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RESEARCH PAPER

Role of frontline demonstrations for reducing the technology gap and extension gap in *Gobhi sarson* (*Brassica napus* L.) in Amritsar district of Punjab

Harpreet Singh* **and** Charanjeet Kaur
Regional Research Station, Gurdaspur (Punjab) India (Email: harsun2021@gmail.com)

Abstract : Front Line Demonstration is one of the most powerful tools for transfer of technology. The present study was undertaken to find out the yield gap through FLDs on mustard crop. ECF centre Amritsar conducted 42 demonstrations on mustard since 2013-2014 to 2016-2017 in six adopted villages of Amritsar district. Prevailing farmer's practices were treated as control for comparison with recommended practices. On the basis of average data, the average yield (13.97 q/ha) was obtained with improved practice over farmer's practice (11.92 q/ha) with an additional yield of 2.05 q/ha and the increase in yield was17.07 per cent. The average technology gap and index were found to be 7.22 and 34.08 per cent, respectively. The extension gap ranged between 1.5 q/ha (2013-2014) to 2.5 q/ha (2016-2017) indicates the need to educate the farmers through various extension approaches for the adoption of improved technologies. The lower value of technology index indicated the feasibility of the demonstrated Mustard crop technology.

Key Words : Mustard, Front line demonstration, Technology gap, Extension gap, Technology index

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INTRODUCTION

The oilseeds contribute second largest agricultural commodity in India after cereals sharing 14 per cent of gross cropped area which accounts for nearly 3 per cent of the gross national product and 10 per cent of value of all agricultural products. Among the edible oilseeds crops, Rapeseed and mustard occupies an important position in Indian oilseeds scenario. Indian mustard is the most important member of the group, accounting for more than 70% of the area under rapeseed- mustard, followed by *toria*, yellow *sarson* and brown *sarson*. Rapeseed and mustard are the third most important edible oilseed crops of the world aftersoybeanandoilpalm.These crops are grown under a wide range of agro-climatic conditions. Rapeseedand mustard are grown in 53 countries of the world on 26.09 m ha area with a production of 46.84 m tonnes. India is the third largest rapeseed-mustard producer in the world after China and Canada with 12 per cent of world's total production. In India, it is grown in 26 states and union territories. Of the total production (5.08 m tonnes) of the country, share of Rajasthan, Uttar

*** Author for correspondence :**

Pradesh and Haryana accounts for over 71 per cent of the production.This crop accounts for nearly one-third of the oil produced in India, making it the country's key edible oilseed crop. Due to the gap between domestic availability and actual consumption of edible oils, India has to resort to import of edible oils. Rapeseed-mustard is the major source of income especially even to the marginal and small farmers in rain-fed areas. Since these crops are cultivated mainly in the rain-fed and resource scarce regions of the country, their contribution to livelihood security of the small and marginal farmers in these regions is also very important.

Rice-wheat is an important cropping system of Punjab but, the issue of crop diversification is getting popularity in Punjab due to the adverse impacts of rice-wheat system. The oilseed crop of *Brassica* spp. is well adapted to the conditions of Punjab and can play a crucial role in crop diversification. Moreover, it ensures regular utilization of farm labour because it matures 15 days earlier than wheat harvesting. Its water requirement is also less as compared to *Rabi* cereals. In Punjab, Rapeseed- Mustard accounts for 30.5 thousand hectares of area with a production of 45.7 thousand tonnes along with average productivity of 14.98 qt/ha (2017-2018). There is considerable scope of enhancement in productivity leading to higher production especially in Amritsar region.Mustard is an important oilseed crop of the district and has been considered as productively potential region of mustard crop due to assured irrigation facilities and favourable soil and climate conditions. Though Mustard occupies important position in the district still a vast yield gap exists between potential yield and the yield obtained under real farming situation. This may be due to partial adoptionof recommended package of practices by the mustard growers. Technology gap is a major problem in increasing mustard production in the region of the State. So far, not much systematic effort was made to study the technological gap existing in various components of mustard cultivation. With the available improved latest technologies, it is possible to bridge the yield gap and increase the existing production level up to certain extent. Keeping this in view, front line demonstrations were organized in Amritsar District with the objective to analyze the yield gaps in mustard cultivation on the newly recommended package ofpractice.

Material and Methods

The present study was carried out by Experiment on Cultivator Field (ECF), Centre, Amritsar of Punjab Agricultural University, Ludhiana during *Rabi* seasons from 2013-14 to 2016-17 (four consecutive years) in the farmers field of six adopted villages namely (Adliwal, Dalam, Uggar Aulakh, Thathiyan, Nangal Guru and Jania) of Amritsar district. During four years of study, area of 42.0 ha was covered with active participation of 80 farmers. Before conducting FLDs, a list of farmers was prepared from group meeting and specific skill training was given to the selected farmers regarding package of practices of mustard. The difference between demonstration package and existing farmers practices are given in Table A. The improved technology included modern high yielding varieties, timely sowing, line sowing,

Table A : Calendar of field operations followed during the crop season

Treatment details	Farmer's method	Improved method
Crop	*Gobhi sarson*	*Gobhi sarson*
Variety	GSL 1	GSL 1
Date of sowing	20 to 30 October	20 to 30 October
N – P – K level and application time	100 – 30 – 0 (Through urea and DAP) Half N and whole P_2O_5 at sowing and remaining N with first irrigation.	100 – 30 – 0 (Through urea and SSP) Half N and whole P_2O_5 at sowing and remaining N with first irrigation.
Spacing	Broadcasting and no thinning for plant to plant distance	45 X 10 cm maintained by thinning
No. of irrigations	4	4
Weed control	Hoeing	Hoeing
Plant protection	Two sprays: Rogor 30 EC @1.25 litre and Malathian 50 EC @ 0.625 liter/ha	Two sprays: Rogor 30 EC and Malathian 50 EC @ 1.0 liter/ha each
Date of harvest	1st week of April	1st week of April

maintenance of optimum plant population, recommended fertilizer management, plant protection measures, etc. The sowing was done in the second fortnight of October. The spacing was 45x10 cm apart and the seed rate of mustard was 4 kg/ha. The fertilizers were given as per soil testing value; however, the average recommended dose of fertilizer applied in the demonstration plots was 100:30:15kg N, P_2O_5 and S per hectare, respectively. The NP and S fertilizers were applied through urea and SSP, respectively. Half dose of N and full dose of P_2O_5 and S were applied at the time of sowing and the remaining N was applied at first irrigation. Thinning and first hand weeding within the lines was done at 15-25 DAS and second hand weeding was done at 45-50 DAS, if necessary. The crops were harvested at perfect maturity stage with suitable method.In general the soils under study were clayey loam in texture with a pH range of 6.8 to 7.5. In demonstration plots, critical inputs in the form of quality seeds of improved varieties, timely weeding, need based applications of pesticides as well as balanced fertilization, irrigation at critical stages were emphasized by the ECF, Centre, Amritsar and comparison has been made with the existing practices (Table A). The necessary step for the selection of site and farmers, lay out of demonstration, etc. were followed as suggested by Chaudhary (1999) (Chaudhary, 1996). The traditional practices were maintained in case of local check. The data output were collected from both FLD plots as well as control plot and finally the extension gap, technology gap, technology index along with the benefit-cost ratio were calculated as suggested by Samui *et al.* (2000).

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield – Farmer's yield

$$\text{Technology index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} 100$$

RESULTS AND DISCUSSION

The data revealed in Table 2 that the yield of mustard fluctuated successively over the years in demonstration plot. The maximum yield was reported (15.1 q/ha) during the year 2015-16 and minimum yield was reported in the year 2014-15 (12.5 q/ha) and the average yield of four years was reported 13.97 q/ha over farmer's practice (11.92 q/ha). During four years of study, the percent increase over farmer's practice ranged between 12.6 to 20.2. The results are similar with the findings of Tomer *et al.* (2003), Tiwari and Saxena (2001), Tiwari *et al.* (2003) and Verma *et al.* (2012). The data indicated the positive effect of front line demonstration over the existing practicestowards increasing the yield of mustard.

During the period of study emphasis was given to educate the farmers through various techniques for adoption of improved agricultural production which reverse the trend of wide extension gap. An extension gap ranging from 1.5 to 2.5 q/ha was obtained during different years of study and on average basis, it was 2.05 q/ha (Table 2). This gap might be attributed to

Table 1 : Seed yield and gap analysis of frontline demonstrations on *Gobhi sarson* at farmer's field

Year	Area (hectares)	No. of farmers	Seed yield (q/ha)		Increase in yield (%)	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			Improved practice	Farmer's practice				
2013-14	6	6	13.4	11.9	12.6	7.8	1.5	36.79
2014-15	12	12	12.5	10.8	15.7	8.7	1.7	41.04
2015-16	12	12	15.1	12.6	19.8	6.1	2.5	28.77
2016-17	12	12	14.9	12.4	20.2	6.3	2.5	29.72
Total/Average	42	42	13.97	11.92	17.07	7.22	2.05	34.08

Table 2 : Gross returns (Rs./ha), cost of cultivation (Rs./ha), net returns (Rs./ha) and B: C ratio as affected by improved and farmer's practices

Year	Gross returns (Rs./ha)		Cost of cultivation (Rs./ha)		Net returns (Rs./ha)		B: C ratio	
	Improved practice	Farmer's practice	Improved practice	Farmer's practice	Improved practice	Farmer's practice	Improved practice	Farmer's practice
2013-14	42987	38080	11743	12332	31244	25748	2.7	2.1
2014-15	40080	34747	11810	12520	28270	22227	2.4	1.8
2015-16	48400	40587	12735	13335	35665	27252	2.8	2.0
2016-17	50830	42443	13018	13750	37812	28693	2.9	2.1
Average	45574.3	38964.3	12326.5	12984.3	33247.8	25980	2.7	2.0

adoption of improved technology in demonstrations which resulted in higher grain yield than the traditional farmers' practices. More and more use of latest production technologies along with use of high yielding variety will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinue the old technology and to adopt new technology (Table 2). The findings were in line with the findings of Goswami *et al.* (1996) and Hiremath and Nagaraju (2010).

Wide technology gap was observed during different years and this was lowest (6.1 q/ha) during 2015-16 and was highest (8.7 q/ha) during 2014-15. The average technology gap found was 7.22 q/ha. The difference in technology gap during different years could be due to more feasibility of recommended technologies during different years. Technology gap imply researchable issues for realization of potential yield, while the extension gap imply what can be achieved by the transfer of existing technologies. Similarly, the technology index for all the demonstrations during different years were in accordance with technology gap. The technology index shows the feasibility of the evolved technology at the farmer's fields and the lower the value of technology index more is the feasibility of the technology. The results were in conformity with the findings of Jeengar *et al.* (2006) and Mitra and Samajdar (2010). The probable reason for high feasibility of mustard production technology was thatthe participant farmers were given opportunity to interact with the scientist and they were made to adopt recommended practices and skills during the process of demonstration.Different variables like seed, fertilizers, labourers and pesticides were considered as critical inputs for the demonstrations as well as for farmers practice.

The inputs and output prices of commodities prevailed during the study of demonstrations were taken for calculating gross returns, cost of cultivation, net returns and benefit: cost ratio (Table 3). Economic returns as a function of grain yield and MSP sale price varied during different years. Maximum returns (Rs.37812/- ha) during the year 2016-17 was obtained due to higher grain yield and MSP sale rates as declared by Government of India. The higher additional returns and effective gain obtained under demonstrations could be due to adoption of improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring. The highest benefit: cost ratio (BCR) was 2.9 during the year 2016-17 might be due to higher MSP sale rate declared by Government of India. Overall average BCR was found to be 2.7:1 among the demonstrated plots. The results confirm the findings of frontline demonstrations on oilseed and pulse crops by Yadav *et al.* (2004) and Lathwal (2010).

Conclusion :

On the basis of the results obtained in present study, it can be summarized that use of improved method of mustard cultivation can reduce the technology gap to a considerable extent thus leading to increase productivity of mustard in the district. Extension gap ranged between 1.5 to 2.5 q/ha which emphasis the need to educate the farmers through various means like village level training, on campus training, method demonstration, front line demonstration, etc. Technology index which shows the feasibility of the technology demonstrated has depicted good performance of the intervention. The farmers where improved technology was demonstrated also acted as primary source of information for other farmers on the improved practices of mustard cultivation and also acted as source of good quality pure seeds in their locality 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.

Therefore, from the findings of present study, it can be concluded that use of latest technologies of mustard cultivation can reduce the technology gap to a considerable extent resulting in to increased productivity of mustard. However, further detailed studies need to be carried out regarding all these aspects.

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