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Assessment of Cluster Front-line Demonstration on the Yield and Gap Analysis of Mustard (*Brassica juncea* L.) in Sirohi District of Rajasthan

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ABSTRACT: Present study assessed the performance of cluster front-line demonstration on mustard through improved varieties, seed inoculation, application of sulphur, disease and pest management on production and productivity. Cluster front-line demonstration were conducted during 2018-19 to 2020-21 in integrated crop management mode. KVK demonstrated the RGN-229 and DRMRIJ-31 (Giriraj) variety of mustard in Sirohi district. The result showed that under CFLD's, the average yield of mustard were 18.13, 21.72, and 21.90 qha^{-1} as compare to 14.64, 16.90 and 16.98qha^{-1} recorded, average yield increase of 23.83, 28.52 and 28.97 per cent, and additional return of 17472, 21162 and 20656 rupees per hectare, respectively. The identified technology gaps are due to different soil fertility status, weather conditions and climate vulnerability. Cluster front line demonstration is a project sanction under National Mission on Oilseeds and Oil Palm (Mini Mission-I) for reducing the wide gap of oilseed distribution. The project is implemented through eight zones of ATARI, ICAR. However, the adoption integrated crop management practices could reduce the extension gap in mustard. Therefore, the results revealed that the use of integrated crop management practices with scientific intervention contribute to enhance the production and productivity of oilseed in Sirohi district.

Keywords: Cluster front-line demonstration, Mustard, DRMRIJ-31, RGN-229, Yield.

INTRODUCTION

Indian mustard [*Brassica juncea* (L) Czern. & Coss.] is the second major oilseed after soybean covers nearly 25% of the total oilseeds production in the country. Indian mustard is grown on 6.23 million hectares, yielding 9.34 million tones with an average productivity of 1499 kg per hectare (GOI, 2019-20). The major growing states are Rajasthan, Uttar Pradesh, Haryana, West Bengal, Madhya Pradesh, Gujarat, and Assam, accounting for 92% of total production. As per USDA, (2016), India has become the leading rapeseed mustard growing country with 21.6% production globally. Rajasthan is the leading state particularly in Indian mustard production contributing about 45 per cent of the India, with an annual output of 3.40 million tonne and average productivity of 1558 kg/ha. It is grown on 2.18 million ha. It has a yearly output of 3.40 million tone and as an average of 1558 kg/ha (Anonymous, 2019-20). Indian mustard is important oilseed crop and determinant of agricultural economy of the country. However, productivity is less due to unawareness of farmers about integrated crop management of oilseed crops. Frontline demonstrations are important to establish its production potentials on the farmer's fields by dissemination transfer of technology. Indian mustard is an important oilseed crop of India. It contributes more than 80 percent of the total rapeseed-mustard production in India (Meena, 2014). However, variations in production are due to weather variations, monsoon failing, low adoption of improved varieties, plant production measures, weed management practices, nutrient management, and inadequate knowledge of farmers knowledge. In Rajasthan under CFLD, during last years observed that mustard yield significantly increases (Meena *et al*., 2021). This crop grants higher income with low cost of cultivation and less water requirement, so it has good potential to increase the availability of edible oil from the domestic production. The oil quality and also its wide adapt varied conditions, the area, production and yield of rapeseed-mustard have been fluctuating due to various stresses (biotic and abiotic). In Brassica breeding programme is one of the most important objectives for improvement of seed quality. High yielding new varieties are also imperative to meet potential edible oil requirement of

the country which is still increasing due to increase in population, increase in per capita consumption and slow increase in local production of oilseed crops (Shengwu *et al*., 2003). For assessment, refinements and dissemination of proven technologies under different agro-climatic conditions KVK are important organization for technology application (Das, 2007). Cluster front line demonstrations were conducted on mustard (RGN-229 and DRMRIJ-31) during 2018-19, 2019-20 and 2020-21 with spreading the technology in the district, establish high production potentials at the field of farmer, adoption assessment, gap in yield and feedback information recorded from farmer's for further improvement in the research and extension programme. In an effort to reduce the existing wide gap in the demand supply chain of oilseeds. The project is implemented through eight zones of ICAR ATARI (Meena *et al.,* 2017). CFLD's in Rajasthan implemented by ICAR-Agricultural Technology Application Research Institute, Zone-II, Jodhpur.

MATERIALS AND METHOD

The study was carried out in the Sirohi district is situated in south west of Rajasthan between parallels of 24°21′ and 25°17′ North latitudes and 72°16′ and 73°10′ East longitudes. This district occupies prominent place in the agro- climatic zone IIb *i.e*. 'Transitional Plain of Luni Basin" comprising three blocks of the district *viz*. Sheoganj, Reodar and Sirohi and Zone IV A *i.e*. "Sub Humid southern Plain and Aravali Hills comprising two blocks *viz*. Pindwara and Aburoad. Cluster frontline demonstrations (CFLD's) were conducted during 2018-19, 2019-20 and 2020-21 with evaluation the performance of integrated crop management in mustard in Sheoganj, Reodar, Sirohi, Aburoad and Pindwara tehsils of the Sirohi. In this assessment, 400 farmer's were selected from previously mentioned block's during successive years under frontline demonstration of mustard. Inputs were taken as per prescribed package and practices for integrated crop management of mustard crop (Table 1). The Yield, gap analysis, cost of input, net return and additional gain parameters were documented (Table 2 and 3).

Before laying out the cluster frontline demonstrations, gap assessment in adoption of recommended technology was done. The training programme was organized for farmer's selection and development of skill about technological intervention for successful mustard cultivation. Farmer's field were visited regularly cluster frontline demonstrations fields by subject matter specialists. The farmer's feedback information was also recorded. The extension activities i.e. Training programme, kisan goshthi and field days were organized at the cluster frontline demonstrations villages. The information were computed from the farmer's farm and analyzed to comparative performance of frontline demonstrations and farmer's practice. To find out gaps, different parameters were calculated by following formula (Singh *et al*., 2018).

Extension gap = yield of demonstration – Yield of Farmers' practice

Technology gap = Potential yield- yield of demonstration

Additional return = Demonstration return – Farmers practice return

Technology index =

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

Table 1: Package and practices for ICM in mustard.

Component	Recommended Practices	Farmers Practices
Variety	RGN-229, NRCHB-101, DRMRIJ-31	Existing/Old recommended cultivar
Seed rate	5 kg ha^{-1}	6 kg ha^{-1}
Seed inoculation	Mancozeb @ 2.5 g kg^{-1}	No seed treatment
Soil inoculation	*Trichoderma viride* @ 5 kg ha^{-1}along with vermicompost	No soil inoculation
Plant geometry	30 cm × 10 cm	Broadcasting
Fertilizer dose	Balance fertilizer dose as per soil test report (60 kg N:40 kg P:40 kg S)	Imbalance use of fertilizer
Water management	Water management at critical stages (Branching, flowering and siliqua formation)	Water stress during critical stages
Plant protection	Seed and soil inoculation with bio fungicide (*T. viridae*), Yellow sticky trap @ 40/ ha, Use of 2.5 kg water soluble sulphur for powdery mildew management and Acetamiprid 20% SP 100 gm/ha for aphid management	No judicious use of insecticide and fungicide

Table 2: Grain yield and gap analysis of cluster front line demonstrations on mustard.

Year	Crop	Variety	Area (ha)	No. of Demo.	Average Yield (Ha)		% increase over FP	Technology Gap q/ha	Extension Gap q/ha	Technology Index (%)
					RP	FP				
2018-19	Mustard	NRCHB-101	30	75	18.13	14.64	23.83	1.87	3.49	9.35
2019-20	Mustard	DRMRIJ-31	50	125	21.72	16.90	28.52	3.28	4.82	13.12
2020-21	Mustard	DRMRIJ-31	167.5	250	21.90	16.98	28.97	3.1	5.19	12.4

Table 3: Economic analysis of cluster front line demonstrations on mustard.

Year	Gross return (Rs ha^{-1})		Cost of cultivation (Rs ha^{-1})		Net return (Rs ha^{-1})		Additional gain (Rs ha^{-1})
	Demonstration	Farmers Practice	Demonstration	Farmers Practice	Demonstration	Farmers Practice	
2018-19	85176	67704	22118	20613	63058	47091	17472
2019-20	95318	74156	23100	21200	72218	52956	21162
2020-21	94607	73951	23710	21805	70897	52146	20656

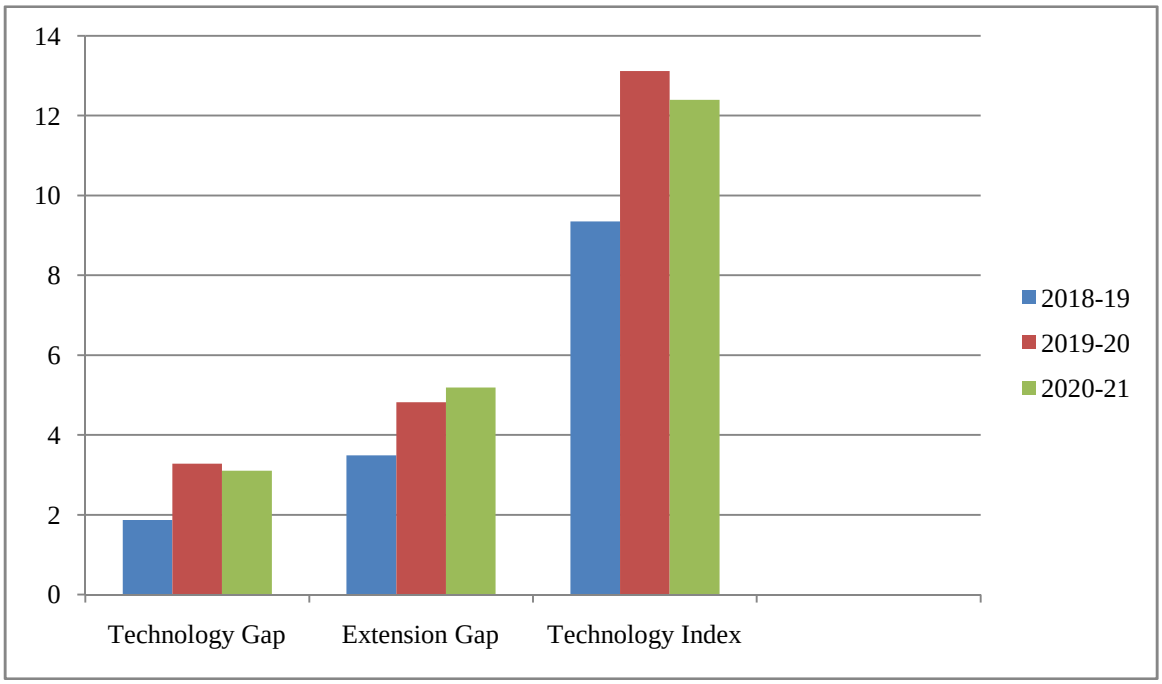

Fig. 1. Technology gap, Extension gap and Technology index of CFLD Mustard.

RESULTS AND DISCUSSION

The integrated crop management is more important with technological intervention for productivity and profitability of oilseeds. Detailed package and practices with technological intervention for recommended practice (Table 1). Sulphur is an important nutrient for oilseed crops and it is recommended that farmer's use single super phosphate fertilizers to meet the requirement of both phosphorus and sulphur in mustard. It was found that farmer's use inadvisable insecticides and mostly farmer's didn't use fungicides for seed inoculation. Similar observations were reported by Gurdarshan *et al*. (2011).

A. Grain Yield

The grain yield of demonstrated field's and farmer's practice is presented in Table 2. Data showed that the average grain yield was higher in demonstration as compare to farmers field in all tehsils of Sirohi district. The results showed that average yield of mustard under cluster frontline demonstrations in 2018-19, 2019-20 and 2020-21 were 18.13, 21.72 and 21.90 q ha^{-1} as compare to 14.64, 16.90 and 16.98 q ha^{-1} recorded in farmer's practice, average yield increase of 23.83,

28.52 and 28.97 per cent, and additional return of 17472, 21162 and 20656 qha^{-1}, respectively. The average yield of mustard ranged from 21.40-23.30 qha^{-1} as compared to 14.85-16.25 qha^{-1} of existing variety in all tehsils indicating suitability of variety and farming system of district. The similar findings of other workers (Singh *et al*., 2007, Singh *et al.,* 2011, Jain *et al*., 2020). The better yield of CFLD's field may be due to awareness and adoption of package and practices accordingly (Table 1). Sharma (2014) also found that the yield levels under frontline demonstration were always higher than farmers' practices. The results revealed that extension gap ranged from 3.49-5.19 qha^{-1} in blocks of Sirohi district which indicated that farmer's should be aware for adoption of improved production technology in mustard. Vittal *et al*. (2004) also supported that frontline demonstrations is better than farmer practices. Technology gaps were also recorded of each blocks and these ranged from 1.87-3.10 qha^{-1}. Due to different status of soil fertility these gaps may be attributed. Similarly technology index were ranged 9.35-12.4 per cent. The results revealed that additional return of mustard under cluster frontline demonstrations were ranged 17472-21162 Rs. ha^{-1} of Sirohi district. However, the adoption levels for the improved technology in oilseeds necessitate the need for better dissemination (Kiresur *et al*., 2001). Singh *et al*. (2018) also supported that frontline demonstrations is better than farmer practices To attain self sufficiency in oilseeds and for enhance the farmers income popularization of front line demonstration is the need of time. Sangwan *et al*. (2021) also revealed that FLDs showed positive effects of production and protection technologies in mustard crop.

B. Economics analysis

Cluster frontline demonstration on mustard economic analysis revealed that the total return from recommended practice (CFLD's) in 2018-19, 2019-20 and 2020-21 were 85176, 95318 and 94607 Rs. ha^{-1} as compared to 67704, 74156 and 73951 Rs. ha^{-1} in farmer's practice, respectively. The net returns ranged from 63058-72218 Rs. ha^{-1} in demonstration in comparison to 47091-52956 Rs ha^{-1} in farmer's practice. It was economically observed that additional income ranged from 17472-21162 Rs. ha^{-1} in recommended practice proved beneficial in respect of yield and economics of mustard in successive years of Sirohi District in Rajasthan Plains.

CONCLUSION

The study showed that integrated crop management of mustard gave high yield and net returns in demonstration practice than farmers practice in all tehsils of Sirohi district. The highest grain yield was attributed to higher potential with improved seed, proper sowing techniques and integrated management of nutrient, weed, disease, pest in accordance of package and practice. Economic analysis of different parameter's revealed that net returns and additional gain were recorded highest with Demonstration practice. The study was concluded that Integrated crop management of mustard in demonstration practice proved beneficial in respect of yield, economics and gap analysis of mustard as compare to farmers practice. But additional extension work is required to reduce the gap between demand and supply as well as area under mustard crop.

FUTURE SCOPE

The demonstrated techniques also found cost effective, profitable and acceptable among farming community. It has been observed that potential yield can be achieved by imparting scientific knowledge, demonstrating the need- based inputs and their proper application. The concept of frontline demonstration may be applied to all farmer categories including progressive farmers for speedy and wider dissemination of the recommended practices to other members of the farming community. Technological and extension gaps in mustard productivity can be bridged by popularizing improved package of practices with emphasis on improved variety seed, seed treatment, inclusion of zinc and sulphur in fertilizers, weed management practices and proper insect-pest management techniques.

Conflict of Interest. None.

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