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Role of cluster frontline demonstrations in enhancing black gram productivity under rainfed conditions in Darrang District of Assam

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Abstract
Krishi Vigyan Kendra, Darrang conducted Cluster Front line Demonstrations (CFLDs) programme on blackgram during kharif 2022 and 2023 on an area of 20 ha each under rainfed conditions. There was a wide yield gap between the potential and demonstration grain yields in blackgram crop mainly due to technology and extension gaps. Improved crop management practices recorded the highest mean seed yield of **7.7** q ha^{-1} and 7.9 q ha^{-1} which was 37.50 and 29.50 per cent higher than the yield obtained with farmers practice (5.6 q ha^{-1}) & (6.1q ha^{-1}) in the year 2022-23 & 2023-24 respectively. The average technology gap was recorded 0.8 q/ha and 0.6 q/ha in case of blackgram var. SBC40 in 2022-23 & 2023-24 respectively while average extension gap was recorded 2.1 q/ha and 1.8 q/ha. Due to adoption of improved package of practices, demonstration plots recorded higher average seed yield over local check. It was further observed that in terms of economics, black gram crop recorded higher net returns/ha compared to farmer's practice during both the years. The benefit cost ratio was 3.18 and 1.92, respectively, during kharif 2022 and 2023 in demonstration plots of black gram. The percent technology index varied between 9.41 and 7.05 per cent indicating urgent need to motivate the farmers to adopt economical viable technologies for increasing production, productivity and profitability of pulse crops.

Keywords: Cluster Front line Demonstration, extension gap, technology index

Introduction
Black gram popularly known as urd bean is one of the important grain legumes and an excellent source of easily digestible good quality protein (24-26%). India currently produces about 1.4 lakh tonnes of black gram annually from about 15 lakh ha area with an average productivity of 451.61 kg/ha. Blackgram (*Vigna mungo*) is considered to be one of the most important kharif pulse grown mostly in char areas of Darrang district of Assam. Darrang is occupying an area of 2620 ha, production of 2072MT and productivity of 791 kg/ha under this crop. Although blackgram occupied a prominent place in the pulse scenario of Darrang district still there were some lecuna in the production practices which results in a vast differences of yield between the potential yield and actual yield obtained by the farmers. Some of the constrains in growing blackgram crop are non-availability of high yielding varieties, non availibity of quality seeds, low seed multiplication rate and poor transfer of technology. There is a tremendous opportunity for increasing area and the production of the crop by adopting the improved production technologies. To boost the production and productivity particularly in pulse crops Krishi Vigyan Kendras are playing a major role in popularizing the improved technologies by demonstrating the technologies covering large areas in the farmers through conducting Cluster Frontline Demonstration programmes. The study was carried out through participatory cluster front line demonstration (CFLD) during Kharif season of 2022-23 and 2023-24 at eleven different villages of Darrang district under north bank plain zone of Assam on farmers field with an objective to evaluate the performances of high yielding blackgram variety SBC-40 as compared to the farmers practice.

Materials and method

The study was conducted by Krishi Vigyan Kendra, Darrang, Assam Agricultural University to assess the effect of cluster frontline demonstration (CFLD) on blackgram crop in char areas of Darrang district during kharif season 2022-23 and 2023-24 (two consecutive years). The demonstrations were being conducted in farmers' field at six different villages of Darrang district during 2022-23 and in seven villages in the year 2023-24. District Darrang comes under North Bank Plain agro climatic zone of Assam. The soil of the district ranges from old alluvial to new alluvial type. The soil is sandy to sandy loam in texture and acidic in reaction and is characterized by medium to high organic carbon, low to medium phosphorus and potash content.

During the study, total area of 20 ha each was covered under cluster frontline demonstration for the two consecutive years and the varieties used by the farmers in the nearby field was kept as farmer's practices. Before conducting CFLDs, a list of farmers was prepared from group meeting and specific skill training and awareness programmes were arranged by KVK officials at different locations to make the farmers aware about the scientific cultivation practices of the crop. High yielding blackgram variety SBC 40 was used for the study. It is short duration blackgram variety (70-75days) which has high yield potential (11.89 q/ha) and protein content (25.20 %) with resistance to Cercospora Leaf Spot & Yellow Mosaic Virus, moderate resistance to WB etc. The need based inputs were supplied to the selected farmers and stage wise monitoring of the demonstration plots by KVK Scientists ensure proper guidance to the farmers. The sowing of the crop was done during kharif season (mid-August to -mid September) under rain fed condition in both the years. The details of the technology interventions and farmer's practice were mentioned in Table no. 01. Crop yields as well other morphological datas were recorded from the demonstration and check plots at the time of harvest. The economic-parameters (Gross return, net return and B:C ratio) were worked out on the basis of prevailing market prices of inputs and Minimum Support prices of outputs. The yield increase in demonstrations over farmers' practice was calculated by using the following formula as suggested by Yadav *et al.* (2004) [5]

Percent increase in yield over farmers' practice = Demonstration yield – farmers' plot yield / Farmers' plot yield x 100

Estimation of extension gap, technological gap and technological index along with the benefit cost ratio by following (Samui *et al.*, 2000) [4] as given below:

Technology gap = Potential yield-Demonstration yield

Extension gap = Demonstration yield-Farmer's yield

Technology index = (Technology gap/potential yield) x 100

Table 1: Details of technology followed in the demonstration

Particulars	Demonstration plot	Farmer's plot	Gap
Land selection	Rainfed medium land	Rainfed medium land	No gap
Variety used	SBC 40	Local	Full gap
Land preparation	Two ploughings	One or two ploughings	No gap
Sowing time	Mid-august - Mid September	First week of October	Late sown
Seed rate	22.5 kg/ha	30 kg/ha	Higher dose of seed rate
Seed treatment	Seeds were treated with PSB @50gm/kg of seed	Not done	Full gap
Nutrient management	10:35:15 ($N:P_2O_5:K_2O$) kg/ha	Only FYM was applied	Full gap
Plant protection measure	Need based application	No pesticide, fungicide application	Full gap
Interculture operations	One weeding at 20-25 days after sowing	No hand weeding	Full gap
Irrigation	Rainfed	Rainfed	No gap

Results and discussion

Impact of CFLD on seed yield of blackgram

From the result it was observed that the high yielding variety SBC 40 out yield the farmers practice in the same farming situation. The seed yield of blackgram for the season 2022-23 & 2023-24 under demonstration was recorded to be as **7.7** q ha^{-1}, 7.9 q ha^{-1} against the farmers practice 5.6q ha^{-1} and 6.1q ha^{-1} respectively. The percent increase in yield of demonstration plots over farmers' plots ranged from 37.50 percent in 2022-23 to 29.50 per cent in 2023-24. Same results for the crop toria under cluster frontline demonstration was recorded earlier by Mary *et.al* (2024). The poor productivity in farmers practice might be mainly due to factors like use of nondescript local variety and low level of agronomic management in addition to non-availability of resources in time. The result clearly depicts the positive effects of demonstrations over the existing practices towards enhancing the yield of blackgram in Darrang district.

Table 2: Influence of CFLD yield, technology gap, extension gap, technology index in blackgram variety SBC40

Year	Potential yield (q/ha)	CFLD (q/ha)	FP (q/ha)	Percent increase in yield over check	Tech gap (qha-1)	Extension gap (qha-1)	Technology index (%)
2022-23	8.5	7.7	5.6	37.50	0.8	2.1	9.41
2023-24	8.5	7.9	6.1	29.50	0.6	1.8	7.05
Mean		7.8	5.58	33.5	0.7	1.95	8.23

Technology Gap

In the present study, technology gap is recorded to be 0.8 qha^{-1} and 0.6 qha^{-1} in the two subsequent year respectively. The observed technological gap may be attributed to the dissimilarity in the soil fertility status, insect pest attack and erratic weather conditions that prevailed during crop season at different locations.

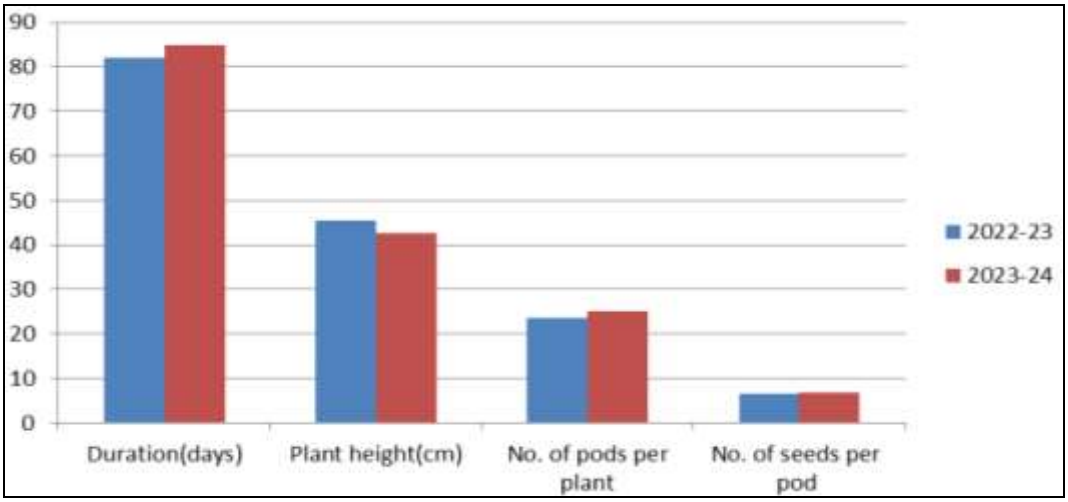
Extension Gap

Extension gap is gap between yield of demonstrated plot and farmers practice. Extension gap is recorded to be 2.1qha^{-1} & 1.8 q ha^{-1} respectively which is solely due to non-adoption of high yielding varieties and delayed sowing (1st week of October). Maximum use of the latest production technologies with high yielding recommended varieties of pulse crops will subsequently help in reducing this alarming trend of galloping extension gap

Technology Index

Technology index indicates the feasibility of the evolved technology in the farmers' field. The lower value of technology index, higher is the feasibility of the improved technology. It was observed that the mean technology index of 9.41 per cent & 7.05 percent was recorded in CFLD programmes under the clusters, which showed the efficacy of good performance of technical interventions. The existence of strong gap in technology generated by the research institutes and technology dissemination to the farmers can only be overcome by CFLD programme which can accelerate the level of adoption of improved technologies and help in attaining self-sufficiency in pulse production and getting more income of farmers.

Other morpho physiological traits



Morpho physiological traits

Table 3: Morpho physiological characters of Blackgram variety SBC 40 under CFLD programme for the year 2022-23 & 2023-24.

Year	Date of sowing	Date of harvesting	Duration(days)	Plant height(cm)	No. of pods per plant	No. of seeds per pod
2022-23	12.09.2022	05.12.2022	82	45.5	23.5	6.5
2023-24	15.09.2023	10.12.2023	85	42.6	25.1	6.9

Economics of the study

The economic analysis of the datas for the consecutive two years showed better performance of the demonstration over the check plot. The gross return, net return and B.C ratio of the study for the last two years is recorded to be Rs. 61600.00,Rs. 42200.00, 3.18(2022-23) & Rs. 54905.00, Rs. 36155.00 & 1.92(2023- 24) respectively. While in farmers plot the results obtained are Gross return (Rs. 44800.00), Net return (Rs. 27300.00), B: C ratio 2.56 (2022-23) and Gross return Rs. 42395.00, Net return Rs. 24395.00 and B: C ratio 1.35 for the year 2023- 24.(Table no. 04) Hence, by adopting proven technologies of black gram, yield potential and economic returns from black gram cultivation can be raised for the farming community. These results were in line with the earlier findings by Kumar *et al.* (2014) [2] and Anuratha *et al.* (2018) [1].

Table 4: Economic analysis of CFLD's on pulse crops in Darrang district of Assam

Year	Area	No. of demo	Cost of cultivation(Rs/ha)		Gross return(Rs/ha)		Net return(Rs/ha)		B:C ratio	
			CFLD	FP	CFLD	FP	CFLD	FP	CFLD	FP
2022	20	60	19400	17500	61600	44800	42200	27300	3.175	2.56
2023	20	91	18750	18000	54905	42,395	36,155	24,395	1.92	1.35

Photographs

Seedling stage

Seedling stage

Crop at maturity stage

Crop at pod bearing stage

Field day

Training

Conclusion

In a nutshell we can conclude from the study that the yield and returns in blackgram crop increased substantially with the improved agro-techniques and use of high yielding varieties. However, the grain yield level under CFLDs was better than the farmer's practice and performance of the variety could be further improved by adopting recommended agro-techniques. So, there is need to disseminate the improved agro-techniques among the farmers with effective extension methods like training and field demonstrations. The farmers should be encouraged to adopt the recommended agro-techniques for getting maximum returns in specific locations

Conflicts of interest: The authors have no conflicts of interest

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