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Performance of Frontline Demonstrations for Increasing the Productivity of Rapeseed Mustard in Jammu Region

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A B S T R A C T

A number of frontline demonstration on Indian mustard were conducted at the farmers field in the Jammu, Samba and Kathua districts of Jammu region during 8 consecutive *rabi* seasons of the year 2013-14, 2014-15, 2015-2016, 2016-17. 2017-18 and 2018-19. On the basis of average of six years of demonstrations about 58.01 % higher seed yield was recorded under the frontline demonstration plots than farmers practice in comparison. The adoption of whole package technology recommended to the farmers resulted in tremendous increase in the production and productivity of the different areas of the Jammu region. However, the extension gap (533.17 kg/ha), technology gap (1081.33 kg/ha) and technology index (54.07 %) indicated that there is a tremendous scope of improvement through central assistance to the FLD programme. Adoption of latest agricultural practices/technologies and effective monitoring and adoption of non-monetory inputs such as timely sowing, balanced nutrition as well as timely thinning and weed management besides a supplementary investment of Rs. 3922 brought an additional return of Rs. 20818. Lower variable rates of MSP influenced the net returns on per hectare basis. The average incremental benefit cost ratio was found to be 6.68 over the period of 6 years.

Introduction

Mustard is an important *Rabi* oilseed crop of India and is grown on an area of 6.02 million hectares (approx.) with an average productivity of 13.97 kg/ha during the year 2017-18 (Anonymous, 2018). India ranks third among the major rapeseed mustard growing countries of the world with 9.98 % of the world's area under Rapeseed mustard cultivation. Among the nine oilseed crops grown in the country, it occupies about 24.70 per cent of area and 48.28 percent of production of the total oilseed production in India. As per the latest estimates, In Jammu and Kashmir Union Territory (J&K UT) the total area under mustard cultivation is more than 55000 hectares with the estimated production of 37000 metric tonnes (approx.) and productivity of 697 kg/ha (Anonymous, 2018).

The three types of *Brassica* species are grown in Jammu region namely *Brassica compestris* var. *rapa* commonly known as Toria, *Brassica napus* viz. Gobhi Sarson, *Brassica juncea* viz. Indian mustard and *Brassica juncea* var. Brown Sarson. The toria crop is

mostly grown as a catch crop in Maize-Toria-Wheat crop rotation in the rain fed areas, whereas Indian mustard is grown as sole crop in mid aoctober both in irrigated as well as rain fed areas of the Jammu region mostly. The *Brassica napus* is confined to the irrigated areas and mid hill regions of Jammu. The Brown sarson is confined to temperate hilly region of J&K UT in both Jammu and Kashmir provinces where it is sown as a cover crop in the month of September-October where it remains in the dormant stage for few months under the snow and later on harvested in the month of May-June with very low productivity.

The present average yield of oilseeds is just about 8.0 quintals per hectare, which is mainly due to low productivity in Brown sarson in the temperate areas. The average productivity of the whole Jammu and Kashmir needs to be increased to at least 12 quintals per hectare by the year 2030 to meet the shortfall of 70 % in the J&K UT which is to be minimized either by increasing the area under oilseeds or by increasing the productivity levels of oilseeds.

The main causes of lower productivity of Rapeseed mustard have been found to be the lack of availability of quality seeds of Rapeseed Mustard crops, poor crop management practices, imbalanced fertilization, inadequate and untimely thinning, several biotic factors such as weeds, aphid and Jassid infestation of the crop. Abiotic stresses in the form of heat stress either as early crop stages or terminal heat stress coupled with moisture stress during the flowering as well as siliquae formation stages of the crop growth. Unawareness and non adoption of proven technologies for crop production as well as protection for increased productivity is also one of the major reason for lower productivity of the crop in Jammu region.

Therefore, in the context of the above listed problems the importance of demonstration as well as testing of the proven technologies viz. high yielding varieties, resistant to biotic and abiotic stresses and other production technologies on the farmer's field is very essential.

The first hand feedback and experience of the latest developed technologies of crop production and protection on the farmer's field gives confidence to the scientist to upscale the proven technology in farmers field whereas the feedback also helps the policy makers for future interventions for improved production and productivity in the region.

Inspite of all the efforts and hard work of the extension workers with support of field functionaries, a wide gap exists in rapeseed mustard production between the available techniques and its actual application by the farmers which is reflected through poor yield in the farmers' fields. There is a tremendous opportunity for increasing the production and productivity of Rapeseed Mustard crop by adopting the improved technologies.

There are so many appropriate technologies generated at agricultural universities and research stations but the productivity of Mustard is still very low due to poor transfer of technology from the points of its development to the points of its utilization and only a little new knowledge percolates to the farmers fields, hence a vast gap has been observed between knowledge production & knowledge utilization. To achieve target of additional production of oilseeds, it is necessary to concentrate efforts on scientific cultivation of mustard, the most important oilseed crop of India.

The basic objective of FLDs is to demonstrate improved proven technology of recently

released high yielding bold seeded varieties in conjunction with balanced nutrition, whole package technology including the timeliness of the farm operations, thinning, weed management, insect pest disease management and other newly developed technologies at farmers field through AICRP centres of DRMR so as to facilitate generation of farm data through participating farmers. In view of the same and importance of FLDs, the AICRP (R&M) Chatha centre of SKUAST-Jammu, J&K UT conducted demonstrations on rapeseed mustard crops mustard at farmers field under irrigated situations in Rabi 2011-12, 2012-13, 2013-14, 2014-15, 2015-2016, 2016-17. 2-17-18 and 2018-19. The main objectives of this study includes, to exhibit the performance of recommended high yielding Mustard varieties with whole package technology for harvesting higher crop yields. To compare the yield levels of local check (farmers' field) and FLD fields. To study the extension gap, technology gap and Technology Index between the farmers practice and improved production technology of Rapeseed Mustard. To collect data on economics w.r.t. additional net returns and integrated cost benefit ration etc. i.e. farmers practice and improved production technology. And also to get the feedback for further improvement in research and extension programme.

Materials and Methods

Front line demonstrations on Mustard were conducted at farmers' field in district Jammu and Samba (Jammu and Kashmir) to assess its performance during Rabi seasons of the year 2013-14 to 2018-19 (6 years). The soils of the district were generally sandy, loamy to Clay loamy in texture which were low in nitrogen, medium in available phosphorus and potassium. Each demonstrations was carried out using recommended package of practices and the farmers were provided quality seed of Indian Mustard and Gobhi Sarson varieties namely NRCDR 2, RH 749, DRMRIJ 31 (Giriraj), RSPN 25 (Gobhi Sarson) during the years of the study. The sowing of the crop was done during mid October to last week of October under assured irrigated conditions as well as rainfed conditions and harvested during first fortnight of March to second fortnight of March respectively. The demonstrations on farmers' fields were regularly monitored by the scientists of Chatha centre of AICRP (Rapeseed Mustard) right from sowing to harvesting. The grain yield of demonstration crop was recorded & analyzed. Different parameters as suggested by *Yadav et al., (2004)* was used for calculating gap analysis, costs and returns. The detail of different parameters is as follows:

Extension gap = Demonstration yield - Farmers practice yield

Effective gain = Additional return - Additional cost

Technology gap = Potential yield - Demonstration yield

Additional return = Dem. return - Farmers practice return

Incremental B: C ratio = Additional return

Additional cost

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

Results and Discussion

Grain yield

The increase in grain yield under demonstration was 40.59 to 72.83 per cent than farmers' local practices. On the basis of

four years, 15.9 percent 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 354-662 kg per hectare was found between demonstrated technology and farmers practices during different six years and on average basis the extension gap was 1081 kg per hectare (Table 1). The extension gap was lowest (354 kg/ha) during 2014-15 and was highest (662 kg/ha) during 2018-19. Such gap might be attributed to adoption of improved technology in demonstrations which resulted in higher grain yield than the traditional farmers'. Wide technology gap were observed during different years and this was lowest (945 kg/ha) during 2018-19 and was highest (1172 kg/ha) during 2015-16. On six years average basis the technology gap of total 90 (189) demonstrations was found as 1081 kg per hectare.

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 exhibited similar trend and 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.

Table.1 The performance of different varieties of Rapeseed Mustard and extension and technological gap analysis of frontline demonstrations at Jammu

Year	Variety	Number of FLD's	PY	IP	FP	YIOFP	Extension Gap	Technology Gap	Technology Index
			(kg/ha)	(kg/ha)	(kg/ha)	(%)	(Kg/ha)	(Kg/ha)	(%)
2013-14	NRCDR 2	10 (19)	2000	1430	920	55.43	510	1080	54.00
2014-15	NRCDR 2	10 (26)	2000	1226	872	40.59	354	1128	56.40
2015-16	Giriraj and RSPN 25	10 (18)	2000	1431	828	72.83	603	1172	58.60
2016-17	Giriraj and RH 749	20 (38)	2000	1468	924	58.87	544	1076	53.80
2017-18	Giriraj and RH 749	20 (46)	2000	1439	913	57.61	526	1087	54.35
2018-19	Giriraj, RSPN 25 and NRCHB 101	20 (42)	2000	1717	1055	62.75	662	945	47.25
Average (6 years)			2000	1451.83	918.66	58.01	533.17	1,081.33	54.07

Table.2 The economic data of frontline demonstration on Rapeseed Mustard in Jammu

Year	Variety	Number of FLD's	Cost of Cultivation (Rs.)		Diff. in Cost of Cultivation (Rs.)	Gross Monetory Returns (Rs.)		Additional return (Rs.)	Annual Net Monetory Returns (Rs.)	Effective gain (Rs.)	B:C ratio		Incremental B:C ratio
			IP	FP		IP	FP				IP	FP	
2013-14	NRCDR 2	10 (19)	13450	10200	3250	42900	27600	15300	12050	12050	3.1	2.7	4.76
2014-15	NRCDR 2	10 (26)	16525	13270	3255	37999	27030	10969	21474	7714	1.3	1.04	3.05
2015-16	Giriraj and RSPN 25	10 (18)	16525	13270	3255	47935	27742	20193	31410	16938	1.9	1.09	6.69
2016-17	Giriraj and RH 749	20 (38)	16525	13270	3255	64316	34188	30128	26873	26873	3.89	2.57	10.62
2017-18	Giriraj and RH 749	20 (46)	18395	13140	5255	56121	35607	20514	15259	15259	3.05	2.7	6.03
2018-19	Giriraj, RSPN 25 and NRCHB 101	20 (42)	18400	13140	5260	72114	44310	27804	22544	22544	3.91	3.37	8.91
Average (6 years)			16637	12715	3,921.67	53564	32746	20,818.00	16,896.33	21602	2.86	2.25	6.68

Economic analysis

Different variables like seed and fertilizers were considered as cash inputs for the demonstrations as well as farmers practice and on an average an additional investment of Rs. 3922 per acre was made under demonstrations. Economic returns as a function of grain yield and MSP sale price varied during different years. Maximum returns (Rs. 30128 per ha) during the year 2016-17 was obtained due to higher seed yield of Rapeseed Mustard yield and higher MSP sale rates as declared by Government of India. The higher additional returns and effective gain obtained under demonstrations could be due to improved technology, increased focus on non-monetary inputs like date of sowing, thinning, weed management and balanced nutrition besides irrigation scheduling as per the crop needs and scientific monitoring. The lowest and highest incremental benefit: cost ratio (IBCR) were 3.05 & 10.62 in 2014-15 and 2016-17 respectively (Table 2) and depended on seed yield produce and minimum support price sale rates. Overall average IBCR was found as 6.68. The results are in conformity to the findings of frontline demonstrations on oilseed and pulse crops by Yadav *et al.,* (2004), Lathwal *et al.,* (2010) *and* Dayanand *et al., (2012).*

In conclusion front line demonstration programme have been found to be effective in bring change in the skill, attitude and knowledge of the farmers with respect to improved practices of Mustard cultivation. This change can effectively help in adoption of improved technology of Rapeseed Mustard Production in Jammu region. The conductance of frontline demonstrations has also improved the relationship between farmers and scientists and built confidence between them. The demonstration on the farmers field acted also as primary source of information on the improved practices of Rapeseed Mustard cultivation besides acting as a source of good quality pure seeds in their locality and surrounding area for the next crop. The data on findings of the front line demonstrations may be used by the researchers for formulation of projects along with extension personnel in the Department of Agriculture and KVKs for speedy and wider dissemination of the improved production technology and high yielding varieties viz. Giriraj, NRCHB 101, RH 749 and NRCDR 2 of Indian mustard and RSPN 25 for Gobhi Sarson to the farmers of the Jammu region. This will definitely help in the removal of the wide gaps in the productivity of Rapeseed Mustard in Jammu region.

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