IMPACT OF FRONT LINE DEMONSTRATIONS ON YIELD AND ECONOMICS OF *Bt* COTTON IN NANDURBAR DIST OF MAHARASHTRA

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Abstract: In present study, 100 field demonstrations were conducted under five different farming situations on Bt cotton in Nandurbar district of Maharashtra by Regional Extension Centre, Dhule during Kharif 2016. Front line demonstrations (FLDs) were conducted by the active participation of the farmers with the objective of transfer of improved technologies for cotton production potential. The improved technologies consist bio-fertilizers, balanced fertilizers (soil test based) and micro-nutrients application and integrated pest and disease management. Field demonstrations in different farming situations recorded the average seed cotton yield of 21.28 q ha^{-1} in demonstration plot as against of 15.58 q ha^{-1} in farmer practice. Maximum 25.75 q ha^{-1} and minimum, 19.55 q ha^{-1} seed cotton yield were obtained from field demonstrations. The higher Benefit Cost Ratio of 2.61 was obtained in demonstrations as against 1.81 in farmers practice.

Key words: Front line demonstration, yield, economics, Bt cotton, Nandurbar.

Introduction

Cotton is one of the most important cash crop of the Maharashtra as well as India. The development of the Agriculture is primarily depends on the application of the scientific technologies by making the best use of available resources. One of the major constraints of traditional cotton farming is low productivity because of partial non-adoption of improved technologies like timely sowing, use of recommended fertilizers dose and application at proper time and integrated crop management technologies etc. To increase the production, productivity and quality of agricultural produce, front line demonstrations are being conducted at farmers' field. All the recommended practices were provided to the selected farmers. The data related to the cost of cultivation, production, productivity, gross return and net return were collected as per schedule and analyzed. The result of the study indicated the gap existed in the potential yield and demonstration yield due to soil fertility and weather conditions. Present results clearly show that the yield and economics of cotton can be boost up by adopting recommended technologies.

Material and Methods

On the basis of feedbacks and participation of farmers, the project is being implemented with an objectives to demonstrate Mahatma Phule Krishi Vidyapeeth developed technologies through cluster approach on farmer's field for improving production, productivity and income of farmers, to test the adoption of technologies with the components of Cotton based production technologies.

The present study was conducted in Nandurbar district of Maharashtra during *Kharif* 2016 under Farmer FIRST Project by Regional Extension Center, College of Agriculture, Dhule. All the participating farmers were trained on various aspects of cotton production technologies. The field was prepared by deep ploughing and harrowing. All the recommended practices like FYM application before sowing, timely sowing, seed treatment with biofertilizers, sowing spacing as per soil types, integrated weed management, integrated nutrient management, integrated plant protection and timely uproot of the crop after harvesting. The yield and economic performance of the front line demonstrations, the data on output were collected

from FLDs as well as farmers practice based plots and finally the seed cotton yield, cost of cultivation, net returns with benefit cost ratio was worked out.

The block demonstrations on cotton based technology were organized in the selected cluster villages on 40 hectares area with critical inputs. The details of technology package and village cluster as well as material for the study for FLDs are given in Table 1 and 2. The demonstration plots were monitored by the University scientists time to time and guided the participating farmers about the cotton cultivation by giving them technology knowledge. Also demonstration field visits, group discussions and farmers rally were organized during the crop period at selected village.

Results and Discussion

Seed cotton yield: After completion of pickings in cotton, the data on seed cotton yield, production cost, market prices were collected and complied. The whole data is divided into five farming situations as per method of irrigation, protective irrigation, sowing period and rainfed situation (Table 3).

The average yield of seed cotton was higher (21.28 q ha^{-1}) than the average yield of farmers practice (15.58 q ha^{-1}). The average per cent increased in the yield over farmers practice was 26.78 per cent. The results indicated that the front line demonstrations organized in cluster have given the good impact over the farming community of Nandurbar district as they were motivated by new agricultural technologies / inputs demonstrated amongst farmers applied in the FLD plots (Table 1). Similar results have been reported by Mhaske and Kolage (2013) on cotton demonstrations in Dhule district and Mhaske *et. al.* (2015) on chickpea demonstrations in Nandurbar district.

Extension gap: The extension gap of 5.7 q ha^{-1} was recorded through FLDs. This emphasized need to educate the farmers through various means for the adoption of improved agricultural technologies to reverse the trend of wide extension gap. More and more use of the latest production technologies and inputs required to achieve the higher production without harmful to the environment and also to avoid the soil hazards subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinue the traditional practices and to adopt new technology and inputs (Table 1). This findings are in corroboration with the findings of Srinivas *et.al.* (2005), Hiremath and Nagaraju (2010).

Economic returns: The input and output prices of commodities prevailed during the study were taken for calculating gross returns, cost of cultivation, net returns and benefit: cost ratio (Table 4). The cultivation of cotton under improved technologies gave higher gross monetary returns of Rs.1,09,720/- per hectare as compared to farmers practices. The benefit cost ratios of cotton under improved technologies were 2.61 as compared to 1.81 under farmers practice.

Entomological record (Sucking pest and bollworm population): Mostly *Bt* cotton varieties were used by the farmers for sowing. For the management of sucking pest, *Lecanicilium (verticillium) lecani*, Neem Seed Extract and yellow sticky traps were used during the crop growth. Yellow sticky traps were used at the rate of 10 traps per acre. These traps were again replaced after filling first one lot. White flies and jassids were very well controlled due to yellow sticky traps. The sucking pest population controlled due to yellow sticky traps is depicted in Fig.1. Secondly, after 4 pickings of cotton, observations on bollworm complex were also measured on picked bolls and remaining green bolls of cotton in demonstration fields. In picked bolls, the population of pink bollworm was lower as compared in green bolls. The population of spotted bollworm was minor in picked bolls. However, no infestation of *Helicoverpa* was found in picked bolls.
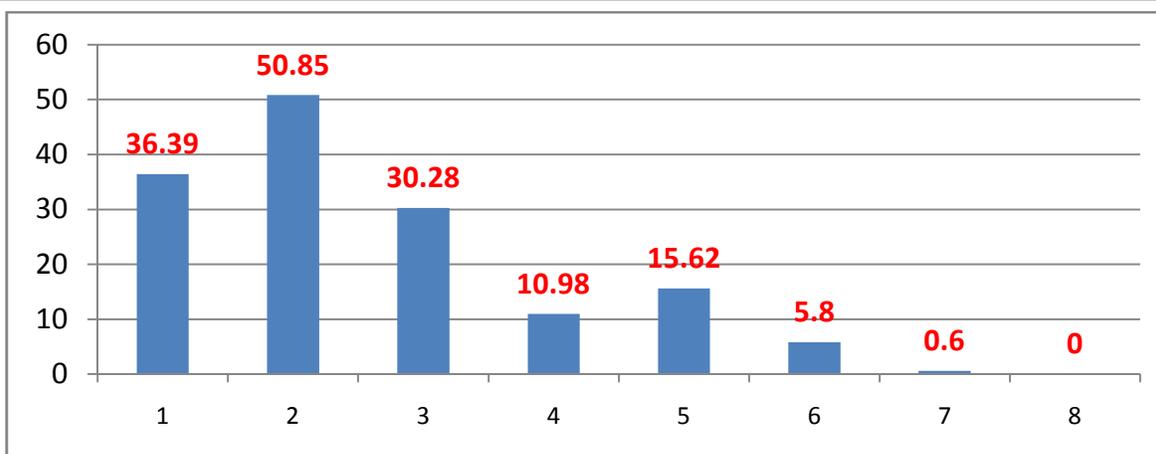
Fig. 1: Pest population in demonstration fields

Details of X-axis (Fig. 1)

X-axis	Details of the each bar
1	Average population of jassids per trap
2	Average population of white fly per trap
3	% pick bollworms in green bolls
4	% pink bollworms in picked bolls
5	% spotted bollworms in green bolls
6	% spotted bollworms in picked bolls
7	% *Helicoverpa* in green bolls
8	% *Helicoverpa* in picked bolls

Table 1: Component Package per Demonstration (0.40 ha)

Sr. No.	Parameter	Farmers shares	Project share	Project share Cost (Rs.)
1.	Soil Health Cards	--	1 sample	860.00
2.	*Bt* Cotton Seed	1 kg	--	--
3.	Organic manure	4 tonne	--	--
4.	Bio-fertilizers			
	a) *Azotobacter*	--	250 g	10.00
	b) *Phosphate Solubilizing Bacteria*	--	250 g	10.00
	c) *Trichoderma*	--	1 kg	160.00
5.	Chemical fertilizers (NPK kg ha^{-1})	125:65:65	--	--
6.	Micro-nutrients			
	a) Zinc sulphate	--	5 kg	142.50
	b) Ferrous sulphate	5 kg	--	--
7.	Plant protection			
	a) Verticillium	--	1 kg	160.00
	b) Neem oil	--	0.500 liter	567.00
	c) Dimethoate 35 EC	--	0.250 liter	87.50
	d) Copper oxychloride	--	0.500 kg	220.00
	e) Streptocycline	--	24 g	144.00
	f) Yellow sticky trap	--	20 Nos.	799.95
	g) Trap crops (cow pea, maize, marry gold)	200 g	--	--
			Total	**3160.95**

Table 2: Cluster villages selected for Demonstrations and area

Sr. No.	Name of village	Tahsil & Dist.	No. of farmer partners	Area (ha)
1.	Baldane	Nandurbar	83	33.20
2.	Ghotane	Nandurbar	14	5.60
3.	Dhavade	Nandurbar	02	0.80
4.	Bhadvad	Nandurbar	01	0.40
Total			100	40.00

Table 3: Seed cotton yield of demonstrations

Sr. No.	Farming situation	Farmers associated	Total area (ha)	Maximum yield (q ha⁻¹)	Minimum yield (q ha⁻¹)	Average yield (q ha⁻¹)
1.	Pre-monsoon sowing (Sufficient irrigation water & drip system)	08	3.20	33.75	25.00	28.68
2.	Pre-monsoon sowing (Protective irrigation & drip system)	17	6.80	24.00	17.75	20.05
3.	Sowing after commencement of Monsoon (Protective irrigation & drip system)	36	14.40	32.50	20.50	22.98
4.	Sowing after commencement of Monsoon (Protective irrigation & traditional system)	27	10.80	20.50	18.25	19.38
5.	Rainfed	12	4.80	18.00	16.25	17.38
Total		100	40	--	--	--
Average		--	0.40	25.75	19.55	21.28

Table 4: Average yields and monetary benefits of demonstrations

Crop	Average yield (q ha⁻¹)		Average cost of production (Rs ha⁻¹)		Gross monetary returns (Rs ha⁻¹)		Average B:C ratio	
	Demonstration plot	Farmer practice	Demonstration plot	Farmer practice	Demonstration plot	Farmer practice	Demonstration plot	Farmer practice
Bt cotton	21.28	15.58	42,090	44,372	1,09,720	80,330	2.61	1.81

Note: Average Market rate: Rs. 5156 per quintal of seed cotton

Conclusion: On an average, the pre-monsoon cotton produced 15 % higher yields than the crop sown after commencement of monsoon. The crop under sufficient irrigation and on protective irrigation either sown pre-monsoon or on the commencement of monsoon produced 31 per cent higher yields than rainfed crop. The average productivity of cotton of 100 demonstrations was 21.28 q ha⁻¹ (Table 4).

Thus it can be concluded that the cultivation of *Bt* cotton with improved production technology was found to be more productive over farmer practice in all the farming situations.

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