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Impacts of Cluster Frontline Demonstrations on Yield and Economics of Blackgram in Southern Part of Tamilnadu, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Cluster Frontline Demonstrations were laid out to upscale improved technologies for enhancing the productivity of blackgram during rabi 2022-23 & 2023-24 by Krishi Vigyan Kendra, Virudhunagr, Tamil Nadu (India). One hundred and fifty demonstrations were conducted in 60 ha with the active participation of the farmers. The results of the demonstrations revealed that the average yield of blackgram under improved technology ranged from 8.4 to 8.6 q/ha with a mean of 8.5 q/ha; which

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was 25 per cent higher as compared to farmer's practices (6.4 q/ha). The study exhibited reduced mean extension gap (2.32 q/ha) and technology gap (5.07 q/ha) with lower technology index (42.58 %) due to the higher yield realized in VBN 11 demonstration plots. The average mean net return (Rs. 38049.5/ha) and mean B: C ratios (2.09) were higher in improved technologies than the farmers' practices (Rs.21282.5/ha) and mean B: C ratio (1.57). The present study resulted in substantial increase in productivity and returns to the farming community through the adoption of improved technologies.

Keywords: Cluster front line demonstrations; blackgram; economics; extension gap; technology gap; technology index.

1. INTRODUCTION

"Pulses play a significant role to address national food and nutritional security and tackle environmental challenges. Blackgram is an important pulse crop grown throughout the country. The crop can withstand adverse climatic conditions and improves the soil fertility by fixing atmospheric nitrogen in the soil. Black gram is a crucial part of the Indian diet since it is a supplement to a cereal-based diet and contains vegetable protein" (Gnanasekaran et al., 2024; Abraham et al., 2024). Blackgram is an important pulse crop in Virudhunagar district cultivated in an area of 3733 ha. However, its productivity is very low compared to national productivity due to unavailability of improved varieties and non-adoption of improved cultivation practices in the district. It is identified that there are several factors responsible for low pulse productivity and high yield gap which are mostly related to inputs and their inefficient management.

Venudevan et al. (2024) stated that "the productivity of blackgram per unit area could be boosted by adopting improved practices in a systematic manner along with high-yielding varieties. In this view, Krishi Vigyan Kendra, Virudhunagar, conducted the Cluster Front Line Demonstration (CFLD) for transferring the latest package of practices to the farmers of Virudhunagar district. The goal of the present study was to increase blackgram production and productivity by showcasing improved technological practices through Cluster Frontline Demonstrations".

2. MATERIALS AND METHODS

The demonstrations were carried out at Kathalampatti, N.Mettupatti, Chithambarapuram villages of Virudhungar District of Tamil Nadu State during Rabi 2022-23 & 2023-24. Blackgram, VBN 11 variety is resistant to viral diseases such as Mungbean Yellow Mosaic and Leaf Curl, duration of 70-75 days suitable for all seasons of Tamil Nadu with an average yield of 8.4 to 9.5 q/ha. Farmers were trained on scientific cultivation practices of black gram, VBN 11 by scientists of KVK, Virudhunagar before laying out the demonstrations. Each demonstration was laid out in an area of 0.4 ha in a cluster of 50 farmers in three villages and farmers' practice was treated as control. The package of improved technologies *viz*., improved variety (VBN 11), optimum seed rate (8 kg/acre), seed treatment with TNAU Vithai Amirtham (10 ml/kg), foliar application of TNAU Pulse wonder (2 kg/acre) and need based plant protection measures were demonstrated (Table 1). Method demonstrations of TNAU Vithai Amirtham seed treatment were conducted at all the three villages to make the farmers aware of the technology know how. The data from CFLD and farmers' practices were analyzed to study the impact of Cluster Front Line Demonstrations.

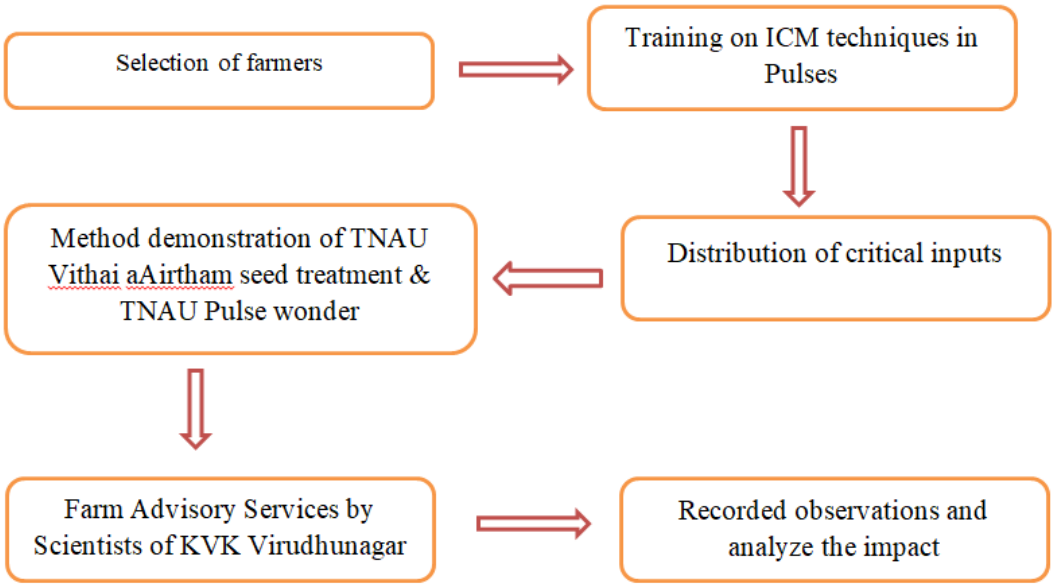
The following formulae for calculating the technology gap, extension gap and technology index was suggested by Samui et al. (2000)

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmers' yield

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

The demonstration fields were monitored and observed by the scientists of KVK,Virudhunagar. The yield parameters for both the CFLD plots and the farmers' practice were recorded at the time of harvest. The cost of cultivation and profit of both the systems were worked out as per the prevailing market price.



Flowchart 1. Flowchart for conducting demonstration of CFLD

3. RESULTS AND DISCUSSION

Technology gap: An average technology gap of 5.07 q/ha was calculated during the demonstration period. The data reflects that there is further potential for increasing yield by implementing better technological interventions, reducing the technological gap, and ultimately reduced the technology index. Mukherjee, (2003) stated that "the technological gap may be attributed to the dissimilarity in the soil fertility status and weather conditions. Hence, location specific recommendation with improved variety are necessary to minimize the technology gap for yield level in different situations" (Rachhoya et al*.*, 2018).

Extension gap: In CFLD plots an extension gap of 2.41 and 2.23 q/ha was recorded during 2022-23 and 2023-24 respectively. On an average, extension gap observed during both the years was 2.32 q/ha which is a wide gap. This emphasized the need to educate the farmers on adoption of improved agricultural production technologies through various means to reduce this trend of wide extension gap. More and more use of latest production technologies with high yielding variety will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually influence the farmers to discontinue the old technology and to adopt new technology. This finding is in confirmation with the findings of Meena et al. (2020); Singh et al (2019).

Technology index: Another important tool for assessing the impact and adoption of various technologies is the technology index. The technology index in this study varied from 44.03 to 41.12%. Lower technology index value indicates the effectiveness of technological intervention. Similar results reported by Jha et al. (2020) in pulses demonstration. Variations in the current weather, soil fertility and insect-pest infestation may be the cause of the wide range in the technology index.

Yield & Economics: It was observed that Cluster Frontline Demonstration plots recorded higher yield (8.5q/ha), higher gross returns (Rs. 52790/ha) and net returns (Rs. 38049.5/ha) in comparison to farmers practice (Rs.35438.5/ha and Rs. 21282.5/ha) (Table 2 & 3). Similar trend of yield enhancement under frontline demonstrations was documented by Saikia et al., (2018) and Sheeba et al. (2024). The benefit cost ratio recorded was also higher (2.09) in recommended practice as compared to farmer's practice (1.57). Similar economic benefits after adoption of improved technologies like high cost benefit ratio, high yield and maximum net return under frontline demonstrations on pulses were documented by Jha et al. 2020 and Singh et al., 2019. The results are also in conformity with the findings of Singh et al. (2018) and Krishnakumar et.al*.* (2025) who reported higher net returns as well as benefit cost ratio in other pulses and brinjal as compared to farmers practice.

Table 1. Details of improved and Farmers practice in blackgram VBN 11

S. No	Particulars	Improved practice	Existing practice
1.	Variety	VBN 11	VBN 8
2.	Land preparation	Ploughing and Levelling	Ploughing and Levelling
3.	Seed rate	8kg/ac	6kg/ac
4.	Seed treatment	TNAU Vithai amirtham @10 ml /kg	No seed treatment
5.	Weed management	Two hand weeding on 15 and 30 days after sowing.	One hand weeding on 30 days after sowing.
5.	Foliar application of nutrient	TNAU pulse wonder @ 5 kg/ha	DAP 2 % Spray
6.	Plant protection	Need based IPM	Indiscriminate use of pesticides

Table 2. Impact of technological intervention on yield, technology gap,extension gap and technology index of CFLD and farmers practice in blackgram VBN 11

Year	Yield (q/ha)		Increase over farmers practice (%)	Technology Gap	Extension Gap	Technology Index (%)
	CFLD	Farmers Practice				
2022-23	8.4	6.2	26	5.31	2.41	44.03
2023-24	8.6	6.5	24	4.83	2.23	41.12
Mean	8.5	6.4	25	5.07	2.32	42.58

Table 3. Economic analysis CFLDS and Farmers Practice in Blackgram VBN 11

Year	Gross cost (Rs/ha)		Gross returns (Rs/ha)		Net Returns (Rs/ha)		BC Ratio	
	CFLD	Farmers Practice	CFLD	Farmers Practice	CFLD	Farmers Practice	CFLD	Farmers Practice
2022-23	24384	22050	52145	34852	37364	20140	2.13	1.58
2023-24	25835	23075	53435	36025	38735	22425	2.06	1.56
Mean	25109.5	22562.5	52790	35438.5	38049.5	21282.5	2.09	1.57

4. CONCLUSION

Cluster Front Line Demonstrations on Blackgram VBN 11 results indicated that technology gap may be reduced by adopting scientific methods of blackgram cultivation besides increasing the productivity of blackgram in the Virudhunagar district. It was noted that educating farmers about science could increase their prospective production. The implementation of several extension activities, such as training programs, field days, exposure trips, etc., arranged in CFLD projects, may help to achieve the horizontal expansion of improved technologies. Since there are still gaps, CFLDs should continue in the upcoming years in order to reduce them as more and more areas are covered by Blackgram. Thus, in the Virudhunagar district, cluster frontline demonstrations (CFLD) were successful in improving farmers' knowledge, abilities, and attitudes while also increasing black gram production and productivity.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

All authors declare that they have no conflict of interest in publication of this article..

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