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Productivity Enhancement of Rapeseed-Mustard through Front Line Demonstration in Seoni District of Madhya Pradesh, India

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A B S T R A C T

The present study was carried out to know that the yield gaps between improved package and practices and farmers practice of rapeseed-mustard crop. Front line demonstrations on mustard variety PusaTarak were conducted at farmers' fields in district Seoni (Madhya Pradesh) during Rabi seasons of the year 2016-17 & 2017-18 On two years overall average basis about 46.56 per cent higher grain yield was recorded under demonstrations than the farmers' traditional practices. The extension gap, technology gap and technology index were 575.5 kg/ ha, 184.5 Kg/ha and 9.24 %, respectively. An additional investments of Rs.1165 per ha coupled with scientific monitoring of demonstrations and non-monetary factors resulted in additional return of Rs. 17265 per ha. On two years overall average basis Incremental benefit: Cost ratio was found as 14.94.By conducting front line demonstration of proven technologies, yield potential from rapeseed – mustard cultivation can be enhanced to a great extent with increase in the income level of the farming community.

Introduction

The Indian agriculture is considered to be the backbone of Indian economy. The agricultural sector is the largest employer in India's economy and employed 49% of its total workforce in 2014 but contributes to a declining share of its GDP (17% in 2013–14). A large number of important industries like jute, textiles, edible oils, tobacco, sugar, etc. receive the raw materials produced by agriculture sectors. Edible oilseeds are an essential part of Indian agriculture and contribute more than 10 percent to agriculture GDP. Soybean, groundnut and rapeseed-mustard are the major oilseed crops in India contributing nearly 79% and 88% to its total acreage and production, respectively. During 2012-13, rapeseed-mustard contributed 24.2 % to the total oilseeds production. Globally,

India account for 19.29 % and 11.27% of the total area and production of mustard (USDA 2013).

Mustard seed is the second most important oil seed crop in India after soybean. It accounts for nearly 20- 22% of the total oilseeds produced in the country. Mustard seed is grown with a different consumption pattern in the country. Indian mustard is mainly used for extraction of mustard oil while black mustard is mainly used as a spice. White mustard is used as fodder crop or as green manure. India is the fourth producer of mustard seed contributing to around 11 % of world's total production. The production in India has been witnessing an increasing trend since the 2001-2014 decade due to increasing usage of mustard seed oil in food. Moreover, strong domestic demand for mustard seed oil was also one of the reasons for rise in production. European Union (27%) is the leading producer of mustard seed in the world accounting for 35% of the world production - followed by Canada (21%), China (22%) and India (11%) (Mustard Crop Survey Report 2014-15). In India, mustard seed is mainly grown in North West parts of India. Rajasthan and Uttar Pradesh are the major producing States in the country. The other significant producers are Madhya Pradesh, Haryana, Gujarat, West Bengal and Assam. Mustard Seed is a Rabi season crop sown during Oct-Nov and harvested during March -April. Marketing season starts from March and end during Feb. Rapeseed-mustard is a multiple use crop. Besides, its oil value, its seeds are also used as condiments in preparation of pickles and flavouring curries and vegetables. Oil and fat play a significant role in the human dietary system as well as the economy of the people. The oil is utilized for human consumption throughout India in cooking & frying. The leaves of young plants are used as a green vegetable as they supply enough sulphur minerals in the diet. The oil cakes are used as cattle feed & manures. Considering the importance of a rapeseed-mustard group of the crop in the Indian economy is the urgent need for undertaking the basic & strategic research for stabilizing and increasing the production & productivity of mustard in our country.

The available agricultural technology does not serve its purpose till it reaches and adopted by its ultimate users, the farmers. Technology transfer refers to the spread of new ideas from originating sources to ultimate users (Prasad *et al.,* 1987). Conducting of frontline demonstrations on farmer's field help to identify the constraints and potential of the rapeseed–mustard in specific area as well as it helps in improving the economic and social status of the farmers. The aim of the front line demonstration is to convey the scientific technical message to farmers that if they use recommended package and practices then the yield of this crop can be easily doubled than their present level. In view of the importance of demonstrations in crop productivity and continuously getting feedback of problems and constraints faced by the farmers, front line demonstration with full skill and knowledge with scientists have been taken up in rapeseed-mustard also. Keeping the importance of FLDs, the KVK, Seoni conducted demonstrations on oilseed crops mustard at farmers field under irrigated situations in Rabi 2016-17 & 2017-18. The objectives were as follows:

To exhibit the performance of recognised & recommended high yielding Mustard varieties with full recommended package of practices for harvesting higher crop yields.

To compare the yield levels of local check (farmers' field) and FLD fields.

To collect feedback information for further improvement in research and extension programme.

Materials and Methods

Front line demonstrations on Mustard were conducted at farmers' field in district Seoni (Madhya Pradesh) to assess its performance during Rabi seasons of the year 2016-17 & 2017-18. Before laying down FLDs, PRA survey was conducted to identify the farmers practices (FP) and interventions were finalized on that basis. Major constraints were identified included the higher seed rate without treatment, delayed sowing time, defective method of sowing, imbalance use of chemical fertilizer, no or less plant protection measures, no weed management and use of old varieties in Seoni district. Keeping in view of above factors, farmers having varied size holdings from each village, were selected. The interventions viz. optimum seed rate with treatment, normal sowing time, sowing in lines, balance use of chemical fertilizer, use of plant protection measures, weed management and use of recent varieties were applied in the demonstrated fields along with control i.e. farmer's practice (Table 1) Above mentioned techniques (FLDs) were demonstrated in 10 ha area along with farmers practice. Mustard crop was sown during 2nd week of October at all demonstration sites. Yield data were recorded by using crop cutting survey. Locality, average weather parameters and soil characteristics of the district are presented in Table 2.

Each demonstration were using recommended package of practices and the farmers were provided quality seed of Mustard variety EJ-9912-13 (PusaTarak) during all the years of the study. The demonstrations on farmers' fields were regularly monitored by Krishi Vigyan Kendra, Seoni scientists right from sowing to harvesting. 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 yield - Farmers practice yield

Technology gap = Potential yield - Demonstration yield

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

Additional cost = Cost of cultivation in demonstration-cost of cultivation in farmer practice

Additional return = Gross return in demonstration – gross return in farmer practice

Effective gain = Additional return - Additional cost

$$\text{Incremental B:C ratio } (ICBR) = \frac{\text{Additional return}}{\text{Additional cost}}$$

Results and Discussion

Grain yield

The increase in grain yield under demonstration was 31.21 to 62.42 per cent than farmers' local practices. On the basis of two years, 46.56 per cent yield advantage was recorded under demonstrations carried out with improved cultivation technology as compared to farmers' traditional way of Mustard cultivation.

Gap analysis

An extension gap of 392-759 kg/ha was found between demonstrated technology and farmers practices during different two years and on average basis the extension gap was 575.5 kg/ha (Table 3). The extension gap was lowest (392 kg/ha) during 2017-18 and was

highest (759 kg/ha) during 2016-17. Such gap might be attributed to adoption of improved technology in demonstrations which resulted in higher grain yield than the traditional farmers practices. Wide technology gap were observed during different years and this was lowest (21 kg/ha) during 2016-17 and was highest (348 kg/ha) during 2017-18. On two years average basis the technology gap of total 15 demonstrations was found as 184 kg/ha. The difference in technology gap during different years could be due to more feasibility of recommended technologies during different years. Similarly, the technology index for all the demonstrations during different years were in accordance with technology gap. Higher technology index reflected the inadequate proven technology for transferring to farmers and insufficient extension services for transfer of technology.

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 3 revealed that the technology index value was 9.24. The findings of the present study are in line with the findings of Sawardekar *et al.,* (2003), Dhaka *et al.,* (2016), Kumari *et al.,* (2017), Mahadik and Talathi (2016), Singh and Kumar (2017) and Kumar 2017

Economic analysis

Different variables like seed, fertilizers, bio fertilizers and pesticides were considered as cash inputs for the demonstrations as well as farmers practice and on an average an additional investment of Rs. 1165 per ha was made under demonstrations. Economic returns as a function of grain yield and MSP sale price varied during different years. Maximum returns (Rs. 22770 per ha) during the year 2016-17 was obtained due to higher grain yield.. These results are in line with the findings of Yadav *et al.,* (2016), Meena *et al.,* (2016), Morwal *et al.,* (2018), Meena and Dudi (2012), Dhaliwal *et al.,* (2018), Dhaka *et al.,* (2016) and Pathak (2018). The higher additional returns and effective gain obtained under demonstrations could be due to improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring. The lowest and highest incremental benefit : cost ratio (IBCR) were 13.38 & 16.50 in 2017-18 and 2016-17, respectively (Table 4) depends on produced grain yield and MSP sale rates. Overall average IBCR was found as 14.94 Similar results were also reported by Meena and Singh (2017), Dhaka *et al.,* (2016), Rathore *et al.,* (2016), Meena and Singh (2017) and Morwal *et al.,* (2018) in wheat crops.

Table.1 Comparison between demonstrations package and existing farmers practice

Particulars	**Rapeseed-mustard**	
	Demonstrations package	**Farmers Practice**
Farming situation	Soybean-Mustard	Soybean-Mustard
Variety	PusaTarak	Old variety
Time of sowing	October 2nd week	1st and 2nd week of November
Method of sowing	Line Sowing	Broadcasting
Seed rate	5kg/ha	7-8kg/ha
Fertilizer dose	80:40:40, N:P:K/ha	Nil/without recommendation
Plant protection	Seed treatment and spray of insecticide if required	Seed treatment is not done, rarely use of insecticide
Weed management	Spray of 1.5kg/ha Pendamethalin herbicide + one hand weeding	Only one hand weeding

Table.2 Characteristic of experimental site of Seoni district

Parameters	Seoni District
Latitude	22.08°N
Longitude	79.53°E
Altitude	611meter
Annual rainfall (Average) mm	1384mm
Maximum temperature °C	41°C
Minimum temperature °C	11.7°C
Soil type	Shallow & Medium Black

Table.3 Grain yield and gap analysis of front line demonstrations on Mustard at farmers field

Year	Demo.	Variety	Potential Yield (Kg/ha)	Demo. Yield (Kg/ha)	Farmers Practice Yield (Kg/ha)	Increase (%)	Extension gap (Kg/ha)	Technology gap (Kg/ha)	Technology index (%)
2016-17	5	Pusa Tarak	1996	1975	1216	62.42	759	21	1.05
2017-18	10	Pusa Tarak	1996	1648	1256	31.21	392	348	17.43
Average	8	Pusa Tarak	1996	1811.5	1236	46.56	575.5	184.5	9.24

Table.4 Economic analysis of front line demonstrations on Mustard at farmers field

Year	Cost of cultivation (Rs/ha)		Additional cost in Demo. (Rs./ha)	Sale price (MSP) of (Rs./qtl.)	Gross Return (Rs/ha)		Additional return in Demo. (Rs./ha)	Effective gain (Rs./ha)	IBCR
	Demo.	FP			Demo.	FP			
2016-17	13150	11770	1380	3000	59250	36480	22770	21390	16.50
2017-18	12850	11900	950	3000	49440	37680	11760	10810	13.38
Average	13000	11835	1165	3000	54345	37080	17265	16100	14.94

Demo.=Demonstration, FP=Farmers practice

Front line demonstration program was effective in changing attitude, skill and knowledge of improved / recommended practices of Mustard cultivation including adoption. This also improved the relationship between farmers and scientists and built confidence between them. Favourable benefit cost ratio itself explanatory of economic viability of the demonstration and convinced the farmers for adoption of intervention imparted. The demonstration farmers acted also as primary source of information on the improved practices of Mustard cultivation and also acted as source of good quality pure seeds in their locality and surrounding area for the next crop. The concept of Front line 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. This will help in the removal of the cross-sectional barrier of the

farming population. The yield gap in mustard can be overcome, through the wide publicity of the improved practices mustard cultivation by use of various extensions methodologies including Front Line Demonstrations as one of the most important method to show the result of improved practices.

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