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Popularization of improved Mustard production technology through frontline demonstrations in Mid-Western plain zone of Uttar Pradesh

AS Jat, YP Singh and RP Singh

Abstract
Mustard is one of the most important oilseeds crop in India, which plays a major role in supplementing the income of small and marginal farmers in Mid Western Plain Zone of Uttar Pradesh. One of the major constraints of traditional mustard farming is low productivity due to non-adoption of recommended package of practices and improved varieties. Frontline demonstration (FLD) is one of the most powerful tools for transfer of technology. Keeping in view of an effective extension approach of FLDs for popularization of improved mustard production technology by Krishi Vigyan Kendra, Budaun under Sardar Vallabhbhai Patel University of Agricultural & Technology, Meerut (UP) were conducted at farmer's fields. The impact assessment was based on the comparison of beneficiary and non-beneficiary respondents with reference to increase in knowledge level of beneficiary farmers, extent of adoption of improved mustard production technologies and attitude of beneficiary farmers towards FLDs. Cultivation practices comprised under FLD viz., use of improved variety, line sowing, balanced application of fertilizers, timely weed management and control of insect-pest through insecticide -pesticides at economic threshold level showed that the yield of mustard increased from 19.66 to 26.14 per cent over farmer's practice during the demonstration period from 2008-09 to 2010-11. The technology gap was observed minimum (457 kg/ha) during 2009-10 and maximum (685 kg/ha) in the year 2010-11. The demonstrations fetched higher average additional return (Rs.4713/ha) and C: B ratio (0.14) along with high (52.22%) to medium (28.33%) extent of farmer's satisfaction.

Keywords: Client Satisfaction Index, Extension gap, Frontline demonstration, Mustard, Technology gap, Technology index

Introduction
Frontline Demonstration (FLD) is the concept of field demonstration evolved by the Indian Council of Agricultural Research with the inception of the Technology Mission on Oilseed Crops during mideighties. The field demonstrations conducted under the close supervision of scientists of the National Agriculture Research System is called front-line demonstrations because the technologies are demonstrated for the first time by the scientists themselves before being fed into the main extension system of the State Department of Agriculture (Sharma *et al.*, 2011). Frontline demonstration (FLD) is one of the most powerful tools of extension because farmers, in general, are driven by the perception that '*Seeing is believing'*. The main objective of Front-Line Demonstrations is to demonstrate newly released crop production and protection technologies and its management practices in the farmers' field under different agro-climatic regions and farming situations. While demonstrating the technologies in the farmers' field, the scientists are required to study the factors contributing higher crop production; field constrains of production and thereby generate production data and feedback information.

Indian mustard [*Brassica juncea* (*L.*) Czernj. & Cosson] is predominantly cultivated in Uttar Pradesh, Rajasthan, Haryana, Madhya Pradesh and Gujarat. The total area in India was 6.30 million hectares along with 7.20 million tonnes of production. Uttar Pradesh accounts for 14.03% and 13.78% of area and production, respectively in the country with the average yield of 1123 kg/ha which is equivalent to the national average (1143 kg/ha). It is the major source of income especially even to the marginal and small farmers in Mid Western Plain Zone of Uttar Pradesh.

The mustard production scenario in the country has undergone a sea change. The main contributors to such transformations have been (i) availability of improved oilseeds production technology and its adoption, (ii) expansion of cultivated area, (iii) price support policy and (iv) institutional support, particularly establishment of technology mission on oilseeds in 1986 (Hegde, 2004). The improved technology packages were also found to be financially

attractive. Yet, adoption levels for several components of the improved technology were low, emphasizing the need for better dissemination (Kiresur *et al.*, 2001). Several biotic, abiotic and socio-economic constraints inhibit exploitation of the yield potential and these needs to be addressed. The state-wise yields obtained both under improved technology and farmers' practice ranges from 12 to 110% between states and the national average being 36%. The additional production that can be attained by exploiting the yield gap at national level is about 2 million tonnes (Kumar and Chauhan, 2005).

Budaun district has the sizeable area (21202 ha) under mustard cultivation with total production of 32822 metric tonnes, but the productivity level is low (1309 kg/ha) as compared to other states like Haryana (1738 kg/ha) during 2010-11 (Anonymous, 2012). Therefore, keeping the above point in view, the FLDs on mustard using integrated crop management technology was started with the objectives of showing the productive potentials of the new production technologies under real farm situation over the locally cultivated mustard crop.

Materials and Methods

The present study was carried out by the Krishi Vigyan Kendra, Ujhani (Budaun) under Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut during *rabi* season from 2008-09 to 2010-11 (03 years) at the farmers' fields of different villages of Budaun district in Mid Western Plain Zone of Uttar Pradesh. In total 36 frontline demonstrations in 15 ha area in different villages were conducted. Materials for the demonstrations with respect to FLDs and farmers' practices were given in Table 1. In case of farmers practice plots, existing practices being used by farmers were followed. In general, soils of the area under study were sandy loam in texture and medium to low in fertility status. The FLDs were conducted to study the gaps between the potential yield and demonstration yield, extension gap and technology index.

In the present evaluation study, the data on output of mustard cultivation were collected from FLD plots, besides the data on local practices commonly adopted by the farmers of this region were also collected. In demonstration plots, a few critical inputs in the form of quality seed, balanced fertilizers, agro-chemicals etc. were provided and non-monetary inputs like timely sowing in lines and timely weeding were performed. Whereas, in farmers practice traditional practices prevailing in the area were maintained. The demonstration farmers were facilitated by KVK scientists in performing field operations like sowing, spraying, weeding, harvesting etc. during the course of training and visits. The technologies demonstrated are mentioned in Table 1 and compared with local practices.

Table 1: Details of package of practices followed in the Front Line Demonstrations

S.No.	Inputs	Quatity per hactare	
		Demonstration	Farmers practice
1	Variety	Kranti	Kanti
2	Seed rate	05 kg	05 kg
3	Carbendazim	2 gm/kg seed	-
4	NPK (12:32:16)	150 kg	-
5	Di-ammonium phosphate (DAP)	-	100 kg
6	Urea	200 kg	150kg
7	Zinc Sulphate (21%)	20 kg	-
8	Sulphur	15 kg	-
9	Imidachloprid (17.8%)	125 ml	100 ml
10	Redomil	1.50 kg	-
11	Weeding	Use of Pendimethalin	Manual weeding

The technology gap, extension gap and technology index were calculated using the following formulae given by (Samui *et al*., 2000).

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - yield under existing practice

Technology index = {(Potential yield - Demonstration yield)/Potential yield} x 100

The satisfaction level of participating as well as neighbouring farmers' for the performance of improved variety demonstrated was also assessed. In all, 180 participating farmers' were selected to measure satisfaction level of farmers' for the performance of improved variety demonstrated. The selected respondents were interviewed personally with the help of a pre-tested and well structured interview schedule. Client Satisfaction Index was calculated as below.

Client satisfaction index = (Individual score obtained/ Maximum score possible) x 100

The data collected were tabulated and statistically analyzed to interpret the results. The economic-parameters (gross return, net return and C: B ratio) were worked out on the basis of prevailing market prices of inputs and Minimum Support Prices of outputs.

Results and Discussion

Mustard Yield

The data (Table 2) indicated that the frontline demonstration has given a good impact over the farming community of Budaun district as they were motivated by the new agricultural technologies applied in the demonstrations. Results of 36 frontline demonstrations indicated that the cultivation practices comprised under FLD *viz.*, use of improved variety (*Kranti*), balanced application of fertilizers (N:P:K@120:60:40 kg/ha with 20 kg $ZnSO_4$ & 15 kg S /ha), line sowing, timely weed management and control of mustard white rust & aphid through fungicide & insecticide, produced on an average 1884 kg/ha mustard yield, which was 23.92% higher compared to prevailing farmers practice (1519 kg/ha). Kumar and Yadav (2007) also reported that recommended dose of phosphorus and sulphur increase the yield and quality of Indian mustard.

Technology and Extension gap

The technology gap observed may be attributed to the dissimilarity in the soil fertility status and weather conditions. Hence, variety wise location specific recommendation appears to be necessary to minimize the technology gap for yield level in different situations. The extension gaps ranged from 290 to

413 kg/ha during the period of demonstration emphasized the need to educate the farmers through various means for the adoption of improved agricultural production technologies to reverse this trend of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinuance of old varieties with the new technology.

Technology index

The technology index shows the feasibility of the evolved technology at the farmers' fields. The lower the value of technology index more is the feasibility of the technology. The data (Table 2) showed that maximum technology index value 27.96% was noticed in the year 2010-11 followed by 22.73% in 2008-09 (22.73%) whereas, minimum value of technology index of 18.65% in the year 2009-10, it may be due to uneven & erratic rainfall and vagaries of weather conditions in the area. The findings of the present study are in line with the findings of Hiremath *et al.* (2007) and Dhaka *et al.* (2010).

Table 2: Yield performance of mustard under FLDs at farmers' field

Year	Yield (kg/ha)		% yield increase over FP	Technology gap (kg/ha)	Extension gap (kg/ha)	Technology index (%)
	Demonstration	Farmers practice				
2008-09	1893	1503	25.95	557	390	22.73
2009-10	1993	1580	26.14	457	413	18.65
2010-11	1765	1475	19.66	685	290	27.96
Average	1884	1519	23.92	566	364	23.12

Cost of cultivation, Gross and Net return

The economics (Cost of cultivation, gross & net return) of Rapeseed-mustard under front line demonstrations were estimated and the results have been presented in Table 3. The front line demonstrations recorded higher average gross returns (Rs. 34399/ha) and net return (Rs. 20943/ha) with higher cost: benefit ratio (2.56) compared to farmers practice.

Table 3: Economic performance of mustard under FLDs at farmers' field

Year	Cost of cultivation (Rs./ha)		Gross return (Rs./ha)		Net return (Rs./ha)	
	Demonstration	Farmers practice	Demonstration	Farmers practice	Demonstration	Farmers practice
2008-09	12557	10417	34074	27054	21517	16637
2009-10	13732	11427	36472	28914	22740	17487
2010-11	14080	12720	32653	27288	18573	14568
Average	13456	11521	34399	27752	20943	16231

Sell price of urdbean was Rs. 1800, 1830 and 1850 per quintal in 2008-09, 2009-10 and 2010-11, respectively.

Additional cost of cultivation, Return and C: B Ratio

Further, data (Table 4) shows that the average additional cost of cultivation (Rs. 1935/ha) under integrated crop management demonstrations and has yielded additional net returns of Rs. 4713 per hectare with incremental benefit cost ratio of 0.14. The results suggest that higher profitability and economic viability of mustard demonstrations under local agro-ecological situation. This might be due to higher production under FLDs as compared to the prevailing farmers practice in all the three years.

Table 4: Additional economic performance of mustard under FLDs at farmers' field

Year	Additional Cost of cultivation (Rs./ha) in Demonstration	Additional Return (Rs./ha) in Demonstration	C : B Ratio	
			Demonstration	Farmers practice
2008-09	2140	4880	2.71	2.60
2009-10	2305	5253	2.66	2.53
2010-11	1360	4005	2.32	2.15
Average	1935	4713	2.56	2.42

Farmer's satisfaction

The extent of satisfaction level of respondent farmers over performance of demonstrated technology was measured by Client Satisfaction Index (CSI) and results presented in Table 5. It is observed that majority of the respondent farmers expressed high (52.22%) to the medium (28.33%) level of satisfaction regarding the performance of FLDs, whereas, very few (19.44%) of respondents expressed lower level of satisfaction. The higher to medium level of satisfaction with respect to performance of demonstrated technology indicate stronger conviction, physical and mental involvement of in the frontline demonstrations which in turn would lead to higher adoption. The results are in close conformity with the results of Kumaran and Vijayaragavan (2005) and Dhaka *et al.* (2010).

Table 5: Extent of farmers satisfaction over performance of FLDs (n=180)

Satisfaction level	Number	Per cent
High	94	52.22
Medium	51	28.33
Low	35	19.44

Conclusion

It may be concluded that the frontline demonstrations on integrated crop management technology in mustard crop has found more productive, profitable and feasible in Mid Western Plain Zone of Uttar Pradesh as compared to prevailing farmers practice under real farm situations. Farmers were motivated by results of demonstrations of integrated crop management practices in mustard and they would adopt these technologies in the coming years. This will

substantially increase the income as well as the livelihood of the farming community.

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