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RESEARCH ARTICLE

EFFECT OF CLUSTER FRONT LINE DEMONSTRATIONS ON ENHANCEMENT OF YIELD AND ECONOMICS OF MUSTARD CULTIVATION IN DIDWANA-KUCHAMAN DISTRICT OF RAJASTHAN

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Abstract: Under centrally sponsored programme on oilseed production technology under NFSM schemes, KVK Maulasar conducted 815demonstrations on different varietyof mustard during *Rabi*, 2016-17 to 2023-24. 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 Didwana-Kuchaman of Rajasthan. 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 eight consecutive years study revealed that the average yield under demonstration plots was obtained 17.26 q/ha as compared to 14.63 q/ha in farmer plots with average 18.10 % increase in yield. The average technology gap, extension gap & technological index were found 636 kg/ha, 264 kg/ha and 26.93 percent, respectively. Further, data showed that the average additional cost of cultivation (Rs. 2011/ha) under integrated crop management demonstrations and has fetched additional net returns of Rs. 10896 per hectare with incremental benefit: cost ratio of 0.26. The results clearly indicate the positive effect of CFLDs over the existing practices.

Keywords: Economic analysis, Extension gap, Frontline demonstration, Mustard, 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. 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. 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.

Indian mustard *Brassica juncea*is predominantly cultivated in Rajasthan, U.P. Haryana, M.P. and Gujarat [7].Rajasthan is the undisputed mustard powerhouse of India, contributing over 40-45 per cent of the country's total output. The state cultivated4.55 million hectares of mustard, yielding 6.68 million tonnes of produce with average productivity of 1468 kg/ha during the year 2022-23 [1].

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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 FLDs 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 FLDs.

MATERIALS AND METHODS

The present study was carried out in the Didwana-Kuchaman district which is a part of Nagaur district and 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 consecutiverabi seasons from 2016-17 to 2023-24at the farmers fields of different villages of Didwana-Kuchaman district in Transitional plain of Inland drainage zone of Rajasthan. In this study, total815 farmers were selected from aforesaid block during consecutive

years and cluster front line demonstrations were conducted on total 332 ha area. All the technological intervention was taken as per prescribed package and practices for improved varieties of mustard crop (Table 1). The grain yield, cost of cultivation, net returns and additional return parameters were recorded (Tables 2-4). Assessment of gap in adoption of recommended technology was done before laying out FLD'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 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. The technology gap, extension gap and technology index were calculated using the following formulae given by [8].

Extension gap = Demonstrated yield- Farmer's practice yield

Technology gap= Potential yield- Demonstration yield

Additional return= Demonstration return- farmer's practice return

Technology index=

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

The satisfaction level of partner farmers for the performance of improved technology demonstrated was also assessed. In all, 815 partner farmers were selected to measure satisfaction level of farmers for the performance of improved technological package demonstrated. The selected respondents were interviewed personally with the help of a pre-tested and well structured interview schedule and Client Satisfaction Index was calculated as below.

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

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

Table1. Detail of package and practices for mustard cultivation

S. No.	Technological intervention	Farmer's practice	Recommended Practice (FLD's)
1.	Variety	Bio-902, PM-26, PM-28, Pioneer 45S46, Pioneer 45S42,	NRCHB-101, NRCDR-2, DRMRIJ-31, RH-725, DRMR 1165-40
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	30x10 cm	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 @1.0 kg/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.

Table 2. Effect of Front Line Demonstrations on seed yield of mustard

FLD Conducted year	Area (ha)	No. of Demonstrations	Variety	Demonstrated plot yield (q/ha)	Local Check plot yield (q/ha)	Yield increased over local check (%)
2016-17	30	60	NRCDR-02	17.63	16.00	10.19
2017-18	12	30	NRCHB-101	17.51	15.50	12.97
2018-19	30	75	DRMRIJ-31	19.10	15.75	21.27
2019-20	120	300	DRMRIJ-31	18.00	14.30	25.87
2020-21	80	200	RH-725	17.70	14.50	22.07
2021-22	20	50	RH-725	17.60	14.60	20.55
2022-23	20	50	DRMR 1165-40	15.17	13.07	16.07
2023-24	20	50	DRMR 1165-40	15.40	13.30	15.79
Total	**332**	**815**	**Average**	**17.26**	**14.63**	**18.10**

Table 3. Effect of Front Line Demonstrations on Economics of mustard cultivation

FLD	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
2016-17	24200	22732	64297	58352	40097	35620
2017-18	25500	24080	71437	63237	45937	39157
2018-19	27600	25300	85874	70812	58274	45512
2019-20	28100	26550	85644	68039	57544	41489
2020-21	29650	27500	88810	72754	59160	45254
2021-22	30400	28200	92268	76541	61868	48341
2022-23	31950	29600	85619	73767	53669	44167
2023-24	34750	32100	93909	81103	59159	49003
Average	**29019**	**27008**	**83482**	**70576**	**54463**	**43568**

Table 4. Effect of Front Line Demonstrations on Additional economic performance of mustard

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 Local Check plot
2016-17	1468	4477	2.66	2.57
2017-18	1420	6780	2.80	2.63
2018-19	2300	12762	3.11	2.80
2019-20	1550	16055	3.05	2.56
2020-21	2150	13906	3.00	2.65
2021-22	2200	13528	3.04	2.71
2022-23	2350	9502	2.68	2.49
2023-24	2650	10156	2.70	2.53
Average	**2011**	**10896**	**2.88**	**2.62**

RESULTS AND DISCUSSION

Effect on yield of mustard:

The performance of mustard crop owing to the adoption of improved technologies was assessed over a period of eight years and is presented in Table 2. Results of 815 cluster front line demonstrations showed that, the integrated crop management practice in mustard recorded 18.10 per cent increase in the average yield as compared to the farmers practice (14.63 q/ha). The seed yield of demonstration plots was higher as compared to farmers practice due to high yielding varieties grown under 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), 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 varieties, timely sowing, INM, IWM, plant protection etc.

Effect on Extension gap, Technology gap and Technology index:

The data on extension gap, technology gap andtechnology index are presented in Figure-1. The average extension gap of 2.64q/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 average value for technology gap was 6.36q/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 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 26.93 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).

Effect on 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) revealed that mustard under cluster front line demonstrations recorded average cost of cultivation (Rs. 29019), gross return (Rs. 83482) and net returns (Rs. 54463) per hectare, which was 7.45, 18.29 and 25.01 per cent higher as compared to the local check, respectively. The findings of the present study are in line with the findings of Choudhary *et al.,* (2018) and Kirar *et al.,* (2018).

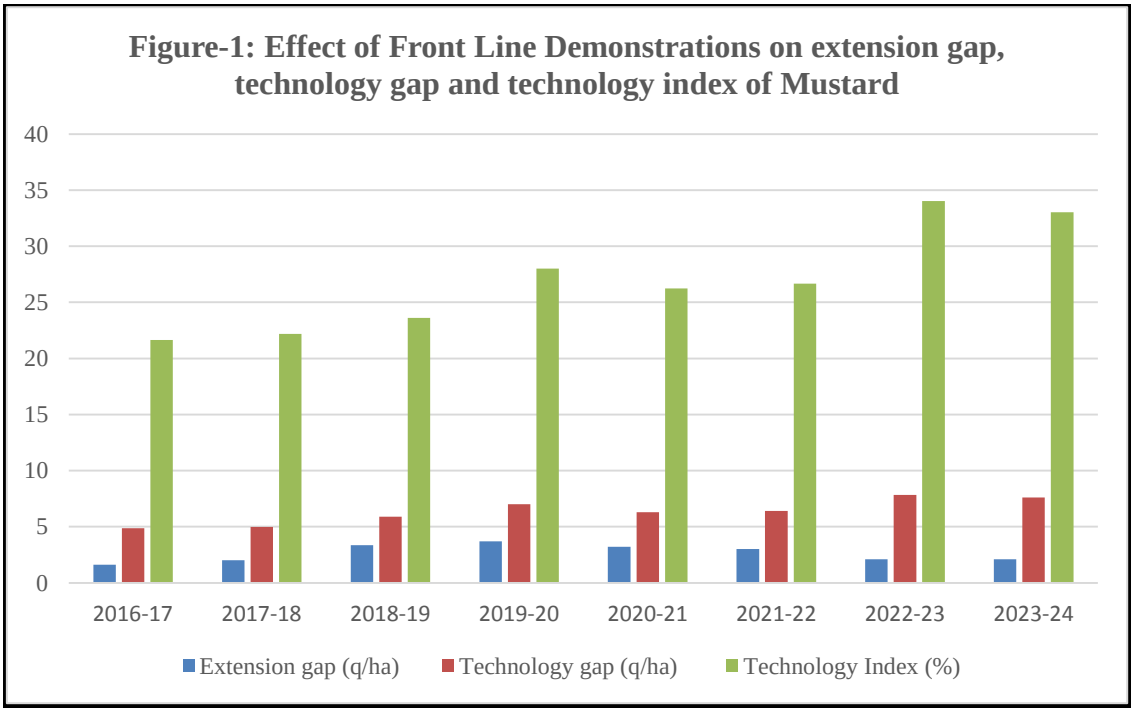
Additional Cost of cultivation, Return and B: C Ratio:

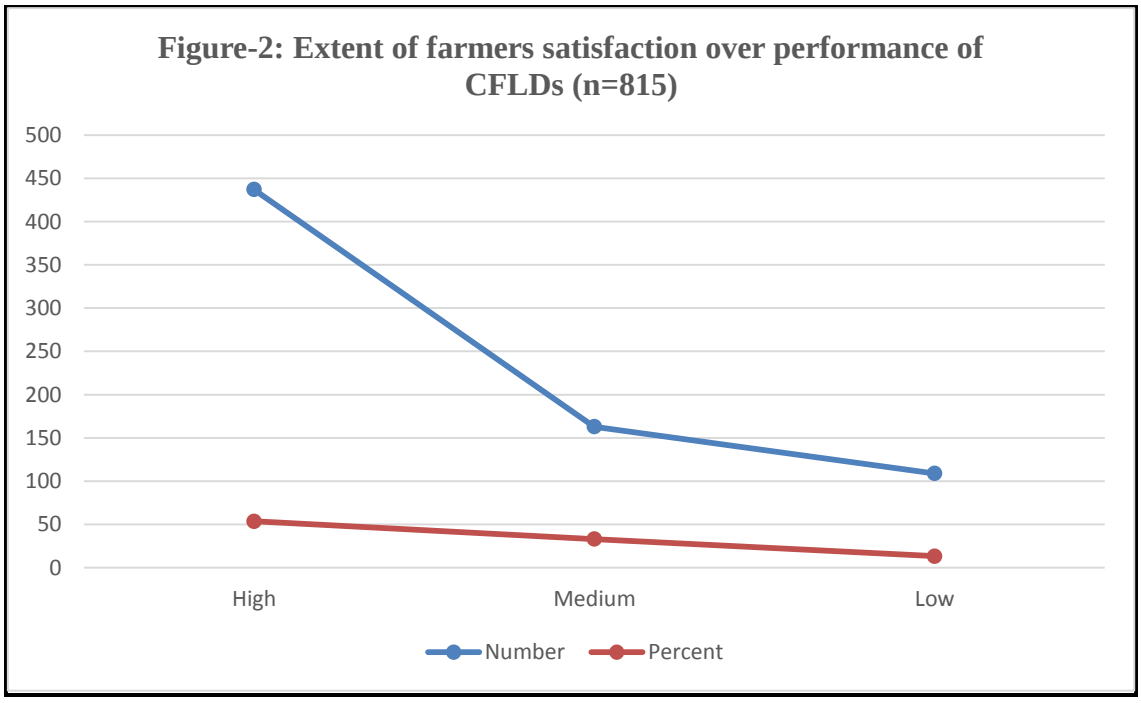
Further, data (Table 4) shows that the average additional cost of cultivation (Rs. 2011/ha) under integrated crop management demonstrations and has yielded additional net returns of Rs. 10896 per hectare with incremental benefit: cost ratio of 0.26.

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 Figure-2. It is observed that majority of the respondent farmers expressed high (53.62%) to the medium (33.01%) level of satisfaction regarding the performance of CFLDs, whereas, very few (13.37%) 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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