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Impact of Frontline Demonstrations on Oilseed Production in Kapurthala District of Punjab

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Abstract

Front Line Demonstration (FLD's) is a programme to demonstrate and popularize the improved technologies on farmers' fields for effective transfer of technology and to enhance the productivity and income of the farmers. In this context, Frontline demonstrations on Mustard crop variety GSC-7 were conducted in 45 farmer's field during 2018-19 in Kapurthala district. The main reason behind these demonstrations was to promote the recommended variety and package of practices for the crop to get the maximum remuneration to the farmer in terms of high returns. Farmers were getting low yield and returns because of adoption of indigenous practices during the cultivation. All the latest scientific technologies in terms of cultivation, plant protection as well as seed and pesticides were provided to the farmers in the demonstrated plots. The findings show that average yield of demonstrated plots was 21.94 q/ha, much higher than the check plot (16.67q/ha), showing a significant increase in yield (32.1%) over check plots. Average extension gap, technology gap and technology index of 5.32 kg/ha, 0.91 kg/ha and 4.11 per cent, respectively was recorded. The benefit- cost ratio (BCR) of 4.14 was recorded in demonstrated plots which were significantly higher than check plot i.e. 2.70. The higher yield and returns in demonstrations shows the significance of improved technologies at demonstrated plots. Thus, it can be concluded that FLDs are an effective extension intervention to demonstrate the production potential of improved technologies on farmers' field in oilseed crops results in increasing the production as well as uplifting the economic status of the farmers. Therefore, it is recommended that the extension functionaries working in agriculture fields may give more emphasis on conducting frontline demonstrations (FLDs) on cluster basis for to get maximum productivity potential of oilseed crops in the country.

Keywords: Frontline demonstrations, GSC-7, production potential, technology

JEL Classification: C80, Q10, D24, O33

Introduction

Globally, rapeseed and mustard constitute the third most significant group of oilseed crops. In world oilseed production, India contributes a significant proportion as it is the second largest producer of groundnut after China (Patil *et al*, 2018). India is the third largest rapeseed/mustard seed producer in the world after China and Canada, with 12 per cent of the world's total production (NRIS 2004).

In India, among oilseed crops, rapeseed-mustard was the third most significant group with gobhi sarson as the most important crop in this group (Kaur and Aulakh, 2020). Rapeseed and mustard play a major part in the Indian economy by contributing about 28 per cent in the oilseed economy with 32 per cent of the total oilseed production in the country (Thakur and Sohal, 2014). In India, these are grown on 13 per cent of the gross cultivated land (CRN 2007) covering 250 million hectare area with a production of 72.01 million tonnes (Anonymous 2010). During 2018-19, India produced 8.43 million metric tons of rapeseed and mustard on an area of 6.63 million hectares, with a productivity of 1270 kg/ha (FAOSTAT). In Punjab, during 2019-20, rapeseed and mustard were grown on 31 thousand hectares producing 46.5 thousand tonnes of seed with an average yield of 14.82 q per ha (GOI 2019).

In past few years, the concept of canola oil has gained significant importance as a registered trade mark of the Canadian Oil Association. Canola oil was first produced in Canada in 1974. The oil of rapeseed canola (*B. napus*) is the most valuable owing to its low content of erucic acid (Mandal *et al* 2002, Aytaç *et al* 2006) and is considered to be among the best quality oils for human consumption (Porter and Crompton 2008) and is widely recommended for cooking and as salad oil. The oil content in the rapeseed mustard varies from 36-39 per cent (Yadav *et al.*, 2013). In

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comparison with the rest of the edible oils, the rapeseed-mustard oil has the lowest amount of harmful saturated fatty acids but adequate amounts of two essential fatty acids (linoleic and linolenic). However, most of the Indian varieties of rapeseed-mustard have high erucic acid (about 50%) and high glucosinolates (>100 ìmoles/g defatted seed meal) which make them undesirable for consumption. So, Punjab Agricultural University, Ludhiana has released a new high-yielding canola type variety GSC-7 in 2014 which has less than two per cent erucic acid in the oil and less than 30 micromoles glucosinolates per gram defatted meal. The oil of GSC-7 is healthy oil for human consumption and the defatted meal is highly suitable as animal feed. So, because of the great health benefits, canola oil gained worldwide importance and recognition among the different strata of the people.

The annual demand of edible oils in India is about 26 million tons. The domestic oil production cannot meet this demand. Therefore, we have to import large quantity of edible oils (about 14 million tons per annum). The domestic supply is around 12 million tons. In percentage terms, the share of import of edible oil is about 55 as compared to 45 of the domestic production. In near future, the domestic production is not going to increase significantly at the present level of oilseed technology. It may be stated that import bill of edible oils was Rs 62 thousand crore in 2018-19 which increased to Rs 71 thousand crore in 2019-20, Rs 1.17 lakh crore in 2020-21 and Rs 1.50 lakh crore in 2021-22. Increase in population coupled with rising standard of living and foreign exchange requirements of our country further pushed the demand for increase in the production of these oilseed crops. However, despite of great demand for the oilseed, India has to import the oil from foreign countries as production is at much lower level than the demand. Production potential of oilseed crops can be increase by expansion of area under these crops or through increase in the crop yield. Since any increase in the area under these crops is possible only at the cost of other crops, hence more emphasis is required to be laid on increasing the yield by highlighting scientific technologies**.** In this context, Front line demonstrations (FLDs) play a very crucial role as it is a long-term educational activity conducted by agricultural scientists in a systematic manner on farmers' field to demonstrate impact of modified and improved technologies which ultimately results in better yield potential of different crop commodities. In India, this program in oilseeds was implemented as a splendid result of "Technological Mission on Oilseeds" (Choudhary *et al.,* 2009).The sole objective behind Front Line Demonstration programme on rapeseed is to create awareness and popularization of improved technologies at farmer's fields by demonstrating them. Therefore, FLDs in oilseeds is an effective extension intervention to demonstrate the production potential of improved technologies on farmers' fields for obtaining the productivity potential of oilseed crops in the country. Keeping this in view, the present FLDs were organized in participatory mode with the objective to enhance the production potential of the mustard crop in the region of the State. Although the crop has potential but gap in adoption of improved technological interventions is the major reason for low production of mustard. Thus, by adopting high yielding varieties and improved practices in a systematic and scientific way, productivity of crops per unit area could be increased (Ranawat *et al.*, 2011 and Rai *et al.*, 2016). Thus, with the help of the adoption of improved technologies, it is possible to bridge the yield gap and increase the existing production and productivity of the mustard crop. Keeping this in view, present FLDs were conducted in the Kapurthala district of the Punjab in a participatory mode with the objective to enhance the production potential of canola *Gobhi sarson* and motivating the farmers to adopt cultivation of canola *Gobhi sarson*.

Data Sources and Methodology

The present study on front line demonstrations was conducted by Krishi Vigyan Kendra, in Kapurthala district during 2018-19. Under this programme, 45 FLDs were conducted in an area of 20 ha in three blocks of the district. Among 45 FLDs 22 demonstrations were conducted in Block Sultanpur Lodhi, 21 in Kapurthala and 2 in Nadala blocks; respectively. For conducting FLDs, farmers were identified on the basis of the survey recommended by Choudhary , 1999. After conducting the survey, it was noted that the surveyed farmers were far behind in the adoption of recommended scientific practices as they still follow the traditional old practices in the cultivation of *gobhi sarson*. For instance, some common practices followed by farmers are the use of local cultivars, the overdose of fertilizers and pesticides, late sowing and much interference by local pesticides dealers in case of any insect/disease attack. These selected farmers were guided to raise the *gobhi sarson* crop as per recommendations of the Punjab Agricultural University, Ludhiana (Table 1).

The required inputs like seeds of GSC 7 and pesticides were supplied to farmers. To know the impact of demonstrated technologies, regular field visits of demonstration plots were conducted by KVK scientists. During these visits feedback from the farmers was collected and utilized to refine the technology. In order to conduct FLDs in best way, field days, kisan goshthies, trainings and group meetings were also organized regarding different aspects of production and protection technologies of *gobhi sarson* crop. These extension activities serve as a means, to create awareness and to show the benefits of adopted technologies to the farming community. During these demonstrations, the farmers 'practice (FP) was considered as control/local check in demonstration cluster and these were maintained by the farmers as per their own cultivation practices. At the end of the crop season, to evaluate the impact of FLDs intervention yield of demonstrated plots as well as control plots were

Table 1. Recommended practices followed under front line demonstrations and farmer's practices for the cultivation of GSC-7 in Kapurthala, 2018-19

Component	Demonstration plots	Farmer's practice
Variety	GSC-7 (Pure bred)	Hayola (Hybrid)
Seed rate (kg/ha)	3.75	4.75-5.00
Spacing	45x10 cm	Row to row-30 cm
Time of sowing	10-30 October	November
Method of sowing	Oilseed drill	Broadcast
Fertilizer dose	Urea -225 kg/ha, SSP 187.5kg/ha	Urea-350kg/ha SSP- Nil
Weed management	One or two hoeing with wheel hand hoe	Trifluralin @750ml/ha
Plant protection measures	Spray of Actara 25 WG @100 g/ha and Ridomil Gold@250 g/acre	Application of non-recommended and over dose of insecticides and fungicides

recorded after harvesting. Data were analyzed for different parameters using the following formula (Yadav *et al*., 2004) as given below:

Extension gap = Demonstrated yield-Farmers' practice yield

Technology gap= Potential yield- Demonstration yield

Technology index (Ti in %) = Py – Dy/ Py x100

Where, Py = Potential yield
Dy= Demonstration yield

The extension gap, technology gap and technology index were calculated as suggested by Dayanand *et al.* (2012) with the help of following formula:

$$\text{Per cent increase in yield} = \frac{\text{Yield gain in DP plot (q/ha) - yield gain in FP plot (q/ha)}}{\text{Yield gain in FP (q/ha)}} \times 100$$

Where, DP = Technology demonstrated plot; FP = Farmers' practice

The following formula was used for the calculation of benefit:cost ratio:

$$\text{B:C ratio} = \frac{\text{Gross return}}{\text{Cost of cultivation}} \times 100$$

Additional returns = Demonstration returns – Farmers practice

Results and Discussion

The present study on the impact of frontline demonstrations in *gobhi sarson* variety canola GSC-7 were conducted during 2018-19. The data revealed that the average yield in demonstrated plots was higher in comparison to farmers' practice plots in all three blocks of Kapurthala district (Table 2). The average yield of GSC-7 varied from 19.33-23.5 q/ha in demonstration plots in comparison with yield of 16.22-17.22q/ha in farmer's plots. Among all the blocks, the average yield of FLDs plots was the maximum in Kapurthala block (23.14 q/ha) followed by Nadala (21.45 q//ha) and Sultanpur Lodhi block (21.22 q/ha). Whereas, average yield from all the 45 FLDs of the district was 21.94 q/ha and of farmer's practice was 16.61 q/ha. The yield of FLDs was 32.1 per cent higher over farmer's practice. These results are corroborated by Meena *et al.,* (2012) who also reported 26.8 to 33.1 per cent increase in yield of improved practices over farmer's practices. The similar trends of yield enhancement were also reported by Singh *et al*., 2007, Katare *et al*., 2011, Singh *et al.,* 2011, Dhaliwal *et al.,* 2018 Kalita *et al.* 2019 and Meena *et al.* 2020.

However, there are many factors responsible for higher yield in demonstrated plots because of timely sowing, application of balanced dose of fertilizers (N & P), weed management, need based plant protection measures and most important above all is the implementation of the package of practices (PAU, 2019) during cultivation. During this study extension gap of 4.8-5.9 q/ha in different blocks was recorded. The results revealed that farmers were not much aware of recommended practices for the cultivation of *gobhi Sarson*. They are still using old traditional practices, like, instead of adopting of recommended high yielding varieties they still use the local varieties or hybrids. They do not have any idea of the concept of balanced dose of fertilizers, integrated pest and disease management, and weed management because of lack of information and knowledge. All these factors indicate farmers are not aware about recommended and improved technologies and there is a dire need to educate the farmers regarding implementation of recommended production technology during the cultivation (Vedna *et al.,* 2007). These provide basis for the next year extension programmes. Technology gaps were also calculated separately for each block and these ranged from 0.8-1.1 q/ha. This gap shows that potential yield of the crop could not be obtained because there is a gap in technology demonstration or variation in agro climatic parameters. However, this gap can be narrowed down by conducting awareness campaigns, kisan gosthies

Table 2. Results of grain yield and gap analysis of cluster front line demonstration on GSC-7, 2018-19

Block	Number of FLD'S	Yield (Kg/ha)		Percent increase in Yield (%)	Technology gap (TG) (kg/ha)	Extension Gap (EG) (kg/ha)	Technology Index (TI) (%)
		DP	FP				
Sultanpur Lodhi	22	23.14	17.22	34.37	0.86	5.92	3.85
Kapurthala	21	21.22	16.39	29.46	1.06	4.83	4.76
Nadala	2	21.45	16.22	32.24	0.83	5.23	3.72
Average		21.94	16.61	32.10	0.91	5.32	4.11

DP= demonstration plot; FP= farmer's plot

Table 3. Pest analysis of cluster front line demonstration on GSC-7, 2018-19

Treatment	White rust control (%)	Mustard aphid population efficiency (%) (no./branch)	Weed control (%)
CFLD	75	5	80
Farmers' practice	40	15	35

and training programmes related to scientific cultivation of the crop. It was observed that specific interventions may have greater implications in increased productivity (Katare *et al*. 2011) The average value of 4.11 per cent of technology index indicated the possibility of adoption of new variety by the farmer. In order to increase the productivity, there is need to bridge the extension and technology gaps by means of specific area suitable interventions as reported by Mitra and Samajdar (2010) and Dhaka *et al.* (2010).

Aphid and white rust were recorded as common insect pest and diseases in mustard field during the study period. White rust was controlled with the application of Ridomil Gold @ 250 g/acre. Mustard aphid (*Lipaphis erysimi*) caused considerable loss in mustard field which was controlled with application of Actara @ 40 g /acre (Table 3).

The data related to economical parameters like cost of cultivation, BC ratio, gross return, net return of GSC-7 was comparatively high in demonstrated plots in comparison to farmers plot under frontline demonstrations programme (Table 4). Average cost of cultivation was Rs. 17833.3 and 18667/ha under farmers' practice and demonstrated plot, respectively during 2018-19. Similarly, higher gross returns (Rs. 77342/ha) and net returns (Rs. 58675.3/ha) were also observed in demonstrated plots in comparison to farmers' practice where they were of Rs. Rs. 63833.3 and 46000/ha, respectively as corroborated by the findings of Verma *et al* (2012). Regarding BC ratio, it was again higher in demonstrated plots (4.14) in comparison to farmer's plots (3.58). Although farmers were facing high cost of cultivation by adopting modified technological interventions but it could be compensated in terms of additional net return and high BC ratio. The average additional gain in demonstration plots was Rs. 12675.3/ha. Present results were corroborated by findings of the studies Singh *et al.* (2008), Singh *et al.* (2014), Yadav *et al.* (2016) and Meena and Dudi (2018) and Singh *et al* (2019) which also reported higher net returns from demonstration plots.

Conclusion and Policy Implications

It is concluded that after conducting frontline demonstrations as per recommended practices since from

Table 4. Cost and returns analysis of frontline demonstrations on GSC-7, 2018-19

Block	Gross Returns (Rs./ha)		Input cost (Rs./ha)		Net return (Rs./ha)		Additional gain (Rs/ha)	BCR	
	FLDs	Farmer's practice	FLDs	Farmer's practice	FLDs	Farmer's Practice		FLDs	Farmer's Practice
Kapurthala	81200	66000	19000	18500	62200	47500	14700	4.28	3.57
Sultanpur Lodhi	76687	63000	18700	17800	57987	45200	12787	4.10	3.54
Nadala	74139	62500	18300	17200	55839	45300	10539	4.05	3.63
Average	77,342	63,833.3	18,667	17,833.3	58,675.3	46,000	12,675.3	4.14	3.58

sowing to harvesting, scientific cultivation and protection technologies play a significant role in enhancing the productivity of the GSC-7 and high returns to the farmers as well as technology gap was also reduced due to use of scientific methods of cultivation. In addition to this, increased BC ratio is a very convincing factor for the farmers to adopt the demonstrated technologies. Another important aspect is that funds should be adequately available for smooth functioning of frontline demonstrations programmes under the close supervision of agricultural scientists & extension functionaries. There is further, need of popularization of technology by conducting more extension programmes so that technology gap can be curtailed and livelihood of the farmer can be improved.

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