RESEARCH ARTICLE

ROLE OF CLUSTER FRONT LINE DEMONSTRATIONS ON YIELD AND ECONOMICS OF MUSTARD (*BRASSICA JUNCEA* L.) IN NAGAUR DISTRICT OF RAJASTHAN

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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 478 demonstrations on different variety of mustard during *Rabi*, 2015-16 to 2019-20. 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 frontline demonstrations (CFLDs) on mustard crop. The results of five consecutive years study revealed that the average yield under demonstration plots was obtained 17.18 q/ha as compared to 14.66 q/ha in farmer plots. The average technology gap, extension gap & technological index were found 318 kg/ha, 312 kg/ha and 14.35 percent, respectively. Further, data showed that the average additional cost of cultivation (Rs. 2269/ha) under integrated crop management demonstrations and has fetched additional net returns of Rs. 14031 per hectare with incremental benefit: cost ratio of 0.35. The results clearly indicate the positive effect of CFLDs over the existing practices.

Keywords: Economic analysis, Extension gap, Technology gap, Technology index, Yield

INTRODUCTION

Mustard (*Brassica juncea* L.) is an important oilseed crop in India. Rapeseed- mustard is the major source of income especially even to the small and marginal farmers in rainfed areas because of its low water requirement (80-240mm) so it fits well in the rainfed cropping system. Indian mustard *Brassica juncea* is predominantly cultivated in Rajasthan, U.P. Haryana, M.P. 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 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 2.7 million ha, 4.8 million tonnes and 1740 kg/ha, respectively (Commissionerate of Agriculture, Rajasthan-Jaipur, 2018-19).

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 to 2019-20 at the farmers fields of different villages of Nagaur district in Transitional plain of Inland drainage zone of Rajasthan. In this study, 478 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 (Table 2 and 3). Assessment of gap in adoption of recommended technology was done 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.

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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 programmes. 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

Technology index =

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

Table 1. Detail of package and practices for mustard cultivation

S. No.	Technological intervention	Farmer's practice	Recommended Practice (CFLD's)
1.	Variety	Pioneer 45S46, Pioneer 45S42, Bio-902	Giriraj, DRMR-2, NRCHB-101, NRCDR-2, RH-406
2.	Seed rate (kg/ha)	4-5	3.5-4.5
3.	Seed treatment	Seed treatment with carbendazim 2g/kg seed	Metalaxyl 35 SD @ 6.0 g/kg+ Imidacloprid 70 WS 5 g/kg seed and *Azotobacter+PSB* culture@ 20 g/kg seed
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	30x10 cm
6.	Time of Sowing	October-November	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 25-30 DAS
9.	Plant protection measures	Aphid- Dimethoate 30% E.C. @ 875 ml/ha White rust- Mancozeb @ 1.0kg/ha.	Aphid-Dimethoate 30 E.C. @ 875 ml/ha or Thiomethoxam 25 WG @ 100 g/ha or Imidacloprid @ 150 ml/ha. White rust-Metalaxyl 8%+ Mancozeb 64% @ 1.0 kg/ha.

RESULTS AND DISCUSSION

Yield performance

The performance of mustard crop owing to the adoption of improved technologies was assessed over a period of five years and is presented in Table 2. Results of 478 cluster front line demonstrations showed that, the integrated crop management practice in mustard recorded 21.81 per cent increase in the average yield as compared to the farmers practice (14.66 q/ha). 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 in front line demonstration has been documented by Balai *et al.* (2012), Choudhary *et al.*(2018), Choudhary *et al.*(2020) and Kirar *et al.* (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 etc.

Table 2. Yield performance, technology gap, extension gap and technology index of mustard under Farmers' Practice and Cluster Front Line Demonstrations

CFLD conducted year	Area (ha)	No. of Demonstrations	Variety	Demonstrated plot yield (q/ha)	Farmer's Practice yield (q/ha)	Yield increased over local check (%)	Technology gap (kg/ha)	Extension gap (kg/ha)	Technology Index (%)
2015-16	16	33	DRMR-2	16.70	13.50	23.70	150	320	8.24

2016-17	20	40	NRCDR-2	17.63	16.0	10.19	150	160	7.85
2017-18	12	30	NRCHB-101	17.5	15.5	12.90	200	200	10.25
2018-19	30	75	Giriraj	19.1	14.0	36.42	490	510	20.41
2019-20	120	300	Giriraj	18.05	14.3	25.87	600	370	25.0
Total	**198**	**478**	**Average**	**17.80**	**14.66**	**21.82**	**318**	**312**	**14.35**

Table 3. Economics of mustard under cluster frontline demonstrations and Farmer's practice

CFLD Conducted year	Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		Net Return (Rs/ha)	
	Demonstration	Farmer's Practice	Demonstration	Farmer's Practice	Demonstration	Farmer's Practice
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
Average	**26960**	**24691**	**68956**	**54924**	**41995**	**31233**

Table 4. Additional economic performance of mustard under cluster frontline demonstrations

Conducted year	Additional cost in demonstrations (Rs./ha)	Additional return from demonstrations (Rs./ha)	B:C Ratio in demonstrations (Rs./ha)	B:C Ratio in Farmer's Practice
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
Average	**2269**	**14031**	**2.53**	**2.18**

Table 5. Extent of farmers satisfaction over performance of cluster frontline demonstrations (n=478)

Satisfaction level	Number	Percent
High	235	49.16
Medium	163	34.10
Low	80	16.74

Extension gap, Technology gap and Technology index-

The average value for technology gap was 318 kg/ha which reflected the farmer's 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 312 kg/ha was recorded in mustard. 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 14.35 percent exhibited the feasibility of technology demonstrated. The results of the present study are in consonance with the findings of Ahmad *et al*., (2013), Kirar *et al.,* (2018) and Singh *et al.,* (2019).

Economic performance-

The economics of the data regarding cost of cultivation, gross return, net return, additional cost, additional return and benefit: cost ratio were analyzed and presented in Table- 3 and 4.

Cost of cultivation, Gross and Net returns-

The economic analysis of the data (Table-3) during rabi, 2015-16 to 2019-20 were revealed that mustard under cluster front line demonstrations recorded higher average cost of cultivation (Rs. 26960), gross return (Rs. 68956) and net returns (Rs. 41995) per hectare as compared to the local check where farmers invest average Rs. 24691/ha on cost of cultivation and got average gross and net returns of Rs. 54924 and 31233 per hectare, respectively. The findings of the present study are in line with the findings of Choudhary *et al.,* (2018) and Kirar *et al.,* (2018).

Additional Cost of cultivation, Return and B: C Ratio-

Further, data (Table 4) shows that the average additional cost of cultivation (Rs. 2269 /ha) under integrated crop management demonstrations and has yielded additional net returns of Rs. 14031 per

hectare with incremental benefit: cost ratio of 0.35. The results suggested that higher profitability and economic viability of mustard demonstrations under local agro-ecological situation. This might be due to higher production under CFLDs as compared to the prevailing farmers practice in all the years.

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 (49.16%) to the medium (34.10%) level of satisfaction regarding the performance of CFLDs, whereas, very few (16.74%) 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 front line demonstrations which in turn would lead to higher adoption. The results are in close conformity with the results of Dhaka *et al.* (2010).

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 area. 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 area need provide proper technical support to the farmers through various education and extension methods for better mustard production in the area.

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