.

Table 2: Distribution of Bt. cotton growers according to innovativeness

SI. No.	Innovativeness	Bt. cotton growers (n=120)	
		Frequency	Percentage
1	Low (Up to 15.57)	18	15.00
2	Medium (15.58 to 20.81)	79	65.83
3	High (above 20.81)	23	19.17
	Total	120	100.00
	Mean = 18.19		

Table 2 revealed that nearly two-thirds of the Bt. cotton growers (65.83%) exhibited a medium level of innovativeness (15.58 to 20.81). This was followed by 19.17 percent of the growers who showed high innovativeness, while the remaining (15.00%) fell under the low innovativeness category (up to 15.57).

It can be concluded from the above data that most Bt. cotton growers are moderately open to adopting new ideas, practices, and technologies, but there is still a sizeable portion of the population with either low or no inclination toward innovation. These findings are similar to Rathwa (2018) [12], Vysali Kantheti (2018) [18], Ghuge (2019) [4], Navya Dasari (2019) [10], Vaishali Rane (2019) [17] and Raut (2019) [13].

Risk orientation: Risk orientation refers to the degree of which farmer is oriented towards the risk and uncertainty in accepting recommended practices of Bt. Cotton cultivation.

It was measured with the help of scale developed by Supe (1969) [15] and consists of six statements. The risk orientation of growers was measured on five point continuum as strongly agree, agree, disagree, undecided and strongly disagree. Out of six statements in the scale, Statement 2, 3, 4 and 5 are positive and statement 1 and 6 are negative.

The distribution of Bt. cotton growers according to their responses towards Risk orientation statements is presented in Table 3.

Table 3: Distribution of Bt. cotton growers according to their responses towards Risk orientation statements

SI. No.	Risk orientation	SA	A	UD	DA	SDA
1*	A Bt. Cotton grower should grow large no. of crops to avoid greater risk involved in growing one or two crops	9 (7.50%)	9 (7.50%)	33 (27.50%)	45 (37.50%)	24 (20.00%)
2	A farmer should rather take more of a chance on making a big profit than to be content with a smaller but less risk profit	11 (9.17%)	27 (22.50%)	34 (28.33%)	43 (35.83%)	5 (4.17%)
3	It is good for a cotton grower to take risk when he knows his chance of success is fairly high	9 (7.50%)	24 (20.00%)	32 (26.67%)	42 (35.00%)	13 (10.83%)
4	A Bt. Cotton growing farmer who is willing to take greater risk than the	10	26	43	33	8 (6.67%)

	average farmers usually does better financially	(8.33%)	(21.67%)	(35.83%)	(27.50%)	
5	Trying entirely new technologies by a cotton farmer involves risk but may be beneficial	8 (6.67%)	31 (25.83%)	45 (37.50%)	26 (21.67%)	10 (8.33%)
6*	It is better for a farmer not to take risk by trying new technologies unless most other farmers have used them with success	6 (5.00%)	10 (8.33%)	21 (17.50%)	47 (39.17%)	36 (30.00%)
(SA - Strongly agree, A - Agree, UD - Undecided, DA- Disagree, SDA- Strongly Disagree)						

Table 3 observed that more than one third (37.50%) of Bt. cotton growers disagreed with the idea that growing a large number of crops reduces the risk involved in cultivating only one or two crops. A similar proportion (35.83%) disagreed with the statement that a farmer should take chances for higher profits rather than settling for smaller but safer gains. About 35.00 percent disagreed with the notion that taking risks is acceptable when the chances of success are fairly high. More than one third (35.83%) were undecided about whether Bt. cotton growers who take greater risks generally perform better financially. Likewise, a similar share (37.50%) remained undecided on whether trying entirely new technologies, despite being risky, could be beneficial. Additionally, 39.17 percent disagreed and nearly one third (30.00%) strongly disagreed with the idea that farmers should wait until most others have successfully adopted new technologies before trying them themselves.

The data regarding Risk orientation in growing Bt. cotton is presented in Table 4.

Table 4: Distribution of Bt. cotton growers according to Risk orientation

SI. No.	Risk orientation	Bt. cotton growers (n=120)	
		Frequency	Percentage
1	Low (Up to 13.78)	15	12.50
2	Medium (13.79 to 18.96)	79	65.83
3	High (above 18.96)	26	21.67
	Total	120	100.00
	Mean = 16.37		

Table 4 revealed that nearly two-thirds of the Bt. cotton growers (65.83%) had a medium level of risk orientation (13.79 to 18.96). This was followed by 21.67 percent of the growers who showed a high level of risk orientation (above 18.96), while 12.50 percent of the growers were categorized under low risk orientation (up to 13.78).

The data indicates that most Bt. cotton growers show moderate willingness to take risks related to agricultural innovations. A fair proportion also exhibit high risk orientation, reflecting the presence of progressive farmers open to new practices. With proper support and information, many of them are likely to adopt advanced methods if seen as beneficial. These findings are similar to Ashvini Nagtilak (2016) [2], Vysali Kantheti (2018) [18], Ghuge (2019) [4], Navya Dasari (2019) [10] and Vaishali Bhandarwar (2022) [16].

Conclusion

The study found that most Bt. cotton growers (65.83%) had a moderate level of innovativeness and risk orientation, indicating a balanced approach towards adopting new practices and handling uncertainties. A smaller group showed high innovativeness (19.17%) and high risk orientation (21.67%), reflecting progressive attitudes.

Farmers were generally cautious, with many undecided on trying untested technologies, but open to adoption when benefits are evident. These findings suggest that with proper support, training, and peer influence, a significant number of farmers can adopt advanced practices effectively.

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