Indian Journal of Extension Education
Vol. 54, No. 3, 2018 (115-118)

Popularization of improved Mustard *(Brassica juncea L.)* production technology through frontline demonstrations in Pali district of Rajasthan

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ABSTRACT

Front line demonstrations (FLD,s) on Mustard were laid down 20 hectare area with the active participation of 60 farmers to demonstrate production potential and economic benefits of improved production technologies comprising high yielding varieties namely NRCDR-2, PM-26 and PM-27 in Pali district of Rajasthan state during rabi seasons from 2012 to 2015 in rainfed farming situation. The improved production technologies recorded an additional yield ranging from 0.47 to 5.93 qha-1. The per cent increase yield under improved production technologies ranged from 27.34 to 53.66 (NRCDR-2), 3.74 to 13.84 (PM-26) and 9.16 to 37.64 (PM-27) in respective years. The average extension gap, technology gap and technology index were 2.82 qha-1, 6.58 qha-1 and 30.32 per cent, respectively in different varieties of mustard. The improved production technologies gave higher benefit cost ratio ranging from 2.11 to 2.86 with compared to local checks (1.03 to 1.31) being grown by farmers under locality. The productivity of mustard per unit area could be increased by adopting feasible scientific and sustainable management practices with a suitable variety. Considering the above facts, frontline demonstrations were carried out in a systematic and scientific manner on farmer's field to show the worth of improved variety and convincing farming community about potentialities of improved production management technologies of mustard for further adoption by the farming community.

Keywords: Adoption, demonstration, impact, livelihood security, mustard.

INTRODUCTION

The Indian agriculture is considered to be backbone of Indian economy. About 75 per cent population lives in rural areas. The main occupation of rural people is agriculture. About 24.70 per cent of the national income originates from the agricultural sector. About 75 per cent of its population and 66.67 per cent of labour force directly or indirectly is dependent on agriculture for livelihood. A large number of important industries like jute, textile, edible oil, tobacco, sugar, etc. receive the raw material produced by agriculture sectors. The estimated area, production and yield of rapeseed-mustard in the world was 34.19 million hectares (m ha), 63.09 million tonnes (mt) and 1,850 kg / ha, respectively, during 2014-15. Globally, India account for 19.29 % and 11.127 % of the total acreage and production (Anonymous, 2014-15). During the last seven years, there has been a considerable increase in productivity from 1750 kg/ha in 2006-07 to 1850 kg/ha in 2014-15 and production has also increased from 46.27 mt in 2006-07 to 63.09 m t in 2014-15. Rapeseed–mustard crops in India are grown in diverse agro climatic conditions ranging from north-eastern / north western hills to down south under irrigated/rainfed, timely/late sown, saline soils and mixed cropping. In Rajasthan the mustard crop is mostly cultivated in the Alwar, Bharatpur, Ganganagar, Pali, Jaipur and Jodhpur districts. Oil seed crops an important position in the farming system of India. These are highly paying crops of the dry regions. Oil seed are rich source of fat and edible oils have various uses for human being and animals. As much as 90 per cent of the total edible oil product in the country comes from two oil seed crops namely rapeseed-mustard and groundnut.

Frontline demonstration is one of the important and powerful tools of extension because, in general farmers are driven by the perception that 'learning by doing' and 'Seeing is believing'. The main objective of front line demonstrations is to demonstrate improved production technologies comprising high yielding varieties and its management practices in the farmer's field under different agro-climatic regions and farming situations. Realizing the importance of FLDs in transfer of latest technologies,

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KVK, Pali has regularly been conducting FLDs on mustard at Pali district farmer's field. The KVK is repository of scientific knowledge Adoption of Improved Mustard Production Technology in Pali District of Rajasthan for agriculture and its allied disciplines and it can be transmitted through effective extension means to the farmers who, in turn, can use this knowledge to improve the production and productivity in their farm operations. Keeping in view it was thought that impact of FLDs conducting by ICAR-CAZRI, KVK, Pali was to be assessed.

METHODOLOGY

The frontline demonstrations were conducted by several institutes or organizations in Rajasthan but due to paucity of time and proximity, study was confined to FLDs conducted by KVK in Pali district of Rajasthan. The study was conducted in farmers' fields to demonstrate production potential and economic benefits of improved technologies in Pali district of Semi Arid Zone IVa of Rajasthan state during Rabi 2013-14 to 2015-16 in rainfed farming situation. The yield and economic performance of frontline demonstrations, the data on output were collected from FLDs as well as local plots and finally the grain yield, average extension gap, technology gap, technology index, cost of cultivation, net returns with the benefit cost ratio was worked out. For the purpose of investigation, ten villages of Pali district, where FLDs were conducted during preceding three years were selected. A sample of 60 respondents was taken comprising 30 beneficiary and 30 non-beneficiary farmers. For selection of beneficiary farmers, a list of farmers where FLDs on mustard were conducted during Rabi 2013-14 to 2015-16 was prepared and taking equal representation, six beneficiary farmers from each of the selected villages making sixty respondents were selected randomly. For the other half of samples (30 non-beneficiary farmers) were selected randomly from the locally adjacent to KVK, where FLDs were not conducted by any institute or organizations. The data were collected through personal contacts with the help of well structured interview schedule. The gathered data were processed, tabulated, classified and analyzed in terms of mean percent score and ranks in the light of objectives of the study. More than 10 percent difference between beneficiary and non-beneficiary farmers' was considered as significant difference. The grain yield of demonstration crop was recorded & analyzed. Different parameters as suggested by Yadav et al. (2004) were used for calculating gap analysis, costs and returns. The detail of different parameters is as follows:

Extension gap = Demonstration – Farmers practice yield

Technology gap = Potential yield – Demonstration yield

Additional return = Dem return – Farmer practice return

$$\text{B : C ratio} = \frac{\text{Additional return}}{\text{Additional cost}}$$

$$\text{Technology index (\%)} = \text{Potential yield (q / ha)} - \frac{\text{Demonstration yield}}{\text{Potential yield}} \times 100$$

The data thus collected were tabulated and statistically analyzed to interpret the FLD,s results.

RESULTS AND DISCUSSION

Performance of FLD: A comparison of productivity levels between demonstrated varieties and local checks is shown in Table 1. During the period under study, it was observed that the productivity of mustard in Pali district under improved production technologies ranged between 12.58 to 17.75 qha-1 with a mean yield of 15.08 qha-1. The productivity under improved varieties varied from 14.62 to 24.57, 10.5 to 17.5 and 12.3 to 16.45 qha-1 for the varieties NRCDR-02, PM-26 and PM-27 respectively as against the yield range between 11.05 to 13.20 with a mean of 15.08 qha-1 under farmers local practices and varieties during study period. The additional yield of different varieties under improved production technologies over local practices ranged from 0.47 to 5.93 qha-1 with a mean of 2.82 qha-1 in comparison to local varieties. The per cent increase yield under improved production technologies ranged from 27.34 to 53.66 (NRCDR-2), 3.74 to 13.84 (PM-26) and 9.16 to 37.64 (PM-27) in respective years. This increased grain yield with improved production technologies was mainly because of high potential yielding varieties, soil type & its moisture availability, rainfall & weather condition, disease & pest attacks as well as the change in the locations of demonstration plots every year. The variation in the productivity was also caused unusual delay in sowing in some of the farmer's fields. The late sowing crop was subjected to relatively less time span available for plant growth and development. The similar result of yield enhancement in rapeseed-mustard crop in front line demonstrations has been documented by Mitra and Samajdar (2010) in tarai zone of West Bengal. The results are also in conformity with the findings of Tiwari and Saxena (2001), Tiwari et al.(2003), Tomer et al.(2003), Singh et al.(2007) and Katare et al.(2011). The results indicated that the improved varieties was found better than the local check under local conditions and Front Line Demonstrations has given a good impact on the farming community of this district as they were motivated by the improved agricultural technologies used in the Front Line Demonstrations.

Yield of the front demonstration trials and potential yield of the different varieties of crop was compared to estimate the yield gaps which were further categorized into technology index. The technology gap shows the gap in the demonstration yield over potential yield and it was 6.58 qha-1. The observed technology gap may be attributed to dissimilarities in soil fertility, salinity and erratic rainfall and other vagaries of weather conditions in the area. Hence, to narrow down the gap between the yields of different varieties, location specific re commendation appears to be necessary. Technology index shows the feasibility of the variety at the farmer's field. The lower the value of technology index more is the feasibility. Table 1 revealed that the technology index value was 30.32. The findings of the present study are in line with the findings of Mitra *et. al.*, (2010) and Katare *et. al.*,(2011).

Table 1: Yield of mustard as influenced by high yielding varieties over local practices in farmer's fields (2013 to 2016).

Year	varieties	Area (ha)	Demo Nos.	Potential yield (q/ha)	Yield (q/ha) Max.	Min.	Mean	Local	Add. yield over local (q/ha)	Increased in yield over local (%)	Ext. gap (q/ha)	Tech. gap (q/ha)	Tech. index (%)
Rabi 2013-14	NRCDR-2	15	30	25	19.4	16.1	17.75	12.55	5.2	41.43	5.2	7.25	29
	PM-26	31	58	20	14.54	11.5	13.02	12.55	0.47	3.74	0.47	6.98	34.9
	PM-27	25	46	20	15.1	12.3	13.7	12.55	1.15	9.16	1.15	6.3	31.5
Rabi 2014-15	NRCDR-2	10	20	25	19.0	14.62	16.81	13.20	3.61	27.34	3.61	8.19	32.76
	PM-26	21	40	20	17.5	12.34	14.92	13.20	1.72	13.03	1.72	5.08	25.4
	PM-27	14	30	20	16.45	13.1	14.77	13.20	1.57	11.89	1.57	5.23	26.15
Rabi 2015-16	NRCDR-2	28	56	25	18.56	15.4	16.98	11.05	5.93	53.66	5.93	8.02	32.08
	PM-26	15	26	20	14.66	10.5	12.58	11.05	1.53	13.84	1.53	7.42	37.1
	PM-27	25	40	20	16.2	14.23	15.21	11.05	4.16	37.64	4.16	4.79	23.95
Means					16.82	13.34	15.08	12.27	2.82	23.53	2.82	6.58	30.32

Economic performance: The economic feasibility of improved technologies over traditional farmer's practices was calculated depending on the prevailing prices of inputs and output costs (Table 2). It was found that cost of production of mustard under improved technologies varied from ` 18950 to 20900 ha$^{-1}$ in case of NRCDR-2, ` 18200 to ` 18800 ha-1 for PM-26 and `18000 to ` 19000 ha$^{-1}$ PM-27 with an average of `19072.22 ha-1 with an average of ` 17633.33 ha$^{-1}$ in local practice. The additional cost incurred in the improved technologies was mainly due to more costs involved in the cost of improved seed only. Front line demonstrations recorded higher mean gross returns (` 47751.44 ha^{-1}) and mean net return (` 28679.22 ha$^{-1}$) with higher benefit ratio (2.50) under improved technologies of different improved varieties of mustard as compared to local checks. These results are in line with the findings of Singh et al. (2011) on seed spices. Further, additional cost of ` 1438.89 ha^{-1} in demonstration has yielded additional net returns of ` 7574.22 ha^{-1} .The results from the present study clearly brought out the potential of improved production technologies in enhancing mustard production and economic gains in rainfed farming situations conditions of this region of Rajasthan. Hence, mustard production technologies have broad scope for increasing the area and productivity at each and every level.

Table 2: Cost of cultivation (`ha$^{-1}$), net returns (` ha^{-1}) and Benefit: Cost ratio of mustard as affected by improved production technologies over local practices.

Year	Varieties	Total cost of cultivation (`ha^{-1})		Gross return (`ha^{-1})		Net return (`ha^{-1})		Benefit: Cost ratio		Add. Cost of cultivation	Add. net return (`ha^{-1})
		Demo.	FP	Demo.	FP	Demo.	FP	Demo.	FP		
Rabi 2013-14	NRCDR-2	18950	17000	54137.5	38277.5	35187.5	21277.5	2.86	1.25	1950.00	13910.00
	PM-26	18800	17000	39711.0	38277.5	20911.0	21277.5	2.11	1.25	1800.00	-366.50
	PM-27	18000	17000	41785.0	38277.5	23785.0	21277.5	2.32	1.25	1000.00	2507.50

Rabi 2014-15	NRCDR-2	20400	17700	52111.0	40920.0	31711.0	23220.0	2.55	1.31	2700.00	8491.00
	PM-26	18200	17700	46252.0	40920.0	28052.0	23220.0	2.54	1.31	500.00	4832.00
	PM-27	18600	17700	45787.0	40920.0	27187.0	23220.0	2.46	1.31	900.00	3967.00
Rabi 2015-16	NRCDR-2	20900	18200	56883.0	37017.5	35983.0	18817.5	2.72	1.03	2700.00	17165.50
	PM-26	18800	18200	42143.0	37017.5	23343.0	18817.5	2.24	1.03	600.00	4525.50
	PM-27	19000	18200	50953.5	37017.5	31953.5	18817.5	2.68	1.03	800.00	13136.00
Means		19072.22	17633.33	47751.44	38738.33	28679.22	21105	2.50	1.20	1438.89	7574.22

MSP (`/q) of mustard during Rabi 2013-14 = 3050, Rabi 2014-15 = 3100 and Rabi 2015-16 = 3350.

CONCLUSION

It is revealed from the above study that the adoption of improved variety with production and management technologies through frontline demonstration gave 23.53 per cent higher yield and ` 7574.22 ha^{-1} more net returns to the growers over local checks. It can be concluded that frontline demonstration conducted under the close supervision of scientists is one of the important tool for extension to demonstrate newly released crop production and protection technologies and its management practices in the farmer's field under different agro-climatic regions and farming situations. FLDs are playing important role in motivating the farmers for adoption of improved varieties resulting in increasing their yield and profits.

Paper received on : December 29, 2018
Accepted on : January 04, 2018

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