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Impact assessment of improved production technologies of Indian mustard (*Brassica juncea*) through frontline demonstrations

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Abstract

To enhance the profitability of mustard growers, the improved mustard production technologies were showcased through cluster frontline demonstrations. In total-150 no. of on-farm demonstrations were conducted on 70 ha area in Bendo ka bera, Kali-mali, Jaloda, Bhojka, Mokheri and Baingti of Jodhpur district of Rajasthan during 2018-19 and 2019-20 and these were compared with existing farmer's practices of mustard cultivation. The improved production technologies consisting high yielding variety (DRMRIJ 31 Giriraj), sowing method, nutrient management, chemical weed management and use of plant protection measures were included in the demonstrations. The findings of the study revealed that the package of improved production technologies recorded a mean yield of 19.32 q/ha which was 40.22 % higher than the farmers practices (13.78 q/ha). Comparatively higher net returns (Rs. 62987/ha) and with a B:C ratio of (3.56) were recorded with improved technologies as compared to farmers practices (Rs. 41636). Adoption of improved technologies significantly increased the yield as well as yield attributing traits of the mustard than the farmers practices. So, there is a need to disseminate the improved technologies among the farmers with effective extension methods like training and demonstrations. The farmers should be encouraged to adopt the improved crop production technologies as discussed in this paper. So the higher Productivity and economic returns from mustard cultivation could be realized.

Key words: *Adoption, front line demonstration, mustard, productivity, profitability*

Introduction

Indian mustard is an important oilseed crop and determinant of oilseed-based agricultural economy of the country. However, productivity is low due to lack of awareness in farming community regarding improved package and practices of oilseed crops. Frontline demonstrations are important dissemination process for transfer of technology and to establish its production potentials on the farmer's fields. Rapeseed-mustard is the second most important edible oilseed crop in India, next only to groundnut and accounts for nearly 30 per cent of the total oilseeds produced in the country (Shivani and Kumar, 2002). India is one of the largest rapeseed-mustard growing countries in the world, occupying the first position in area and second position in production after China (Thakur and Sohal, 2014). India is the largest producer of oilseeds in the world and accounts for about 14 per cent of the global oilseeds area, 7 per cent of the total vegetable oil production and 10 per cent of the total edible oil consumption. Indian mustard is an important oilseed crop of Indian subcontinent contributes more than 80 per cent of the total rapeseed-mustard production in India (Meena *et al.*, 2014; Meena *et al.*, 2015). This group of oilseed crops offers higher return with low cost of production and low water requirement, so it has greater potential to increase the availability of edible oil from the domestic production. Inspite the high quality of oil and also its wide adaptability for varied agro-climatic conditions, the area, production and yield of rapeseed-mustard have been fluctuating due to various biotic and abiotic stresses together with domestic price support programme. 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). Thus, there is a need to disseminate the improved production technologies of mustard cultivation among the farmers to enhance the productivity and profitability. Accordingly, the present investigation was undertaken to bridge the extension gap.

Materials and Methods

Present study was conducted on CFLD mustard in irrigated condition in Jodhpur district of Rajasthan. In total 150 frontline demonstrations were conducted on farmers' field in villages of Bendo ka bera, Kali-mali, Jaloda, Bhojka, Mokheri and Baingti of Jodhpur district of

Rajasthan, during *Rabi* season 2018-19 and 2019-20. Each demonstration was conducted on an area of 0.4 and 0.8 ha, adjacent-to the demonstration plot was kept as farmers' practices. The package of improved technologies like line sowing, nutrient management, seed treatment and whole package were used in the demonstrations. The mustard variety DRMRIJ 31 (Giriraj) developed by the ICAR-DRMR, Bharatpur (Rajasthan) was included in demonstrations methods used for the present study with respect to CFLDs and farmers' practices are given in Table 1. In case of local check plots, existing practices being used by farmers were followed. In general, soils of the area under study were loamy fine to coarse and medium to low in fertility status. The spacing was 30 cm between rows and 10 cm between plants in the rows. The thinning and weeding were done invariably 20-25 days after sowing to ensure recommended plant spacing (10 cm) within a row (30 cm) because excess population adversely affects growth and yield of crop. Seed sowing was done in the mid to last week of October, with a seed rate of 3-4 kg/ha. Other management practices were applied as per the package of practices for *Rabi* crops by Department of Agriculture, Agro-climatic Zone Ia-Arid Western Plains Zone (DOA, 2018). Data with respect to seed yield from FLD plots and from farmer's fields cultivated following local practices adopted by the farmers of the area were collected and evaluated. Different parameters as suggested by Yadav *et al.* (2004) was used for gap analysis, technology index and calculating the economics parameters of mustard. The details of different parameters and formula adopted for analysis are as under:

Extension gap = Demonstration yield - Farmers' practice yield

Technology gap = Potential yield - Demonstration yield

Technology index = Potential yield - Demonstration yield/ Potential yield x 100

Additional cost (Rs.) = Demonstration Cost (Rs.) - Farmers' Practice Cost (Rs.)

Effective gain = Additional Returns (Rs.)- Additional cost (Rs.)

Additional returns = Demonstration returns (Rs.) - Farmers' practice returns (Rs.)

B: C ratio = Gross Returns/Gross Cost

Table 1: Package of practices followed by farmers under FLD

Particulars	Technology Interventions	Farmer's practices
Variety	Giriraj (DRMRIJ-31)	Local cultivar
Seed rate	3-4 kg/ha	5-6 kg/ha
Soil treatment	Trichoderma @ 2.5 kg/ha cultured with 100 kg FYM	No use
Seed treatment	2.5 gm Mancozeb/kg seed and for white rust Metalexil 35 SD 6 gm/kg seed	No seed treatment
Time of sowing	Mid to last week of October	Last week of October
Method of sowing	line sowing 30 cm (row to row) and 10 cm (plant to plant)	Broadcasting
Fertilizer management	60:30-40:40 (NPS kg/ha)	Use of urea 45 kg/ha and DAP 50-60 kg/ha
Weed management	Pre- emergence application of Pendimethalin 30 EC @1.0 kg a.i./ha and Oxadiargyl @ 90gm/ha	Only use Pendimethalin
Plant protection	Painted bug and Aphid -Methyl Parathion @ 20 kg/ha White rust- Mancozeb 2 kg/ha	Products suggested by local pesticide dealers

Table 2: Yield gap analysis of cluster front line demonstrations on mustard crop

Block	Variety	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
Bendo ka bera	Giriraj	7.98	5.48	29.6
Kalimali	Giriraj	7.48	5.50	27.7
Jaloda	Giriraj	8.15	5.42	30.2
Bhojka	Giriraj	7.28	5.59	27.0
Mokheri	Giriraj	7.4	5.54	27.4
Baingti	Giriraj	7.79	5.71	28.8
Average	7.68	5.54	28.4	

Results and Discussion

The improved package and practices are more important with technological intervention for productivity and profitability of oilseeds. Detailed package and practices with technological intervention for recommended practice has been presented in (Table 1). Sulphur is an important supplement for oilseed crops and it is recommended that farmer's should apply single super phosphate fertilizers to meet the requirement of both phosphorus and sulphur in mustard. It was also observed that farmer's use injudicious and non-recommended insecticides and most of the farmer's didn't use fungicides. Similar observations were reported by Singh *et al.,* 2011.

Seed yield

The seed yield of demonstrated field's and farmer's practice is presented in table 2. Data revealed that average seed yield of demonstrated field's was higher than the farmer's practice in all the villages of Jodhpur district. The results revealed that average yield of mustard under cluster frontline demonstrations were 19.02, 19.52,18.85,19.72,19.60 and 19.21 q/ha and these were recorded higher than the farmers practices (13.54,14.02,13.43,14.13,14.06 and 13.50 q/ha) by 40.47, 39.23, 40.36, 39.56, 39.40 and 42.30 per cent, respectively with an additional returns of Rs 20969, 21318, 21007, 21381, 21341 and 22085/ha, respectively. The average yield of Giriraj ranged from 18.85-19.72 q/ha as compared to 13.43-14.13 q/ha of existing variety in all villages indicating suitability of variety in the district. The average yield of cluster frontline demonstrations (CFLD's) field's was highest in Bhojka village (19.72 q/ha) followed by Mokheri (19.60 q/ha), Kali-mali (19.52 q/ha), Baingti (19.21 q/ha) Bendo ka bera (19.02 q/ha) and Jaloda village (18.85 q/ha). The similar results were in accordance with findings of other workers (Singh *et al.*, 2007, Singh *et al.,* 2011). The better yield in cluster frontline demonstrations (CFLD's) field may be due to awareness and adoption of package and practices accordingly (Table 1).

Table 3: Technical impact of mustard crop demonstrations during 2018-19 and 2019-20 in different blocks

Crop	Block	Variety	Area (ha.)	No. of FLDs	Potential yield (q/ha)	Average yield under demo (q/ha)	Average yield under farmer practices (q/ha)	Increase in yield (%)
Mustard	Bendo ka bera	Giriraj	10	25	27.0	19.0	13.5	40.5
Mustard	Kalimali	Giriraj	10	25	27.0	19.5	14.0	39.2
Mustard	Jaloda	Giriraj	10.4	26	27.0	18.8	13.4	40.4
Mustard	Bhojka	Giriraj	20	25	27.0	19.7	14.1	39.6
Mustard	Mokheri	Giriraj	10	25	27.0	19.6	14.1	39.4
Mustard	Baingti	Giriraj	9.6	24	27.0	19.2	13.5	42.3
Average			11.66	25	27.0	19.3	13.8	40.2

The present findings are also in accordance with the findings of Sharma (2014) who found that the yield levels under farmers' practices were always lower than obtained under frontline demonstration. The results revealed that extension gap ranged from 5.42-5.71q/ha in villages of Jodhpur district which indicated that farmers should be awared for adoption of improved production technology in mustard. There is a vast gap between the farmer's yield and improved variety yield as per recommended practice through cluster frontline demonstrations on farmers' field. Vittal *et al*. (2005) also supported that frontline demonstrations are better than farmer practices. Technology gaps were also recorded of each village and these ranged from 7.28-8.15 q/ha. These gaps may be attributed to the variation in soil fertility status. Similarly, technology index was ranged 26.96-30.19 per cent and average figure comes out to be 28.58 per cent. The results revealed that additional return of mustard under cluster frontline demonstrations were ranged 20969-22085 Rs / ha of each village. However, the adoption levels for the improved technology in oilseeds necessitate the need for better dissemination (Kiresur *et al*. 2001). The programme of large scale frontline demonstration could be popularized for other oilseed crops also in order to increase farmer's income and attain self- sufficiency in oilseeds production.

Economics

Economic analysis of cluster frontline demonstration on mustard revealed that the average total returns from recommended practice (CFLD's) were Rs. 81144/ha as compared to Rs 57876/ha in farmers practices. The net returns ranged from Rs. 61013-64667/ha in recommended practice in comparison to Rs. 40006-43286/ha in farmer's practice. It was observed that additional gain ranged from Rs. 20969-22085/ha in recommended practice proved

Table 4: Economic impact of cluster frontline demonstrations on mustard crop

Block	Average Cost of Cultivation (Rs./ha)		Additional cost in demo (Rs./ha)	Average Gross Return (Rs./ha)		Average Net Return (Rs./ha)		Additional in demo (Rs. /ha)	Benefit returns Cost Ratio	
	FLDs plot	Local check plot	-	FLDs plot	Local check plot	FLDs plot	Local check plot	-	FLDs plot	Local-check plot
BendoKa bera	18157	16110	2047	79884	56868	61727	40758	20969	4.40	3.53
Kalimali	18157	16375	1782	81984	58884	63827	42509	21318	4.52	3.60
Jaloda	18157	16400	1757	79170	56406	61013	40006	21007	4.36	3.44
Bhojka	18157	16060	2097	82824	59346	64667	43286	21381	4.56	3.70
Mokheri	18157	16230	1927	82320	59052	64163	42822	21341	4.53	3.64
Baingti	18157	16260	1897	80682	56700	62525	40440	22085	4.44	3.49
Avg	18157	16239	1917	81144	57876	62987	41636	21350	4.46	3.56

beneficial in respect of yield and economics of mustard in consecutive villages of Jodhpur district in Arid Western Plains.

Conclusion

The present study revealed that DRMRIJ 31, variety gave higher yield and net returns with improved production technologies in (CFLD's) than the existing farmer's practice of mustard cultivation in the entire villages of Jodhpur district. Further, use of high yielding variety, adjustment in sowing time, balance nutrition and appropriate management of weed, insect-pest and diseases were observed crucial in achieving the higher mustard productivity and profitability. Thus, showcasing of improved crop production technologies through front-line demonstrations was able to convince the farmers to adopt the technologies to increase the productivity and profitability of mustard in Jodhpur district of Rajasthan.

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