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Short Communication

Impact of cluster frontline demonstrations (CFLDs) of oilseeds on productivity and profitability of Gobhi Sarson in Sangrur district of Punjab

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Abstract

The study was conducted during *Rabi* season of 2019-20 and 2020-21 to find out the yield gap between scientific production and farmer's practice under cluster frontline demonstrations (CFLD's oilseeds) scheme of Gobhi sarson in Sangrur district of Punjab. The CFLD's were conducted with gobhi sarson canola variety GSC 7 of gobhi sarson in 21 ha and 10 ha area for two years with active involvement of 104 farmers and technical staff of Krishi Vigyan Kendra, Sangrur. The findings of the study revealed that the highest grain yield was obtained in demonstrated plots with an average of 23.23 q/ha as compared to local check (Hyola 401/PBR 91) with an average of 17.98 q/ha. The average mean of extension gap, technology gap and technology index were calculated as 5.25 q/ha, -0.98 q/ha, -4.38, respectively. The demonstrated plots where recommended package of practices for gobhi sarson cultivation were followed ended up with higher B:C ratio (4.05) as compared to farmer's practice (2.90). Hence, it can be concluded that the productivity of gobhi sarson can be further increased with the cultivation of improved variety GSC 7 along with adoption of recommended production practices.

Keywords*: Economic returns, frontline demonstration, Gobhi sarson, practices, technology gap, yield,*

Introduction

Indian soils and agro-climate are quite diverse, allowing for the production of different oilseed crops. In terms of production, value and acreage, oilseeds are second only to foodgrains in India's agricultural sector. Due to the enormous disparity between supply and demand, which led to the purchase of vegetable oil worth millions of rupees each year, oilseed production is given significant weightage in India. India is one of the top producers of rapeseed-mustard worldwide. The major rapeseed-mustard producing states in India are Rajasthan (44.97 %), Haryana (12.44 %), Madhya Pradesh (11.32%) Uttar Pradesh (10.60 %), and West Bengal (7.53 %). Rapeseed-mustard was grown on 31.6 thousand hectares area with total production of 50.3 thousand tonnes and an average yield of 15.95 quintals per hectare in Punjab during 2020-21 (Anonymous, 2022). Rapeseed-mustard, one of India's nine oil seed crops, provides nearly one-third of the nation's edible oil (Langadi *et al.*, 2021). This crop may be grown under both rainfed and irrigated conditions, gets a better market price, and contributes to the rural economy, particularly for marginal and small farmers. The organizations at the grassroots level known as Krishi Vigyan Kendras work to evaluate and demonstrate successful production techniques in a variety of micro-farming environments (DAC, 2010). As part of the National Food Security Mission, Cluster Frontline Demonstration's primary goals were to popularise recently released improved varieties for varietal diversification and effective resource management, as well as to demonstrate scientific crop production technologies of oilseeds on farmers' fields. By methodically carrying out cluster frontline demonstrations to hasten the adoption of new & tested technologies at farmer's fields in a participatory mode with an aim to identify any potential local crop production resources as well as to reduce productivity gaps by boosting the output and financial security of rural farmers. Therefore, under cluster frontline demonstrations project, a study was planned for two years at farmers' fields during *rabi* 2019-20 to 2020-21 to find out gap between potential yield, demonstration yield, extension gap and technology index of high yielding Gobhi sarson canola variety (GSC-7) versus local varieties along with improved production technologies.

Materials and Methods

The cluster frontline demonstration (CFLD's) on Gobhi sarson (*Brassica napus*) were conducted on farmer's fields during *rabi* season of two sequential years i.e. 2019-2020 and 2020-2021 by Krishi Vigyan Kendra, Sangrur

under the Project on Cluster FLDs, sanctioned by ICAR-Agricultural Technology Application Research Institute, Zone-I, Ludhiana, to demonstrate the impact of recommended agro-techniques on production and economic benefits of gobhi sarson cultivation under irrigated conditions. The CFLD's were conducted with canola variety GSC 7 of gobhi sarson which takes 154 days to mature and contains 40.5% oil content. It was released by Punjab Agricultural University, Ludhiana, India in the year 2014 with potential yield of 22.25 q/ha (PAU, 2017). The beneficiary farmers were trained by scientists of Krishi Vigyan Kendra to follow the PAU recommended package of practices for mustard cultivation. They were guided at every growth stage along with maintenance of optimum plant population, application of recommended dose of fertilizers, timely irrigation and proper plant protection measures. The critical inputs like seed of variety GSC-7, bentonite sulphur and insecticides/fungicides were provided to the farmers by the KVK. The seed of demonstrated variety was procured from PAU, Ludhiana and distributed amongst 78 and 26 selected farmers during 2019-20 and 2020-21, respectively. In general, the soil texture of the demonstration plots varied from sandy loam to loamy sand. The soils were neutral to alkaline in soil reaction, low to medium in organic carbon, low to medium in plant available phosphorus and sufficient in potash. The sowing was done in the second fortnight of October during both the years of study. In case of farmers' practice, the farmers generally sow seed of the Hyola 401/PBR 91 and followed traditional practices. The yield data were collected from both the demonstration and farmers' practice plots by crop cutting method randomly during both the years. The detailed information of cultivation practices in demonstration plots and farmers' plots are shown in Table 1.

Table 1: Cultivation practices followed in demonstration and farmers' plots under CFLDs of Gobhi sarson in district Sangrur

Particulars	Farmers' practice	Demonstrated practice
Seed rate	<3.75 kg/ha	3.75 kg/ha
Variety	Hyola 401/ PBR 91	GSC 7
Timely of sowing	Last week of October to last week of November	Second fortnight of October
Method of sowing	Broadcasting/line sowing	Line sowing
Chemical fertilizers (kg/acre) kg Bentonite Sulphur	112.5 kg Urea only	90 kg Urea, 26 kg Diammonium phosphate and 13
Weeding and thinning	One weeding and no thinning	Two times hand weeding after 3-4 weeks and 45 days and proper thinning to maintain proper plant spacing
Plant protection measures	No spray of pesticide and fungicide	Disease tolerant and recommended spray at the appearance of disease

The qualitative data were converted into quantitative form and expressed in terms of per cent increase in yield calculated using following formula:

% Increase in the yield: (Yield in demonstration plots – Yield in farmers' practice plots)/ Yield in farmers' practice plots) × 100

Technology gap: Potential yield – Yield in demonstration plots

Extension gap: Yield in demonstration plots – Yield in farmers' practice plots

Technology Index = ((Potential yield – Yield in demonstration plots)/ Potential yield) × 100

Additional Return = Returns from demonstration plots – Returns from farmers' practice plots

Benefit: cost ratio = Gross returns/ Gross cost

Results and Discussion

Seed yield and gap analysis

Seed yield data obtained from demonstration and farmer's practice plots is presented in Table 2. The demonstration variety of Gobhi sarson GSC-7 was taken up along with the locally available old varieties viz. Hyola 401 and PBR 91. Seventy-eight and twenty-six demonstrations were conducted over an area of 21 and 10 ha during 2019-20 and 2020-21, respectively.

It is apparent from the findings that the performance of selected canola type variety of gobhi sarson GSC-7 has considerable and beneficial effect on grain yield. As shown in the results that demonstrated variety (GSC 7) yielded highest i.e. 22.66 and 23.79 q ha^{-1} in 2019-20 and 2020-21, respectively, followed by (17.20 and 18.75 q ha^{-1})

Table 2: Average yield, technological gap, extension gap and technology index in demonstration (Demo) and farmer's practice (FP) plots

Year	No.	Area (ha)	Potential Yield (q ha^{-1})	Average Yield (q ha^{-1})		% Increase over FP	Extension gap (q ha^{-1})	Technology gap (q ha^{-1})	Technology index
				Demo	FP				
2019-20	78	21	22.25	22.66	17.20	31.74	5.46	-0.41	-1.84
2020-21	26	10	22.25	23.79	18.75	26.88	5.04	-1.54	-6.92
Average	22.25	23.23	17.98	29.31	5.25	-0.98	-4.38		

in farmer's practice. The demonstrated variety GSC 7 exhibit a beneficial response under cluster frontline demonstrated plots with 31.74 and 26.88 % increase in yield during 2019-20 and 2020-21, respectively. The data also revealed that average yield of the two years of demonstration for variety GSC 7 was 23.22 q/ha against the check variety under farmers' practice 17.98 q ha^{-1} (Table 2). The results presented in Table 2 also indicated that respective average extension gap, technology gap and technology index of 5.25 q ha^{-1}, -0.98 q ha^{-1} and -4.38 was observed over two years. The negative technology gap of -0.41 and -1.54 q ha^{-1} was observed in 2019-20 & 2020-21, respectively which revealed better adaptability of demonstrated crop variety in the district. The outcome thus emphasizes the impact of CFLDs under the close supervision of scientists for enhancing productivity and popularization of the variety in this area. According to the present investigation, there is a need to bridge the extension gap between the scientific production practices and farmer's practice, for which the extension workers should use a variety of tools to teach farmers (especially those who aren't participating) for adopting recommended cultivation techniques for the demonstrated variety. Similarly, negative indexes were observed in both the years of study that reflect high feasibility of adopting gobhi sarson variety GSC 7 on farmers' fields due to more yield than the potential yield.

The findings have made it clear that the improved average grain yield in demonstration plots over time, when compared to existing practises, was the result of enhanced knowledge and adoption of the full package of practises, including the use of improved varieties, timely sowing, line sowing, application of recommended dose of fertilisers, proper irrigation, rational control measures for aphid and Alternaria blight, and harvesting at physiological maturity of the crop. The study highlighted how farmers could be encouraged to adopt more advanced scientific methods of mustard production, increasing the output of mustard in the district over that obtained using traditional wisdom. The aforementioned findings concur with those of Chauhan *et al.* (2006) and Kumpawat (2004).

Economics

The results presented in Table 3 indicated that benefit : cost ratio in demonstration plots for the year 2019-20 was 3.18, and 4.92 for the year 2020-21 against the farmer practice of 2.41 for 2019-20 and 3.39 in 2020-21. The improved variety of gobhi sarson and the related agronomical practices generated a net returns of Rs. 62,315/ ha which was 58.50% higher than the exciting farmer practises (Rs. 39320/ha) during 2019-20 (Table 3). The corresponding figures of net returns were Rs. 1,12,262/ha in demonstrated plots during 2020-21, which was 74.2% higher than farmers' practice due to higher grain yield as well as higher selling price.

The results are consistent with those of Meena *et al.* (2012) and other researchers. In their study on yield gap analysis of oilseeds through frontline demonstrations, Samui *et al.* (2000) and Singh *et al.* (2014) also observed that the

Table 3: Economics of cluster frontline demonstrations on Gobhi Sarson (GSC 7) in demonstration (Demo) and farmer's practice (FP) plots

Year	Gross returns (Rs/ha)		Gross costs (Rs/ha)		Net returns (Rs/ha)		Additional gain in (Rs/ha)	B:C ratio	
	Demo	FP	Demo	FP	Demo	FP	Demo	Demo	FP
2019-20	90856	67080	28541	27760	62315	39320	22995	3.18	2.41
2020-21	140886	99375	28623	29302	112262	64449	47813	4.92	3.39
Average	115871	83228	28582	28531	87289	51885	35404	4.05	2.90

improved production techniques resulted in higher gross returns, net returns, and benefit: cost ratios over farmer's practices. The results are corroboration with the findings of Balai *et al.* (2012) in rapeseed and mustard. The region's ability to produce enough oilseeds on its own will be greatly aided by the adoption of enhanced production technology, both in terms of revenue and lifestyle.

Conclusion

The present investigation revealed that gobhi sarson variety GSC 7 resulted in higher yield under the demonstrated plots than local check varieties being adopted by the farmers at all the locations. It was noted during the study period that there is a significant disparity between farmers' actual production and potential yield, which is most likely caused by the lack of technology and extension support. Propagation of cutting-edge technologies can significantly reduce the technology gap, increasing the district's oilseed output. To plug the adoption gaps, ground level interface initiatives are needed to boost farmers' adoption of technology that is specific to their locations and crops. Economic analysis of various criteria also revealed higher net returns and additional income in scientific practise (Demo), suggesting that the CFLD programme is a successful tool for increasing oilseed production and productivity. As a result, it is advised that the policymakers should continue to extend adequate financial support to the frontline extension system so that CFLDs can be organised under the close supervision of agricultural scientists and extension specialists. It is also possible to draw the conclusion that farmers' attitudes about new technology can be altered to enable them to adopt improved technologies and boost oilseed yield, which will raise their revenue from the existing level.

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