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IMPACT OF FRONT LINE DEMONSTRATIONS ON MUSTARD PRODUCTION AND PROFITABILITY IN SRI GANGANAGAR DISTRICT OF RAJASTHAN, INDIA

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ABSTRACT
Krishi Vigyan Kendra, Sri Ganganagar conducted 500 front line demonstration in area of 200 hectare on mustard variety *i.e.* RGN-48, RGN-229, RGN-298 and Giriraj during seven consecutive years from 2013-14 to 2019-20 at the farmer's fields of operational area of KVK. The farmer selection was done on the basis of Participatory Rural Appraisal (PRA) action plan. The findings of seven years front line demonstrations revealed that improved mustard varieties with full package under demonstration had significant impact on seed yield (16.70 q/ha) as compared to local check (14.29 q/ha) varieties used by farmers. Further, mean results of the study revealed that average additional yield (241 kg/ha), yield increase (16.31%), net monetary return (₹ 37380), additional returns (₹ 9443), effective gain (₹ 7101) and benefit: cost ratio (2.51) from one hectare was obtained under demonstration plots as compared to farmer practices. The average technology gap, extension gap and technology index were found to be 4.44 q/ha, 2.41q/ha and 20.83%, respectively. The results clearly indicate the positive effects of frontline demonstrations (FLDs) over the local check practices. It may be concluded that adoption of improved production technologies of mustard can reduce the technology gap to a considerable extent thus leading to increased productivity and also found productive, economic viable and also feasible to local conditions as compared to existing farmer practices.

KEY WORDS: Front line demonstration, Mustard, Improved practice.

INTRODUCTION

India holds a premier position in rapeseed-mustard economy of the world with 2nd and 3rd rank in area and production, respectively. This crop can cultivated both irrigated and rainfed condition and fetches higher market value, thus add to the rural economy of small and marginal farmers. Mustard is a major rabi oilseed crop of the country cultivated 6.8 million hectare area with production of 8.32 million tons and its average productivity is 1397 kg/ha (Anonymous, 2018). In Rajasthan, it is grown in 2.76 mha with production of 4.81 Mt and with average productivity of 1740 kg/ha**.** But in Sriganganagar district total production of *rabi* mustard was 553173mt from the area of 247699 hectare with productivity of 2233 kg/ha during 2018-19 (Anonymous (2018-19). Mustard is rich source of fat and edible oil content (37-49%) has various use for human and animals.

Survey of technology adoption of package of practice of mustard crop in Sriganganagar district of Rajasthan, indicated that there was either by lack of adoption or partial adoption of improved practices resulting lower productivity level as compare to their potential yield level. To convince the mustard grower on effectiveness of improved mustard production technology and to motivate them for adoption, front line demonstration conducted to demonstrate the potential of improved practice and farmer practice under real farm situations. Front line demonstration is an applied approach to accelerate the dissemination of proven technologies at farmer field in participatory mode with an objective to explore the maximum available resource of crop production and also to bridge the productivity gap by enhancing production in national basket. The main emphasis was to maximize production per unit area by using high yielding improved varieties of mustard in conjunction with other interventions. Keeping this in view the Krishi Vigyan Kendra, Sriganganagar have conducted cluster front line demonstrations (CFLDs) under National Food Security Mission on Oilseed (NFSM) funded by government of India.

METHODOLOGY

Front line demonstrations (FLDs) on mustard were conducted in cluster mode (group of villages) at farmers' fields in the close supervision of scientists. As per the agro climatic zones of Rajasthan, Sriganganagar district comes under Irrigated North Western Plain Zone-1b. Mustard varieties *i.e.* RGN-48, RGN-229, RGN-298 and DRMRIJ-31 (Giriraj), which have been released/notified within 10 years, were demonstrated at farmers' fields. During Rabi 2013-14 to 2019-20, total 500 CFLDs on mustard were conducted by KVK Sriganganagar of Rajasthan in 200 ha area to enhance mustard production and profitability. For individual farmer, 0.4 ha area is allotted under

demonstration. Full package of practices of mustard were demonstrated in addition to promote Integrate Nutrient Management (INM), Integrated Pest Management (IPM) to realize better yield. The required inputs were supplied and regular visits to the demonstration field by KVK scientists ensured proper guidance to the farmers. All the participating farmers were trained on various aspects of mustard production technologies. Field days and group meetings were also organized to provide the opportunities for other farmers to witness the benefits of demonstrated technologies. Data on results of CFLDs collected by KVK Sriganganagar from partner farmers where CFLDs were undertaken. The extension gap, technology gap and technology index were worked out (Katare *et al*., 2011, Samui *et. al*., 2000) as given below:

% increase in yield = (Demonstration yield - Farmer practice yield/ Farmer practice yield) ×100

Technology gap = Potential yield-Demonstration yield

Extension gap = Demonstration yield- Yield under farmer practice

$$\text{Technology index} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100.$$

Differentiation in technological interventions and farmer practice in mustard crop

Results of cluster front line demonstration indicate that major differences were observed between demonstration package and local farmer' s practice regarding improved variety, proper seed rate, seed treatment, sowing method, nutrient management and plant protection measures. Table 1 show that under the demonstrated plot recommended improved variety, seed treatment, herbicide and insecticide for plant protection measure were given to the farmers by the KVK and all other package and practices were timely performed by the farmer itself under the supervision of KVK scientist. Under farmer practice they generally sow seed of mustard local variety or low yielding variety seed without treatment. Similar findings have also been observed by Singh *et al.* (2012) and Raj *et al.* (2013).

Performance of FLD programme on production and economics of mustard

Under NFSM-Oilseed, total 500 CFLDs of mustard were demonstrated during 2013-14 to 2019-20 to showcase potentials of improved varieties and performance recommended package of practices in agro-climatic zone of Sriganganagar. The results obtained during last seven years are presented in Table 2 revealed that the yield of mustard under FLD plots varied between 15.80 q/ha to 19.79 q/ha, whereas, under the farmer practice (Local check), it varied between 13.24 q/ha to 15.74 q/ha. The FLD plots recorded 12.36 to 25.73% increase in yield over the local check. The average increase in per cent of yield was 16.31q/ha was recorded during seven years of study. Among demonstrated mustard varieties, Giriraj gave the highest average seed yield (18.23 q/ha.) during year of 2018-19 and 2019-20, which is suitable for timely sown in irrigated condition. Thus, recorded 19.07 % higher seed yield compared to local check

varieties. The next best variety was RGN-298 (16.32 q/ha.) in the demonstration year of 2017-18 followed by RGN-48 (16.05 q/ha) in the average three year of demonstrations, which is suitable for timely sown in rainfed condition. Thus, recorded 15.1 and 16.19%, respectively higher seed yield under recommended package of practice over local check varieties with farmer practices. Data further revealed that highest mean seed yield (16.70 kg/ha) recorded under demonstration yield than existing farmer practices (14.29 q/ha) and yield increase over farmer practice was to the tune of 16.31%. The results clearly indicate the positive effects of CFLDs over the existing practices toward enhancing the yield of mustard in different clusters of Sriganganagar district. Farmers were motivated by results of improved practices applied in FLDs trial. The higher yield of mustard could be attributed due to adoption of improved variety with improved production practices of mustard. These results were also supported by Meena *et al.* (2018) and Bhawani Shankar and Meena (2015).

Technology gap: The data of table 3 depicted the technology gap in demonstration yield against potential yield which ranged from 3.68 to 7.34 q/ha during different years of demonstration. Technology gap was maximum (7.34 q/ha) with demonstration variety Giriraj during 2019-20 and minimum (3.68 q/ha) with RGN-298 during 2019-20. On an average technology gap under seven years of FLDs were 4.44 q/ha for mustard cultivation in Sriganganagar district. The technology gap observed may be attributed to dissimilarity in crop management practices and some extent to variation in soil fertility and local climatic conditions. Hence, a location specific recommendation appears to be necessary to bridge the technology gap. Similar findings were recorded by (Tiwari *et al.*, 2017 and Chaudhary *et al.*, 2018).

Extension gap: Evaluation of the findings of study (Table 3) stated that the extension gap ranging between 1.76-4.05 q/ha was found between demonstrated technology and local check during period of study. The extension gap was highest (4.05 q/ha) with demonstrated mustard variety Giriraj and lowest (1.76 q/ha) with variety RGN-229 during the year 2018-19 and 2016-17, respectively. On an average extension gap during period of study were 2.41q/ha for mustard cultivation in Sriganganagar district. To minimize the extension gap it is need to educate the farmers through various means for more adoption of improved high yielding variety and recommended practices to bridge the wide extension gap. More use of improved production technologies with high yielding varieties will subsequently change this hurdle extension gap.

Technology index: The technology index showed the feasibility of the evolved technology at the farmer's fields. The lower value of technology index the more is the feasibility of technology and higher technology index reflected the inadequate transfer of proven technology to growers and insufficient extension services. Data on technology index presented in table 3 shows that technology index varied from 17.54 to 30.58 per cent. During study period of front line demonstration the highest technology index (30.58%) and lowest (17.54%) with variety Giriraj during year of 2019-20 and 2018-19, respectively. Further, On an average technology index 20.83% was observed during seven experimental years of

mustard in Sriganganagar district, which shows the efficacy of good performance of technical interventions. This will accelerate the adoption of demonstrated technical intervention to increase the yield performance of mustard at farmer's field.

Economic analysis: Economics of improved production practices under front line demonstration were estimated on the basis of prevailing market rates recorded higher gross monetary return (₹ 67269 /ha.), additional returns (₹ 13761/ha.) and effective gain (₹ 11861/ha.) with variety Giriraj compare to farmer practice in the year 2018-19. Further, on the average of seven years front line demonstration higher average gross return (₹ 62229 /ha.), additional returns (₹ 9443/ha.), average net return (37380 ₹ /ha.), effective gain (₹ 7101/ha.) and benefit: cost ratio (2.5) compare to farmer practice. The higher additional returns and effective gain obtained under demonstration could be due to improved technology and non-monetary factors, timely operations of crop cultivation and scientific monitoring. The results suggest that improvement in productivity and of economic viability of green gram were obtained by adoption of improved practice under specific agro-ecological situation. Similarly result has earlier being reported on green gram by Meena and Singh (2017) and on mustard by Meena *et al*. (2018).

TABLE 1. Comparison between technological intervention and farmers practices under FLD on Mustard

Particular	Technology intervention	Farmer practice
Variety	RGN-48, RGN-229, RGN-298 and Giriraj	Pusa Bold, Bio-902 and local seed
Sowing Method	Line sowing through seed cum ferti drill	Line sowing through seed drill
Seed treatment	Seed treatment with Metalaxyl 35 S.D.@6g/kg seed	Partial seed treatment
Weed management	Weed management by using herbicide Pendemethalin 30 EC @ 3.3L/ha as a pre- emergence followed by manual weeding at 30 days after sowing	Partial weed management by using herbicide or One hand weeding at 30 days after sowing
Nutrient Management	Nitrogen 75 kg/ha and Phosphorus 40 kg/ha	Imbalance use of fertilizers
Plant Protection For White rust, Blight and Stem rot	1st Spray of Mencozeb (75 WP)@ 2g/L @ 60 DAS & 2nd spray of Propiconazole 25 EC@ 0.5 ml/l after 15 days	Over dose/un-recommended brands of insecticides and fungicide
Aphid	Need based timely spraying of recommended pesticide.	Over dose/un-recommended brands of insecticides

TABLE 2: Yield performance of mustard under local check and front line demonstration

Year	Crop	Technology Demonstrated	Variety	Area (ha.)	No. of Demo	Demo. Yield (Qt/ha)	Yield of local Check (Qt./ha)	Increase in yield (%)
2013-14	Mustard	Timely sown HYV under Rainfed Condition	RGN-48	20	50	15.80	13.24	16.20
2014-15				20	50	16.15	13.74	17.54
2015-16				20	50	16.19	14.10	14.82
2016-17			RGN-229	30	75	16.00	14.24	12.36
2017-18			RGN-298	30	75	16.32	14.18	15.09
2018-19		Timely sown HYV under Irrigated Condition	DRMRIJ-31 (Giriraj)	30	75	19.79	15.74	25.73
2019-20				50	125	16.66	14.82	12.42
Total				200	500	-	-	-
Mean				-	-	16.70	14.29	16.31

TABLE 3: Yield gap variety wise of mustard during year of investigation

Year	Variety	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
2013-14	RGN-48	4.2	2.56	21.00
2014-15		3.85	2.41	19.25
2015-16		3.81	2.1	19.05
2016-17	RGN-229	4.0	1.76	20.00
2017-18	RGN-298	3.68	2.14	18.40
2018-19	DRMRIJ-31 (Giriraj)	4.21	4.05	17.54
2019-20		7.34	1.84	30.58
Mean		5.8	2.9	24.1

TABLE 4: Economic analysis of FLDs in mustard in Sriganganagar district of Rajasthan

Variety	Season and years	Average Cost of cultivation (₹/ha)		Additional cost in demo. (₹/ha.)	Average Gross Return (₹/ha)		Additional return in demo. (₹/ha.)	Average Net Return (₹/ha)		Effective gain (₹/ha)	Benefit-Cost Ratio	
		Demo.	Local Check		Demo.	Local Check		Demo	Local Check		Demo.	Local Check
RGN-48	Rabi 2013-14	23000	19590	3410	59400	48600	10800	36400	29010	7390	2.58	2.5
	Rabi 2014-15	22900	20500	2400	66000	55500	10500	43100	35000	8100	2.88	2.7
	Rabi 2015-16	23120	20200	2920	54250	48050	6200	31130	27850	3280	2.35	2.4
Mean		23007	20097	2910	59883	50717	9167	36877	30620	6257	2.6	2.5
RGN-229	Rabi 2016-17	25010	22650	2360	66000	58000	8000	40990	35350	5640	2.64	2.6
RGN-298	Rabi 2017-18	26737	24500	2237	59377	49513	9864	32640	25013	7627	2.22	2.0
DRMRIJ-31 (Giriraj)	Rabi 2018-19	26450	24550	1900	67269	53508	13761	40819	28958	11861	2.54	2.2
	Rabi 2019-20	26725	25557	1168	63308	56329	6979	36583	30772	5811	2.37	2.2
Mean		26588	25054	1534	65289	54919	10370	38701	29865	8836	2.5	2.2
Overall Mean		24619	22205	2413	62229	52786	9443	37380	30279	7101	2.5	2.4

TABLE 5: Comparative economics of mustard under demonstration and local check (Mean data of 7 Years)

Particulars	Demonstration	Local check	Actual increase over local check	Increase over local check (%)
Average yield (q/ha.)	14.29	16.70	2.4	16.3
Cost of cultivation (₹/ha)	52786	62229	9443	17.9
Gross return (₹/ha)	22205	24619	2413	10.9
Net return (₹/ha)	30279	37380	7101	23.5
B:C ratio	2.36	2.51	0.15	6.4

CONCLUSION

The front line demonstration conducted on mustard at the farmer's field revealed that adoption of improved production technologies of mustard along with use of improved varieties found productive, economic viable and also feasible to local conditions as compared to existing farmer practices. The main issue reported by mustard growers was no use of recommended varieties for the area and use of poor quality seed. In conclusion, demonstrated mustard variety RGN-48, RGN-229 & RGN-298 performed well in rainfed condition and variety Giriraj is suitable for sowing in irrigation condition. However, within these four varieties of mustard variety Giriraj perform better in Sriganganagar district in comparison to other demonstrated varieties. For wide dissemination of improved technologies Horizontal spread of improved technologies may be achieved by the successful implementation of frontline demonstrations and various extensions activities like training programme, field day, exposure visit organized in CFLDs programmes in the farmer's fields. For wide dissemination of improved technologies recommended by SAUs and other research institute, more number of front line demonstrations should be conducted. Farmers were motivated by results of improved practices applied in front line demonstrations and they would adopt these improved technologies in coming years for betterment of farming.

REFERENCES

Anonymous (2018) Agricultural Statistic at a glance, Department of Agriculture and cooperation, Directorate of Economics and Statistics, Ministry of Agriculture and Farmer welfare, Government of India.

Anonymous (2018-19) 4th Advance estimates of area, production and yield of mustard. Agriculture statistics,

Department of Agriculture, Govt. of Rajasthan.

Bhawani Shankar and Meena, K.C. (2015) Nutrient management for enhancing the productivity of Indian mustard (*Brasssica juncea*). Adv. Appl. Res. Vol 7(1):36-41.

Chaudhary, R.P., Chaudhary, G.K., Prasad, R., Singh, Rekha and Chaudhary, A.K. (2018) Impact assessment of front line demonstrations on mustard crop. Int. J. Curr. Microbial App. Sci. (7): 4737-4742.

Katare, S., Pandey, S.K., and Mustafa, M. (2011) Yield gap analysis of Rapeseed-mustard through front line demonstrations. Agriculture Update. 6(2): 5-7.

Meena, B.S., Meena, D.S., Meena, K.C. and Meena, C.B. (2018) Enhanced mustard productivity and profitability through front line demonstration in South-Eastern Rajasthan India. Int. J. Curr. Microbial App. Sci. 7(7):800-805.

Meena, M.L. and Singh, Dheeraj (2017) Technological and extension yield gaps in green gram in Pali district of Rajasthan, India. Legume Research. 40(1):187-190.

Raj, A.D., Yadav, V. and Rathod, J.H. (2013) Impact of Front Line Demonstrations (FLD) on the Yield of Pulses. International Journal of Scientific and Research Publications, 3(9):1-4.

Samui, S.K., Maitra, S., Roy, D.K., Mandal, A.K. and Saha, D. (2000) Evaluation of front line demonstration on groundnut. J. Indian Soc. Coastal Agric. Res. 18(2):180-183.

Singh, G., Sharma, K., Dhaliwal, N.S. and Singh, J. (2012) Boosting *Moong* productivity through frontline demonstrations. Raj. J. Extn. Edu. 20: 32-34.

Tiwari, D.K., Chandra, V., Pandey, S.K. Sahay, R., Singh, A., and Singh, A.K. (2017) Effect of front line demonstration on production, profitability and social impact on mustard cultivation. Bull. Env. Pharmacol Life Sci. Vol. 6(3): 134-137.