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Impact of Cluster Front Line Demonstration (CFLD) on productivity and profitability of blackgram (*Vigna mungo* L.) under rainfed condition in Dibrugarh district of Assam

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Abstract
Blackgram is one of the important pulse crops cultivated during *kharif* season in Dibrugarh district of Assam. During 2022-23 and 2023-24, Krishi Vigyan Kendra, Dibrugarh conducted Cluster Front Line Demonstration (CFLD) programme on blackgram for 35 hectares (ha) area of high yielding variety (HYV) SBC 40 among 78 farmers covering nine villages, to study the impact of CFLD programme in terms of grain yield, extension gap, technological gap, technology index and additional return along with benefit-cost ratio through improved package of practices. The results revealed that, the mean yield of blackgram during both the years under demonstrated practices was 9.1 q/ha as against 5.8 q/ha from farmers practices. The mean extension gap (3.3 q/ha), technological gap (2.79 q/ha) and technology index (23.47%). The mean net return (Rs. 45050/ha) and benefit- cost ratio (2.94) of demonstrated practices was higher as against Rs. 25910/ha and 2.48, respectively under farmers practices. The results clearly concluded that, by the use of high yielding blackgram variety SBC 40 and improved package of practices remarkably increase the productivity and profitability of blackgram in Dibrugarh district of Assam.

Keywords: Cluster Frontline Demonstration (CFLD), blackgram, yield, high yielding variety

Introduction
In India, pulses play a vital role for their high nutritional value, environmental benefits such as soil health improvement, nitrogen fixation and economic advantages for farmers. In the world, pulse production was 97.39 million tonnes, cultivated over 95.97 million hectares with an average productivity of 1015 kg/ha (Anonymous, 2022) [1]. India is the world's leading producer and consumer of black gram produces about 13.02 lakh tonnes from about 21.01 lakh hectares area with an average productivity of 657 kg/ha (Anonymous, 2022) [2].

Black gram is an important *kharif* pulse crop in Dibrugarh district of Assam. In Assam, blackgram occupies an area of 129.16 thousand hectares producing 51.50 thousand tonnes with a productivity of 398 kg/ha (Anonymous, 2022) [3]. The productivity of blackgram in Assam is low as compared to national average, mainly due to lack of technical knowledge, poor farming practices like lack of availability of good quality improved varieties of seed, injudicious use of fertilizer, lack of pest and weed management practices, lack of soil moisture during critical growth stages (Sahare *et al.* 2018) [10]. Black gram (*Vigna mungo* L.) is a widely grown legume, with special characteristics of soil fertility restoration through fixing atmospheric nitrogen in symbiotic association with Rhizobium bacteria present in root nodules.

The main objective of Cluster Front Line Demonstration (CFLD) under National Food Security Mission (NFSM) was to demonstrate improved crop production technologies of Pulses in the farmers' fields and to popularize the newly notified and improved varieties/technologies for varietal diversification and efficient management of resources. Therefore, CFLD programme on blackgram variety SBC 40 with the improved package of practices was conducted in farmers field in a participatory mode with the objective to enhance the production and productivity of pulse crop.

Materials and Methods

Krishi Vigyan Kendra, Assam Agricultural University, Dibrugarh conducted Cluster Front Line Demonstration (CFLD) programme on blackgram variety SBC 40 with improved package of practices in 35 ha area of nine different villages covering 78 farmers during *kharif* season under rainfed condition of 2022-23 and 2023-24. The demonstrated practice as well as farmers traditional practice along with local variety were detailed in Table 1. The soils of farmers field were sandy loam in texture with pH 6.3, medium in available nitrogen (397 kg/ha), available phosphorous (25.7 kg/ha), available potassium (183 kg/ha) and organic carbon (0.67%). The data were collected from both the years 2022-23 and 2023-24 from demonstrated plots as well as control plots (farmers plots) and after that technology gap, extension gap, technology index, % increase of demo yield over farmers yield and economics of production were worked out (Samui *et al.*, 2000) [11] as mentioned below:

Technology gap = Potential yield - Demonstration plot average yield

Extension gap = Demonstration plot average yield - Farmers plot average yield

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

$$\text{\% increase of demo yield over farmers yield} = \frac{\text{Average demo plot yield - Average farmers plot yield}}{\text{Average farmers plot yield}}$$

Results and Discussion

The results of the study have been discussed under the following points:

Grain yield: The data presented in Table 2 revealed that higher average seed yield of blackgram was obtained with improved package of practices followed in Cluster Frontline Demonstration (CFLD) plots as compared to farmer's traditional practice during both the years *ie.* 2022-23 and 2023-24. The mean seed yield during both the years of demonstrated plots recorded 9.1 q/ha which was higher when compared with farmers plots which was 5.8 q/ha. The mean percentage seed yield of demonstrated plots over farmers plots was 56.89%. The yield enhancement through adoption of improved technology was also reported by Kumar *et al.*, 2019 [9] and Jamwal *et al.*, 2020 [8]. Yield of demonstration trials and potential yield of the crop was compared to estimate the yield gaps which were further classified into technology and extension gaps (Hiremath and Nagarju, 2009) [7].

Extension gap: The mean extension gap between demonstrated practices and farmers practices recorded 3.3 q/ha (Table 2) which suggested that there is a need to motivate and aware the farmers for adoption of improved production technology in blackgram over the existing traditional famers practice. The similar findings were also reported by Devi *et al.*, 2018 [6] and Jamwal *et al.*, 2020 [8].

Vegetative stage

Pod formation stage

Field day

Technology gap and technology index: The technology gap observed may be attributed to the dissimilarity in soil status, non-congenial weather conditions, disease pest infestation. The mean technology gap of the study was 2.79 q/ha. The technology index was 25.15% and 21.78% during 2022-23 and 2023-24 respectively. Lower the value of technology index more is the feasibility and applicability of the tested technology which showed that a gap existed between technology evolved and technology adopted at farmer's field. Similar findings were also showed by Choudhary *et al.*, 2009 [5], Devi *et al.*, 2018 [6] and Jamwal *et al.*, 2020 [8].

Economic analysis: The data in Table 3 depicted that the mean cost of cultivation during both the years of demonstrated plots (Rs. 23200/ha) which was higher as compared to farmers plots (Rs. 17590/ha). Similarly, the mean gross return (Rs. 68250/ha), net return (Rs. 45050/ha) and benefit- cost ratio (2.94) was also higher in demonstrated plots. Improved monetary return and benefit-cost ratio had also been reported by Bairwa *et al.*, 2013 [4] and Jamwal *et al.*, 2020 [8].

Table 1: Practice followed in demonstrated plots and farmers plots under CFLD on blackgram

Sl. No	Practices	Demonstrated plots	Farmers plots
1.	Land preparation	2 ploughings followed by levelling	Single ploughing
2.	Method of sowing	Line sowing	Broadcasting
3.	Variety	SBC 40	Local
4.	Seed rate (kg/ha)	22.5	25
5.	Spacing	30 x 10 cm	-
6.	Seed treatment	Rhizobium and PSB @ 50g/kg of seed	-
7.	Sowing time	First fortnight of November	First fortnight of November
8.	Fertilizer doses	Vermicompost @ 1t/ha along with Urea: SSP: MOP:: 16: 110:13 kg/ha applied as basal	Imbalance use of fertilizer
9.	Plant Protection measures	IPM practices like use of yellow sticky traps, spraying of neem oil and rouging	More use of pesticides
10.	Weed management	One hand weeding at 25-30 days after sowing (DAS)	Nil
11.	Technical Guidance	Time to time	-

Table 2: Year-wise seed yield, technology gap, extension gap and technology index of blackgram as grown under CFLD demonstrated plots and farmers plots

Year	Potential yield (q/ha)	Demo yield (q/ha)	Farmers yield (q/ha)	Increase yield (%)	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
2022-23	11.89	8.9	5.7	56.14	2.99	3.2	25.15
2023-24	11.89	9.3	5.9	57.63	2.59	3.4	21.78
Mean	-	9.1	5.8	56.89	2.79	3.3	23.47

Table 3: Year- wise economic analysis of blackgram as grown under CFLD demonstrated plots and farmers plots

Year	Cost of cultivation (Rs. /ha)		Gross return (Rs. /ha)		Net return (Rs. /ha)		B-C ratio	
	Demo plot	Farmers plot	Demo plot	Farmers plot	Demo plot	Farmers plot	Demo plot	Farmers plot
2022-23	23100/-	17480/-	66750/-	42750/-	43650/-	25270/-	2.89	2.45
2023-24	23300/-	17700/-	69750/-	44250/-	46450/-	26550/-	2.99	2.50
Mean	23200/-	17590/-	68250/-	43500/-	45050/-	25910/-	2.94	2.48

Conclusion

By conducting Cluster Frontline Demonstration (CFLD) programme with the use of improved blackgram variety and production technology along with active participation of famers had positive effect on increasing the seed yield as well as economic return of blackgram which motivated the farmers towards adoption of improved technologies in Dibrugarh district of Assam.

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Disclaimer (Artificial intelligence)

Authors hereby declare that no generative AI technologies such as large language models (Chat GPT, COPILOT etc.) and text - to- image generators have been used during the writing or editing of this manuscript.

Competing Interests

Authors have declared that no competing interests exist.

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