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Adoption of improved cultivation practices of Bt. cotton by the farmers in distress prone area of Vidarbha

Vijay Shinde, YB Shambharkar, VS Tekale and Rewendra Sahu

Abstract

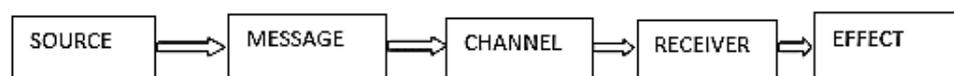
Study entitled "Involvement of Farmers in Feedback Management with Reference to Bt cotton" was undertaken in Umardhed Panchayat samiti in Yavatmal district of Vidarbha region of Maharashtra state. Ex-post facto research design was used for the same. The farmers growing Bt cotton since last three years consecutively were identified and from each selected village 12 Bt cotton growers as respondents were selected randomly to constitute sample size of 120 respondents. The data from Bt cotton growers were collected by personal interview method. Relatively higher proportion of Bt cotton growers (58.34%) were in medium adoption level followed by more than one fifth of them (23.33%) were in low level of adoption of recommended package of practices whereas, 18.33 per cent Bt cotton growers who were in high level of adoption of recommended package of practices by Bt cotton growers.

Keywords: cultivation practices, Bt. Cotton, prone area

Introduction

The development of agriculture is the prime need of every developing country. Agricultural technologies play an important role in the development of agriculture. Several need based agricultural technologies are being invented and these technologies from most essential agricultural input for increasing the agricultural production. Improved technologies are transferred to the farmers through various agencies like State Agricultural Universities, State Department of Agriculture Panchayat Raj Institutions, NGOs and So on. However, it is not enough merely to deliver the message or transfer the technology but it is of paramount importance to see the resultant effect of transference of the messages or technologies. It is possible only through management of feedback. Feedback helps the extension personnel to find out the effect of the message or technology. It is proved that effective transfer of technology mostly depends on the extent of feedback provided.

Action-reaction interdependence in communication is referred to as feedback. He has given a model of communication consisting of source, message, channel, receiver and effect. Berlo's model is as follows:



Leagans (1961) has also given a communication model by showing the feedback where the last factor audience response is meant as feedback. Leagans model is as follows:



He referred feedback as audience response when the communication is meant for changing the behavior of the people.

Feedback plays a very important role in communication system because it tells us how our message is being interpreted. It helps in improving the process of communication through increasing the accuracy of the information and removing the doubts of the receiver. It is an error correcting mechanism that can overcome noise, which ultimately helps to increase the fidelity of communication Benor and Harrison (1977). It is also observed that inter-personal

communication with relevant feedback is most effective in transfer of technology (Ingle and Supe 1990). It may be true in several other development also.

Communication research indicates that learners perceived better gain in knowledge and retain longer when the opportunities of feedback are provided. If there is no feedback, no communication has taken place that means feedback helps to maintain the stability and equilibrium of communication system.

In agriculture, Feedback plays a vital role in the process of transfer of technology and helps the farmers in identifying and communicating their problems to the source. Of course, for an effective transfer of technology and its assured adoption by the farmers, effective linkage between farmers, extension workers and research is needed which is possible only through feedback. Thus, feedback helps in building the linkage between scientists, extension workers and farmers such to and fro mechanism is based on feedback provided by the farmers and feedback received by the extension worker. If the feedback provided by the farmers is effective, it may promote understanding, encourage acceptance and persuade the adoption of related to agriculture.

An effective feedback management helps in timely rectification of farmer problems. However, unless farmers or extension worker identifies, significant and relevant constraints in adoption of technology, feedback has practically no value. Therefore, it is true that management of feedback on the part of all concerned is necessary as it determines the effectiveness of transfer of technology.

Methodology

The study was confined to the Umarched Panchayat Samiti in Yavatmal district in Vidarbha region of Maharashtra State. For the present study, ex-post facto design of social research was thought to be appropriate, as the study emphasized on ascertaining involvement of farmers in feedback management with reference to Bt cotton. The sampling plan adopted for this research has been described under subhead. Out of 16 tahsil of Yavatmal district, Umarched tahsil was purposively selected on the basis of maximum area under Bt cotton cultivation amongst all the tahsils. As per discussion with Taluka Agriculture Officer, Umarched, about Bt cotton production in this tahsil, it was noticed that, mostly farmers were growing Bt cotton in Umarched tahsil followed by Soybean. On this basis, list of Bt cotton growing villages in Umarched panchayat samiti was obtained from Taluka Agriculture Officer amongst which 10 villages were selected purposively on the basis of larger area under Bt cotton cultivation during the year 2017-18. The selected villages were Bhawani (J), Brahmangaon, Dhanki, Dhighdi, Kharus (B), Lohara (Kh), Pimpri-Devet, Soit (GH), Taroda and Unchwadad. The list of farmers growing Bt cotton since last three years consecutively in the selected villages was obtained from Taluka Agriculture officer, Umarched and from each selected village, 12 Bt cotton growers as respondents were selected randomly by using simple random sampling method to constitute sample size of 120 respondents

Results and Discussions

Table 1: Distribution of the Bt cotton growers according to their adoption of selected package practices of Bt cotton growers

Sl. No.	Cultivation Practices	Respondent (n=120)		
		CA	PA	NA
		Freq. %	Freq. %	Freq. %
A	Land Preparation			
1	Growing of Bt cotton in recommended soil (medium to heavy black cotton soil)	103 (85.83)	0 (0.00)	17 (14.17)
2	Land preparation operation before sowing the seeds (ploughing, harrowing, etc.)	120 (100.00)	0 (0.00)	0 (0.00)
B	Time of Sowing			
1	Recommended time of sowing for Bt cotton seeds (In irrigated condition within May & in Rainfed condition- up to 15 th July.)	44 (36.67)	10 (8.33)	66 (55.00)
C	Sowing Method			
1	Use of dibbling method of sowing the seeds of Bt cotton	120 (100.00)	0 (0.00)	0 (0.00)
2	Sowing depth for Bt cotton seed (3-5cm)	37 (30.83)	13 (10.82)	70 (58.33)
3	Number of seeds require per hill basis (1 or 2 seeds)	87 (72.50)	21 (17.50)	12 (10.00)
D	Variety Selection			
1	Recommended varieties of Bt cotton in area	120 (100.0)	0 (0.00)	0 (0.00)
E	Seed Rate and Spacing			
1	The recommended seed rate of Bt cotton (For rainfed condition: 2.5-3 kg/ha., For irrigated condition: 1.5-2.2 kg/ha)	53 (44.17)	21 (17.50)	46 (38.33)
2	The recommended spacing required for Bt cotton cultivation (For rainfed condition: 90 x 45 cm., For irrigated condition: 120 x 60 cm)	54 (45.00)	11 (09.17)	55 (45.83)
F	Inter-cultivation Practices			
1	Gap filling operation	95 (79.20)	12 (10.00)	13 (10.80)
2	Hand weeding (Hand weeding for manual weed control)	81 (67.50)	23 (19.17)	16 (13.33)
3	Weedicide used to control of weeds in case of pre and post emergence in Bt cotton (in case Pre- emergence: STOMP, Pendimethalin, 30EC), (in case Post-emergence: Targa Super, Quasimodo-ethyl)	25 (20.83)	14 (11.67)	81 (67.50)
4	Recommended dose of weedicide for chemical control of weeds in Bt cotton (Stomp: 35/40 ml/10 lit of water, Targa super: 2 ml/lit of water)	38 (31.67)	22 (18.33)	60 (50.00)
5	Practices to control square and boll drop (Topping of apical buds, application of NAA (100 ml/acre)	29 (24.17)	15 (12.50)	76 (63.33)
6	Three to four hoeing at an 15 to 20 days interval for weeds, aeration and check evaporation	42 (35.00)	16 (13.33)	62 (51.67)
7	Use foliar sprays of Planofix @ 0.25 ml/lit of water	40 (33.33)	06 (5.00)	74 (61.67)
G	Water Management			
1	Irrigation during critical stages for irrigation in Bt cotton (Germination, seedling growth, flowering stage, boll formation & development stage) rainfed (Protective	56 (46.67)	34 (28.33)	30 (25.00)

	irrigation 1 or 2)			
2	Total number of irrigations being provided for all critical stage in Bt cotton cultivation (4-6 irrigations)	50 (41.67)	06 (5.00)	64 (53.33)
H	Inter Cropping			
1	Inter cropping in Bt cotton (Cotton+ Green Gram/ Black Gram, Cotton + Sorghum + Pigeon Pea + Sorghum, Cotton + Marigold etc.)	64 (53.33)	29 (24.17)	27 (22.50)
I	Nutrient Management			
1	Soil testing (To know the nutrient level in soil)	40 (33.33)	0 (0.00)	80 (66.67)
2	Application of recommended dose of vermicompost (2.5 t/ha)	17 (14.17)	26 (21.67)	77 (64.17)
3	Time of application of vermicompost (Before 7 day sowing)	14 (11.67)	30 (25.00)	76 (63.33)
4	Application of recommended dose of FYM/ha for Bt cotton cultivation (5 to 6 tonnes /acre)	37 (30.83)	45 (37.50)	38 (31.67)
5	Proper time of FYM application (2 to 3 weeks before sowing)	46 (38.33)	17 (14.17)	57 (47.50)
6	Application of recommended dose of nitrogen fertilizers for Bt cotton crop. (120-150 kg) (Irrigated: 120 and Rainfed: 60)	42 (35.00)	49 (40.83)	29 (24.17)
7	Time of application of nitrogenous fertilizers. (34 kg N/ha at the time of sowing and 33 kg Nitrogen after one month and 33 kg Nitrogen after 2 months for Cotton crop $\frac{1}{2}$ half of N at the time of sowing.	48 (40.00)	30 (25.00)	42 (35.00)
8	Spraying of 2% urea. (200g + 10 lit water) at the time of flowering (at the time of flowering)	41 (34.17)	10 (8.33)	69 (57.50)
9	Application of recommended dose of phosphatic fertilizers for Bt cotton crop. (60 kg Phosphorus ha ⁻¹) (30 kg/ha of SSP at the time of sowing and 30 kg/ha at the time of boll development)	43 (35.83)	25 (20.83)	52 (43.34)
10	Spraying of 2% DAP (200gms + 10 lit water) at the boll development stage.	23 (19.17)	27 (22.50)	70 (58.33)
11	Recommended dose of Potassic fertilizers for Bt cotton crop. (60 kg potassium/ha) (30 kg/ha of p at the time of sowing and 30 kg/ha of p at the time of boll development)	39 (32.50)	19 (15.80)	62 (51.70)
12	Placement of fertilizer at 7-10 cm away from plant at 7-10 cm depth.	34 (28.33)	25 (20.83)	61 (50.84)
13	Spraying of ZnSO ₄ (2gm in 1 lit of water) twice at an interval of 4-5 days.	27 (22.50)	16 (13.33)	77 (64.17)
14	Application of recommended dose of zinc sulphate for Bt cotton crop. (20 kg ZnSO ₄ ha ⁻¹)	23 (19.17)	24 (20.00)	73 (60.83)
15	Spraying of Bt cotton with 1% MgSO ₄ (10g of MgSO ₄ in 1 lit of water at 45 and 75 days after sowing to control reddening)	71 (59.17)	0 (0.00)	49 (40.83)
16	Application of recommended dose of Calcium Nitrate for Bt cotton crop. (25 to 35 kg CaNO ₄ /ha)	18 (15.00)	05 (4.17)	97 (80.83)
17	Application of dose of spraying of poly- feed (19:19:19) (@1.5 to 2.00% i.e.15 to 20 g per litre of water)	22 (18.33)	10 (8.34)	88 (73.33)
18	Time of spraying of poly- feed (75 days after sowing and after 85 days after sowing)	35 (29.17)	05 (4.16)	80 (66.67)
19	Application of dose of spraying of multi-k with Boron (15-20 g/lit of water with Boron @ 0.1% i.e.1 g/lit of water) (To enhance boll set and development)	61 (50.83)	0 (0.00)	59 (49.17)
20	Time of application of multi-K with Boron (105 day after of sowing) (105 day after of sowing)	31 (25.83)	23 (19.17)	66 (55.00)
21	Spraying of Bt cotton crop with 0.1% Boric acid (1 gm of Boric acid in 1 lit of water) at 60 and 90 days after sowing (To overcome boron deficiency and boll set development)	20 (16.67)	0 (0.00)	100 (83.33)
22	Spraying of the Bt cotton crop with 0.5 to 1% Potassium Chloride and 0.5 to 1% Ferrous Sulphate, (To overcome deficit of Potassium and Magnesium occurred due to water deficit conditions)	27 (22.50)	0 (0.00)	93 (77.50)
J	Integrated Pest and Disease Management			
1	Use of recommended pesticides/insecticides to control pests of Bt cotton (Imidachloprid, Thiamethoxam, Fipronil, Triazophos)	89 (74.17)	15 (12.50)	16 (13.33)
2	Use of chemicals/fungicides to control those diseases (Copper Oxychloride, Streptocycline, Bavistin, Carbandazim)	57 (47.50)	10 (8.33)	53 (44.17)
3	Application of neem kernel extract.(5% neem kernel extract spraying to control sucking pests, bollworms etc.)	37 (30.83)	15 (12.50)	68 (56.67)
4	Planting refugia (Planting non-Bt cotton as border rows of Bt cotton to preventing pest attack into main field and development of resistance by Bollworms)	54 (45.00)	0 (0.00)	66 (55.00)
K	Picking			
1	Appropriate time of pickings for Bt cotton (165 -175 DAS or within 5 - 7 days of boll bursting)	65 (54.17)	13 (10.83)	42 (35.00)
2	Total Number of pickings recommended for Bt cotton (Rainfed condition:- 2 & Irrigated condition:- 3)	47 (39.17)	37 (30.83)	36 (30.00)

(Figures in parenthesis indicates in percentage)

CA= complete adoption PA= partial adoption NA= non-adoption

Adoption indicates the present status of using the recommended package of practice by the Bt cotton growers. The results obtained after analysis of data about adoption of recommended package of practices by the respondents Bt cotton growers are presented in the Table 1.

It is observed from Table 18 that majority of the respondents (85.83%) of the respondents Bt cotton growers were having suitable soil for Bt cotton cultivation whereas, only 14.17 per cent of the respondents were observed in not cultivating Bt cotton crop as per soil recommendations which means that

they cultivate Bt cotton on the land available with them by thinking Bt cotton growing trend.

Regarding the land preparation, cent per cent of the respondents completely adopted the land preparation practices like ploughing, harrowing or hoeing completely.

In case of period of sowing, maximum number of the respondents (36.67%) followed complete adoption for recommended time of sowing both for irrigated and rain fed conditions. While studying the various sowing operations, it was found that cent per cent of the respondents, less than three fourth of them (72.50%) and 30.83 per cent of the respondents adopted completely the recommended sowing method, require number of seeds per hill basis and the proper sowing depth of seeds respectively. The proportion of the respondents in partial adoption of sowing depth of Bt cotton seeds and number of seeds require per hill were found to be 10.82 per cent and 17.50 per cent whereas, more than half (58.33%) and one tenth of the respondents not adopted these practices respectively.

It was further observed that cent per cent of the respondents completely adopted the varietal recommendations of Bt cotton for that particular area. While studying the adoption about recommended seed rate and spacing, it was found that around 44.17 per cent of the respondents completely adopted the recommended seed rate for sowing both in rain fed as well as irrigated condition and 45.00 per cent of the respondents were in complete adoption regarding the recommended spacing for Bt cotton respectively whereas 17.50 per cent and slightly less than one tenth (09.17%) used the recommended seed rate and spacing respectively. The proportion of the respondents 38.33 per cent and 45.83 per cent were not adopted the recommended seed rate and spacing respectively.

In case of various inter-cultivation practices, it was observed that majority of the respondents (79.20%) had complete adoption in gap filling operation, followed slightly more than one tenth (10.80%) not done the gap filling might be because of non-availability of seeds whereas, one tenth of the respondents were partially done this practice. Hand weeding operation were done by majority of the respondents (67.50%) followed by less than one fifth (19.17%) of them were done hand weeding operation partially. might be because of less availability of labours. Only 13.33 per cent of the respondents were not done hand weeding might be because of high cost of or non-availability of labours. On the other side 67.50 per cent respondents were not used any weedicide for chemical control of the pre-emergence weeds followed by little more than one fifth (20.83%) were in complete adoption of this practice whereas 11.67 per cent partially adopted the said practice. The proportion of the respondents, Bt cotton growers who adopted the recommended dose of those chemical to control of weeds by weedicide were 31.67 per cent whereas 18.33 per cent of them partially adopted and half of respondents. Among the respondents 24.17 per cent were done the topping of apical bud and application of NAA. Respondents (12.50%) were done the topping of apical bud and application of NAA, partially whereas majority of the respondents (63.33%) were not adopted this practice.

More than half of the respondents (51.67%) were not adopted the practice of three to four hoeing at an 15 to 20 days interval for weeds, aeration and check evaporation followed by 35.00 per cent of them adopted the same completely and 13.33 per cent of the respondents were adopted the said practice partially. Further it was noticed that maximum number of the respondents (61.67%) were not sprayed foliar spray of Planofix whereas it was found that 33.33 per cent of the

respondents sprayed the foliar spraying of Planofix completely and very meager per cent of the respondents (05.00%) were adopted this practice partially means not the required extent.

Regarding water management, it was observed that maximum number of the respondents i.e. 46.67 per cent and (41.67%) had completely adoption behaviour about recommended number of irrigations at proper growth stages of Bt cotton and total number of irrigations being provided for all critical stage in Bt cotton cultivation. Further it was noticed that 28.33 per cent and very meager (5.00%) were irrigate their Bt cotton crop in critical stages and provided required number of irrigation respectively. One fourth and more than half (53.33%) of the respondents were unable to irrigate the Bt cotton crop at critical stages with required number of irrigations.

It was found that more than half of the respondents (53.33%) followed the intercropping in Bt cotton followed by less than one fourth of them (24.17%) were sown the intercrop partially and more than one fifth (22.50%) one fifth of the respondents (22.50%) did not adopt the inter cropping practices, in Bt cotton.

As regards to the nutrient management practices, in case of FYM application 37.50 per cent of the respondents and 38.33 per cent of the respondents adopted the recommended doses of FYM and the recommended time for application of FYM in the field respectively. But, in case of FYM application more than half (54.17%) of the respondents and 47.50 per cent of the respondents did not adopt the recommended doses of FYM and the recommended time for application of FYM in the field respectively. Respondents 14.17 per cent and 08.33 per cent were observed in partially adopting the practices of recommended time for application of FYM in the field and recommended doses of FYM respectively. Most of the respondents (19.17%) (40.00%) and (35.00%) were in complete adoption of nutrient management practices such as spraying of DAP 2.00 per cent, time of application of nitrogenous fertilizers and recommended dose of nitrogenous fertilizers respectively. The proportion of the respondents who adopted the practices partially as spraying of DAP 2.00 per cent, time of application of nitrogenous fertilizers and recommended dose of nitrogenous fertilizers were by 22.50 per cent, one fourth per cent and 40.83 per cent respectively.

As regards to the practices such as, recommended dose of vermin-compost, soil testing and recommended dose of zinc sulphate were having complete adoption by the respondents (14.20%), (33.33%) and (19.17%) respectively whereas, 21.70 per cent, 20.00 per cent were adopted the same practices in partial form respectively.

In case of respondents (34.17%), (32.50%) and (18.33%) were in complete adoption of nutrient management practices such as spraying of 2.00 per cent urea, recommended dose of potassium fertilizers and dose of spraying of Poly-feed respectively whereas 08.34 per cent, 15.80 per cent and 08.33 per cent were adopted the same practices in partial form might be because of lack of money or required labour.

The proportion of the respondents, (25.83%), and (22.50%) were observed in complete adoption of nutrient management practices such as, time of application of Multi-K with Boron and spraying of the crop with 0.5 to 1.00 per cent potassium chloride and 0.5 to 1.00 per cent ferrous sulphate respectively. Whereas, 19.17 per cent were in partial adoption of time of application of multi K with Boron.

With regards to time of application of vermin-compost majority of the respondents (63.33%) did not adopt the said

practice followed by one fourth of the respondents adopted the same partially whereas; only 11.67 per cent of them were observed incomplete adoption of time of application of vermi-compost. The proportion of the respondents, 43.33 per cent, 35.83 per cent and 20.83 per cent were observed in non-adoption, complete adoption and partial adoption respectively with respect to recommended dose of phosphatic fertilizers.

In case of placement of fertilizer at 7-10 cm away from the plant, little more than half (50.84%) were not adopted this practice followed by more than one fourth (28.33%) of them were observed in complete adoption whereas 20.83 per cent of the respondents were adopted this practice partially.

With regards to practices such as spraying of ZnSO₄ and MgSO₄ more than one fifth (22.50%) and more than half (59.17%) of the respondents were observed in complete adoption of these practices respectively whereas, maximum number of the respondents (64.17%) and (40.83%) were not adopted these practices respectively and only 13.33 per cent of them were sprayed the ZnSO₄ on Bt cotton plant in partial form.

In case of application of recommended dose of Calcium Nitrate, majority of the respondents (80.83%) not adopted this practice followed by 15.00 per cent who adopted this practice completely whereas, negligible per cent (04.17%) of the respondents were adopted the same partially.

Regarding practices such as spraying of multi-k with Boron and with boric acid, majority of the respondents (49.17%) and (83.33%) were not adopted these practices respectively followed by 50.83 per cent and 16.67 per cent of the Bt cotton growers were sprayed their crop respectively and more than one fifth (21.66%) were adopted the practice of spraying of multi-K with boron in partial form. 15.00 per cent and 22.50 per cent were complete adoption of time of application of vermin-compost and recommended dose of calcium nitrate and spraying of ZnSO₄ respectively.

In case of integrated pests and disease management practices, the proportion of the respondents (74.17%), (47.50%) (30.83%) and 45.00 per cent were adopted the practices as use of recommended pesticides/fungicides to control pests and diseases, application of neem seed kernel extract and planting of refugia respectively whereas, 13.33 per cent, 44.17 per cent, 56.67 per cent and 55.00 per cent of them were not adopted these practices respectively and few of the respondents 12.50 per cent, 08.33 per cent and 12.50 per cent were adopted these practices in partial form respectively.

Regarding picking practices, it was found that 54.17 per cent and 39.17 per cent of the respondents completely adopted the correct picking stage along with recommended numbers of picking of Bt cotton respectively whereas and 10.83 per cent 30.83 per cent of them were in partially adoption these practices and remaining respondents not adopted these practices.

growers (58.34%) were in medium adoption level followed by more than one fifth of them (23.33%) were in low level of adoption of recommended package of practices whereas, 18.33 per cent Bt cotton growers who were in high level of adoption of recommended package of practices by Bt cotton growers.

Thus, it could be inferred that, maximum number of the Bt cotton growers had medium level of adoption of nutrient management practices.

These findings in accordance with the findings of Girhe (2011), Roy (2017) and Shambharkar (2018) who reported that, majority of Bt cotton respondents had medium adoption.

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Table 2: Distribution of the Bt cotton growers according to their level of adoption

Sl. No.	Adoption levels	Respondents (n=120)	
		Frequency	Percentage
1	Low	28	23.33
2	Medium	70	58.34
3	High	22	18.33
	Total	120	100.00

The data with regards to level of adoption of improved package of practices by Bt cotton growers furnished in Table 2, indicates that, relatively higher proportion of Bt cotton