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Impact of Cluster Frontline Demonstrations on Productivity and Profitability in Mustard

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ABSTRACT

Front line demonstration is an appropriate means for demonstration as well as transfer of improved agricultural innovations to the farming community. Under centrally sponsored schemes on oilseed production technology under NFSM schemes, KVK Maulasar conducted 728 demonstrations on mustard during *rabi*, 2015-16 to 2021-22. The critical inputs were identified in existing production technology through discussion with farmers and on the basis of soil sampling. Lack of plant protection measures were the predominant identified causes of low productivity of oilseed crop in district Nagaur. In the same sequence the other parameters like technological impact, economical impact and extension gap were analyzed for impact assessment of cluster front line demonstration (CFLDs) on mustard crop. The results of seven consecutive years study revealed that the average yield under demonstration plots was 17.8 q/ha as compared to 14.6 q/ha in farmer plots. The average technology gap, extension gap and technological index were found 481 kg/ha, 313 kg/ha and 20.20 percent, respectively. The results clearly indicate the positive effect of CFLDs over the existing practices. Benefit cost ratio was recorded to be higher under demonstration against control treatment during the years of experimentation.

Keywords Frontline demonstration, Economic analysis, Mustard, Technology, Yield gap.

INTRODUCTION

Mustard (*Brassica juncea* L.) is an important oilseed crop in India. Rapeseed- mustard is the major source of income specially even to the small and marginal farmers in rainfed areas because of its low water requirement (300-400 mm) so it fits well in the rainfed cropping system. Indian mustard *Brassica juncea* is predominantly cultivated in Rajasthan, UP Haryana, MP and Gujarat (Shekhawat *et al.* 2012). Its seed contain 35–40% oil and 16–22% protein content and high level of amino acids. The oil of mustard possesses a sizable amount of erucic acid (38–57%). Protein content in rapeseed and mustard normally range between 24–30% on the basis of whole seed basis and between 35–40% on the meal basis. But the

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Table 1. Yield performance, technology gap, extension gap and technology. Index of mustard under Farmers' Practice and cluster Frontline demonstration.

Conducted year	Crop	Variety	No. of Demos	Area (ha)	Potential of variety	Demonstrated plot	Local check plot	% Increased yield over local check	Technology gap (kg/ha)	Extension gap (kg/ha)	Technology index (%)
2015-16	Mustard	DRMR-2	33	16	18	16.7	13.50	23.70	130	320	7.2
2016-17	Mustard	NRCDR-2	40	20	20	17.6	16.0	10.19	240	160	12.0
2017-18	Mustard	NRCHB-101	30	12	20	17.5	15.5	12.90	250	200	12.5
2018-19	Mustard	Giriraj	75	30	25	19.1	14.0	36.42	590	510	23.6
2019-20	Mustard	Giriraj	300	120	25	18.1	14.3	25.87	690	380	27.6
2020-21	Mustard	RH-725	200	90	25	17.7	14.5	22.35	730	320	29.2
2021-22	Mustard	RH-725	50	20	25	17.6	14.6	20.54	740	300	29.6
			728	**308**	**Average**	**17.8**	**14.6**	**21.71**	**481**	**313**	**20.2**

presence of toxic glucosinolates in the mustard cake renders it unsuitable as a source of human protein and is at present as manure and as cattle feed. The leaves of young plants are used in human diet as a green vegetable. The oilseed Brassica usually contains 4.7–13% linolenic acid and 27% oleic acid and high nutritive value required for human health. The area, production and productivity of rapeseed mustard in the Rajasthan state was 2.6 million ha, 4.4 million tones and 1694 kg/ha, respectively (Commissionerate of agriculture, Rajasthan-Jaipur 2020-21).

The improved technology packages were also found to be financially attractive. Yet, adoption level of several components of improve technology were low, emphasizing the need for better dissemination. Keeping the above points in view the CFLDs on mustard using new crop production technology was started with the objectives of showing the productive potentials of the new production technology under real farm situation over the locally cultivated mustard crop and to know the varietal replacement of oilseed crops and its horizontal spread due to CFLDs.

MATERIALS AND METHODS

The present study was carried out in the Nagaur District which is located on the North-western part of Rajasthan state and lies at 27°20′N latitude and 73°74′E longitude with an altitude of 302 m above the mean sea level. Cluster frontline demonstrations were conducted during *rabi,* 2015-16 and 2021-22 with evaluation of the performance of Giriraj and RH-725, variety of mustard with other improved technologies in Maulasar, Nawan, Kuchaman, Didwana and Makrana block of the district. In this study, 728

Table 2. Economics of mustard under cluster frontline demonstrations.

	Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		Net return (Rs/ha)	
Conducted year	Demonstrated plot	Local check plot	Demonstrated plot	Local check plot	Demonstrated plot	Local check plot
2015-16	24573	19187	45820	30663	21247	11476
2016-17	26000	24800	65000	57600	39000	32800
2017-18	27000	24500	70000	54500	43000	35000
2018-19	28462	27366	84418	68667	55955	41300
2019-20	28767	27600	79542	63191	50775	35591
2020-21	29848	27700	91327	76150	61479	48450
2021-22	31669	29500	96587	81000	64918	51500
Average	**28046**	**25808**	**76099**	**61682**	**48053**	**36588**

farmers were selected from aforesaid block during consecutive years. All the technological intervention was taken as per prescribed package and practices for improved variety of mustard crop (Table 1). The grain yield, gap analysis, cost of cultivation, net returns and additional return parameters were recorded (Tables 2 and 3). Assessment of gap in adoption of recommended technology before laying out CFLD's through personal discussion with selected farmers. The training was organized for selection of farmer's and skilled development about detailed technological intervention with improved package and practice for successful mustard cultivation. Scientists visited regularly demonstrated fields and farmer's field also. The feedback information from the farmers was also recorded for further improvement in research and extension programs. The extension activities i.e. training, scientist's visits and field days were organized at the cluster frontline demonstration sites. The basic information were recorded from the farmer's field and analyzed to comparative performance of demonstrated plot and local check. Different parameters were calculated to find out technology gaps (Yadav *et al.* 2004).

Extension gap = Demonstrated yield- farmer's practice yield

Technology gap= Potential yield- Demonstration yield

Additional return= Demonstration return- farmer's practice return

$$\text{Technology index} = \frac{\text{Potential yield-Demonstration yield}}{\text{Potential yield}} \times 100$$

Detail of package and practices for mustard cultivation.

Sl. No.	Technological intervention	Farmer's practice	Recommended practice (CFLD's)
1.	Variety	Pioneer 45546, Pioneer 45542, Bio-902, Pusa	Giriraj, PM-26, PM-27, RH-406 NRCHB-101, NRCDR-2
2.	Seed rate	4-5 kg/ha	3.5-4.5 kg/ha
3.	Seed treatment	Seed treatment with carbondazim 2 g/kg seed	Metalaxyl 35 SD @ 6.0 g/kg+Imidacloprid 70 WS 5 g/kg seed and *Azotobacter+PSB* culture
4.	Soil treatment	No soil treatment	Soil treatment by Trichoderma spp. @ 2.5 kg/ha (mixed with 100 kg FYM)
5.	Spacing	No definite spacing	30×10 cm
6.	Time of sowing	Oct-Nov	Second fortnight of October
7.	Nutrient management	Imbalance use of fertilizers	Balanced use of fertilizers (60 kg N +30 kg P_2O_5 + 25 kg $ZnSO_4$/ha)
8.	Weed management	One hand weeding at 20-30 DAS	Use of oxadiargyl @ 90 g a.i. or pendimethalin 0.75 kg a.i/ha at 1-2 DAS + one hand weeding at 20-25 DAS
9.	Plant protection measures	Aphid- Dimethoate 30% EC @ 875 ml/ha White rust- Mancozeb @ 2 g/l of water	Aphid-Acetamprid 250 g/ha or Thiomethoxam 25 WG @ 100 g/ha or Imidacloprid @ 0.33 ml/l of water. White rust Metalaxyl 8% + Mancozeb 64% @ 2 g/l of water

RESULTS AND DISCUSSION

Yield performance

The performance of mustard crop owing to the adoption of improved technologies was assessed over a period of two years and is presented in Table 1. From the demonstration it observed that, the integrated crop management practice in mustard recorded 21.71% increase in the yield as compared to the farmers practice (14.6 q ha^{-1}) as against 17.8 q ha^{-1} in demonstration. The seed yield of demonstration plots was higher as compared to farmers practice due to high yielding variety and other integrated crop management practices. Similar yield enhancement in different crops

Table 3. Additional economic performance of mustard under cluster frontline demonstrations.

Conducted year	Additional cost in demo (Rs/ha)	Additional return in demo (Rs/ha)	BC Ratio	
			Demonstrated plot	Local check plot
2015-16	5386	15157	1.86	1.59
2016-17	1200	7400	2.50	2.32
2017-18	2500	15500	2.59	2.22
2018-19	1090	15750	2.96	2.50
2019-20	1167	16351	2.76	2.28
2020-21	2148	13029	3.06	2.75
2021-22	2169	13418	3.05	2.75
Average	**2237**	**13801**	**2.68**	**2.34**

in frontline demonstration has been documented by Balai *et al.* (2012) and Choudhary *et al.* (2018) and Kirar (2018). The results clearly indicated the positive effect of CFLDs over the existing practices toward enhancing the yield of mustard in the study area due to use of high yielding variety, timely sowing, INM, IWM, plant protection.

Extension gap, technology gap and Technology index

The average value for technology gap was 481 kg/ha which reflected the farmers cooperation. In carrying out such demonstrations with encouraging results in subsequent years. The technology gap observed may be attributed to the dissimilarity in soil fertility status and weather conditions.

The average extension gap of 313 kg/ha was recorded in mustard (Table 1). This emphasized the need to educate the farmers through various means for the adoption of improved agricultural production to reverse the trend of wide extension gap.

The technology index showed the feasibility of the evolved technology at the farmer's fields and the lower is the value of technology index, more the feasibility of the technology demonstrated as such lower value of index 20.20% exhibited the feasibility of technology demonstrated. The results of the present study are in consonance with the finding Ahmad *et al.* (2013), Kirar (2018) and Singh *et al.* (2019).

Economics

The economic analysis of the data (Table 2) during *rabi*, 2015-16 and 202.1-22 were revealed that mustard under cluster front line demonstrations recorded average gross returns (Rs 76099 ha^{-1}), net returns (Rs 48053 ha^{-1}) and B:C ratio (2.68) as compared to the local check where farmers got gross returns, net returns and B:C ratio of Rs 61682 and 36588 ha^{-1} and 2.34, respectively during 2015-16 and 20121-22. The additional returns in demonstration plot were Rs.13801 ha^{-1} over the local check (Table 3). The findings of the present study are in line with the findings of Choudhary *et al*. (2018) and Kirar (2018).

CONCLUSION

From the findings of present study, it can be concluded that use of latest technologies of mustard cultivation can reduce the technology gap to a considerable extent resulting in to increased productivity of mustard in the district. It requires collaborative extension efforts to enhance adoption level of location and crop specific technologies among of the farmers for bridging these gaps. Therefore, extension agencies in the district need provide proper technical support to the farmers through various education and extension methods for better mustard production in the district.

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