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Mitigating Extension and Technological Gaps Through Cluster Front Line Demonstration in Blackgram

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ABSTRACT

Background: Blackgram is a vital *Kharif* pulse crop in Himachal Pradesh, but its acreage in Bilaspur district is declining due to outdated sowing practices and old seeds that have poor germination and disease susceptibility. As a rainfed area, Bilaspur could benefit from pulse cultivation to boost farmer income, but low knowledge levels hinder blackgram production. To address this, Krishi Vigyan Kendra initiated demonstrations to bridge technological gaps by introducing modern practices.

Methods: Present investigation reports on cluster front line demonstrations conducted over three years (2021-2023) at 50 locations across 20 hectares each year. Key inputs, including improved seed varieties (Him Mash^{-1} and UG-218), herbicides and insecticides were provided to farmers.

Result: Demonstration plots yielded significantly more than farmers' practices over three years, with increases of 50.70%, 47.86% and 59.02%. These findings suggest that demonstrating new technologies is crucial for expanding pulse acreage and achieving sustainability.

Key words: Blackgram, CFLD, Demonstrations, Extension gap, Technological gap.

INTRODUCTION

Blackgram (*Vigna mungo* L.), an important pulse crop from India, belongs to the legume family. Cultivated on 3.30 million ha, it produces 1.60 million tonnes, either as a solo, inter, or catch crop (Amuthaselvi *et al.,* 2023 and Ajaykumar *et al.,* 2022). Its short duration and photo insensitivity make it adaptable to various cropping systems, contributing about 11% of India's pulse production. Known for its high protein content, Blackgram also enhances soil health by fixing nitrogen, meeting up to 80% of its own N needs. It produces 22.10 kg N ha^{-1} annually, supplementing 59,000 tons of urea (Jat *et al.,* 2017).

In Himachal Pradesh's lower hills, blackgram is grown as a rainfed crop from July to October. Despite its long history of cultivation, significant production gaps persist, mainly due to the lack of high-yielding varieties, limited knowledge of improved techniques and pest-disease complexities (Dhaka *et al.,* 2016). To boost productivity and close these gaps, adopting scientific, sustainable practices and suitable varieties is essential. Under India's National Food Security Mission, Krishi Vigyan Kendras (KVKs) implement a cluster approach to promote pulse production. The program demonstrates production technologies on farmers' fields, supervised by agricultural scientists, with feedback collected from farmers. The cluster frontline demonstrations (CFLDs) in KVKs aim to enhance blackgram productivity by addressing key challenges and introducing the latest technologies.

MATERIALS AND METHODS

The cluster frontline demonstrations were conducted during Kharif seasons 2021-2023 in Bilaspur, Himachal Pradesh, by Krishi Vigyan Kendra (KVK). The crop was sown after the *Rabi* harvest across 50 locations on 20 hectares in four blocks (Jhandutta, Sadar, Ghumarwin and Shri Naina Devi Ji) (Table 1). The primary aim was to increase the area and productivity of pulses. KVK provided critical inputs such as improved seeds (Him Mash-1), herbicides and insecticides, while farmers managed fertilizers and irrigation. The blackgram varieties 'Him Mash^{-1}' and 'UG-218' were sown in July in lines with the spacing of 30 × 20 cm and seed rate of 20 kg ha^{-1}. The full dose of NPK was applied as basal at the time of sowing. The recommended practices followed under KVK guidance. Farmers received training and KVK scientists conducted regular field visits. The detail of activities carried out in demonstration plots is given in Table 2.

For comparison, local plots used traditional varieties and minimal pest and disease management. Yield data and other parameters plant height, number of pods and pod length were collected from both demonstration and

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local plots. Technology gap, extension gap and technology index were calculated using Samui *et al.* (2000) formula as given below:

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmers yield

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

Economic returns and B:C ratio

The gross, net returns and B:C ratio was calculated as follow:

Gross returns (Rs. ha^{-1}) =

Yield (kg ha^{-1}) × Price of produce (Rs. kg^{-1})

Net returns (Rs. ha^{-1}) =

Gross returns (Rs. ha^{-1}) - Cost ofcultivation (Rs. ha^{-1})

Benefit cost ratio =

$$\frac{\text{Gross returns (Rs. ha}^{-1}\text{)}}{\text{Cost of cultivation (Rs. ha}^{-1}\text{)}}$$

To check the significant difference between the check and demo yield the student's t-test was used.

RESULTS AND DISCUSSION

The total number of demonstrations laid in the year 2021 to 2023 was 150. Improved technologies adopted as the cultivation and the crop was supervised by the scientists of KVK from time to time particularly during critical growth stages. The data (Table 3) revealed that demonstration's yield was significantly higher than the check yield during all the three years under study. The average yield of blackgram was 10.7, 10.2 and 9.7 kg ha^{-1} for the three consecutive years respectively. As compared to check yield the demo yield was 50.70, 47.83 and 59.02 per cent higher for the year 2021, 2022 and 2023 respectively. Similar findings have also been observed by Singh *et al.* (2018), Devi *et al.* (2018) and Tiwari *et al.* (2021) where results from demonstrations plots observed to be higher in black gram crop. The data indicated the positive effect of CFLD over the existing practices towards increasing the yield of blackgram. The major differences were observed between

Table 1: Detail of number of farmers under different clusters.

Year	Number of farmers	Number of farmers under different clusters			
		Cluster I	Cluster II	Cluster III	Cluster IV
2021	50	12	14	03	21
2022	50	11	16	07	16
2023	50	16	13	10	11

Table 2: Detail of cultural practices carried in CFLD plots vs farmers.

Cultural practices	Farmers' practice	CFLD practice
Type of seed	Local	Him Mash-1
Quality of seed	Small seeds	Foundation seed of high yielding variety
Seed treatment	None	With bavistin
Method of sowing	Broadcasting	Line sowing
Herbicide	None	Pre emergence herbicide application
Fertilizer application	None	Recommended dose of NPK (20:40:20)
Pest control	None	Two sprays of recommended pesticide

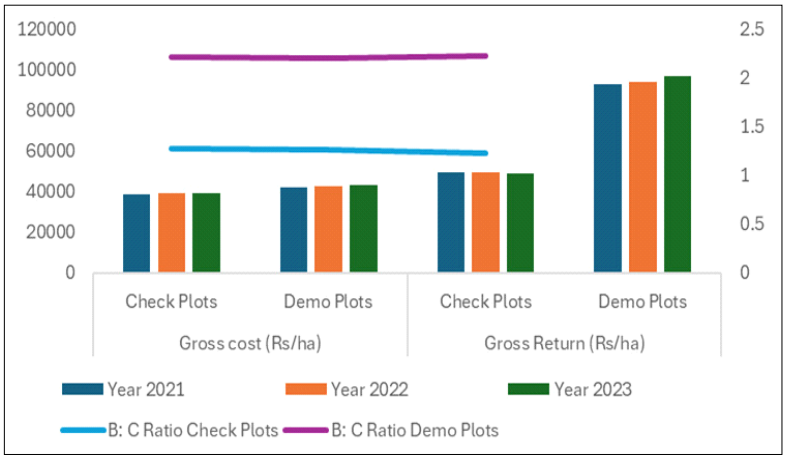


Fig 1: Economics of blackgram cultivation under CFLD.

Table 3: Yield, technology gap, extension gap and technology index of blackgram.

Year	Variety	Potential yield (q/ha)	Demo yield (q/ha)			Check yield (q/ha)			Yield increase over check (%)	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			Max.	Min.	Average	Max.	Min.	Average				
2021	Him mash-1	14	11.9	8.5	10.7*	8.1	5.7	7.1*	50.70	3.3	3.6	23.6
2022	Him mash-1	14	10.8	8.3	10.2*	7.6	5.7	6.9*	47.83	3.8	3.3	27.1
2023	UG-218	12	9.8	7.1	9.7*	6.6	5.3	6.1*	59.02	2.3	3.6	19.2

*Significant at P 0.05.

demonstration package and farmers' practices may be due to introduction of improved seed and seed treatment, line sowing and time of sowing, fertilizer doses and method of its application and plant protection measures. It is evident from the data that yield in demo plots out-performed the farmer practice under the similar environmental conditions. Farmers were motivated by the results of demonstration and agro-technologies applied in the cluster front line demonstration. These findings are in corroboration with the finding of Devi *et al.* (2018) and Singh *et al.* (2018).

The technology gap, extension gap and technology index is presented in the Table 3. Technology gap is the gap between demonstration yield and potential yield and for present study was 3.3, 3.8 and 2.3 q/ha for 2021, 2022 and 2023 respectively. The reasons for technology gap may be due to the difference in soil fertility, availability of low soil moisture content, sowing time and climatic hazards *etc.* The difference in agro-ecological conditions between technology evolved and technology adoption at farmer's field also contributed to technology gap.

Location specific agro-techniques and package of practices as per agro-ecological conditions may reduce the technology gap. The extension gap should be assigned to adoption of improved transfer of technology in demonstrations practices, resulted in higher grain yield than traditional farmer practices. The extension gap for the present study was 3.6, 3.3 and 3.6 q ha^{-1} for the year 2021, 2022 and 2023, respectively. The similarly observations were also obtained in black gram crop as reported by Mahalingam *et al.* (2018). There is a need to decrease this wider extension gap through latest techniques. The technology index signifies the practicability of technology at farmers' field. A lower technology value indicates the higher feasibility of variety among the farmers. In the present study it varies from 19.2 per cent to 27.1 per cent. Technology index is variable due to uneven and erratic rainfall and vagaries of weather conditions during study period in the area. This result is in line with the findings of Dhaka *et al.* (2016); Sandhu and Dhaliwal (2016); Gourav *et al.* (2023) and Duary *et al.* (2024). The economics of blackgram for the three consecutive years under study has been given in Fig 1. The data indicates demonstration plots under CFLD recorded higher gross return and B:C ratio as compared to check plots. The gross return under CFLD was Rs. 93090, 93840 and 97000 per hectare for the year 2021, 2022 and 2023 respectively. Whereas in check plots the gross return was mere Rs. 49700, 49680 and 48800 per hectare for the same years under study. Similarly, the B:C ratio under CFLD plots was 2.22, 2.20 and 2.23 as compared to 1.28, 1.26 and 1.23 for the year 2021,2022 and 2023. The net returns per hectare and benefit cost ratio in demonstrated plots was higher due to of higher yield obtained under improved technologies as compared to farmer's practices during the experimental year. The higher economic returns under CFLD plots were also documented by Tiwari *et al.* (2021); Gourav *et al.* (2023) and Jayaramasoundari (2024).

CONCLUSION

From the three years study it can be concluded that demonstrations under CFLD significantly increased the yield of blackgram. The increase in blackgram yield resulted through imparting trainings and providing critical inputs at right time. Regular visits have also played a vital role in motivating farmers to follow the right operations at right time. These will substantially increase the income as well as livelihood of the farming communities.

Conflict of interest

All authors declared that there is no conflict of interest.

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