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Impact analysis of cluster frontline demonstrations on blackgram in Bishnupur district, Manipur

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Abstract
The study attempted to analyse the overall effectiveness of the Cluster frontline demonstrations (CFLDs) conducted by the Krishi Vigyan Kendra, Bishnupur, from 2016 to 2021 using Improved cultivation technologies on blackgram. A combination of experimental and before-after research designs was used, and 325 beneficiaries were selected for conducting the CFLDs. The obtained results from both the demonstrated and local check plots were compared, and the average yield of the improved blackgram variety PU-31 from the demonstrated plots was significantly higher than that from the local check plots during these years. The highest average yield was obtained in CFLDs (920 kg/ha), with 47 percent more against farmers' practice (630 kg/ha). The average extension gap, technology gap and technology index were 290.8 kg/ha, 437.2 kg/ha and 33.6 percent, respectively. The average gross returns (Rs. 66560/ha), net returns (Rs. 36318 /ha) and benefit-cost ratio (2.20) were higher in improved practice when compared to farmers' practice.

Keywords: CFLD, economics, extension gap, farmers' practice, technology gap, technology index, yield

Introduction
Black gram is one of the important pulse crops grown throughout India. It is consumed in the form of 'dal' (whole or split, husked and un-husked) or perched. It is used as nutritive fodder especially for milch animals. It is also green manuring crop. High values of lysine make urdbean an excellent complement to rice in terms of balanced human nutrition. Kharif blackgram is mostly sown in August-September and harvested in November-December. The PU-31 is a bold seeded Yellow Mosaic Virus (YMV) tolerant blackgram variety with crop duration of 75-85 days depending on the environmental condition. Indian government imports large quantity of pulses to fulfill domestic requirement of pulses. In this regard, to sustain this production and consumption system, the Department of Agriculture, Cooperation and Farmers Welfare had sanctioned the project "Cluster Frontline Demonstrations on kharif pulses from 2015-16'' to ICAR-ATARI, Umiam (Barapani) through National Food Security Mission. The basic strategy of the Mission is to promote and extend improved technologies, i.e., seed, micro-nutrients, soil amendments, integrated pest management, farm machinery and implements, irrigation devices along with capacity building of farmers. This project was implemented by Krishi Vigyan Kendra, Bishnupur of Zone-VII in Bishnupur district with main objective to boost the production and productivity of pulses through CFLDs with latest and specific technologies. In keeping view of this, KVK, Bishnupur had planned and executed Cluster Frontline Demonstrations with improved technologies in blackgram under different farming situations with closer supervision and monitoring of the KVK Scientists which helps in increasing productivity and economic return to analyze yield gap and technology gap in blackgram cultivation with the best management practices.

Methodology
Cluster Frontline Demonstrations (CFLDs) were conducted by Krishi Vigyan Kendra, Bishnupur District, Manipur with the latest improved crop production technologies in blackgram during six consecutive *kharif* seasons i.e. from 2016 to 2021. The CFLDs were conducted in six selected clusters in Bishnupur district i.e. Utlou, Thinungei, Salankonjil, Kumbi, Saiton and Keinou of different farming situations under National Food Security Mission (NFSM). The selection of beneficiaries was through Participatory Rural Appraisal (PRA) technique, baseline survey, later active meetings, group discussions, and field diagnostic visits.

A total of 325 demonstrations were conducted in six consecutive *kharif* seasons i.e. from 2016 (50 Nos.), 2017 (100 Nos.), 2018 (50 Nos.), 2019 (50 No.), 2020 (50nos.) and 2021 (25 Nos.). The improved technology was demonstrated in one acre area of selected farmers' field and adjacent one acre was considered as control plot of same the farmer. To study the yield gap between potential and actual yields, beneficiaries were selected through group discussions. The selected beneficiaries were given pre-seasonal training and briefed about the improved package of practices for successful implementation of CFLDs, and provided the need based critical inputs for an area of one acre *viz*., blackgram seed of PU-31, seed treatment with Carbendazim+Mancozeb @ 1 g/kg seed, Imidacloprid @ 1 ml/7ml of water for one kg seed, rhizobium @ 20 g/kg seed, spraying of need based plant protection chemicals was done to control the pests and diseases. The technology gap, extension gap, technology index, and economic parameters were compared with farmers' practice.

Technology gap = Potential yield - Demonstration yield

Extension gap= Demonstration yield - Farmer's yield

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demontration yield}}{\text{Potential yield}} x\ 100$$

Results and Discussion

Adoption gap

The adoption gap is an important factor influencing productivity of blackgram. The yield gap analysis was evaluated through extension gap, technology gap and technology index. The extension gap showed an increasing trend. The extension gap was ranged from 260 to 307 kg/ha during the investigation period with an average of 290.8 kg/ha during six consecutive years (Table 1). Need arisen to educate the farmers on adoption of improved technologies as a wide gap between improved practice vs farmers' practice was observed. The yield of the cluster front line demonstrations and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology index and Technology gap. The trend of technology gap (ranging between 380-500 kg/ha) reflects the farmer's cooperation in carrying out such demonstrations with encouraging results in subsequent years. Similar finding was recorded by Katare *et al.* (2011) [2] and Sharma and Sharma (2004) [1] in oil seeds. From these results it is evident that the performance of the technology demonstrated was found to be better than the farmers practice under same environment conditions. The farmers were motivated by seeing the results in terms of productivity and they are now adopting the blackgram variety PU 31 with improved package and practices. The increase in percent of yield was ranged from 47.7 to 60 during the six years of study. The results clearly indicate the positive effects of CFLDs over the existing practices toward enhancing the yield of blackgram in Bishnupur district with its positive effect on yield attributes (Table1). Benefit-Cost ratio was recorded higher under demonstration against control in all the years of study (Table 2). The farmers were motivated by seeing the results in terms of productivity and they are now adopting the blackgram variety PU 31 with improved package and practices. The technology gap was higher and reflecting on farmers' due to non cooperation on demonstration of improved technologies and poor extension activities. This might be attributed to different parameters, *viz.* soil fertility status, crop suitability, and variations among dates of sowing and weather parameters. Similar observations were reported by Kumbhare *et al*., (2014) [3]; Nain *et al*., (2015) [4]; Jyothi & Subbaiah (2019) [1]; Pawar *et al*., (2018) [6] & Rai *et al*., (2020) [7]; Strengthening of extension programs and location-specific on-farm research, encouragement and adoption of the improved package of practices lower the technology gap. The technology index is dependent on the technology gap, and it is expressed in percentage (%). The higher value of technology index shows lower adoption of improved technologies by the farmers. The technology index of six years in demonstrations ranged from 29.2 to 38.5 percent with an average of 33.6 percent (Table 1). The lower technology index was observed (29.2%) during *kharif* 2021 due to the interventions of KVK Scientists, adoption of the improved practices by the farmers. Timely and need based suggestions by KVK scientists, extension personnel, favourable climatic conditions and low incidence of pests and diseases favoured lower technology index. These findings were in conformity with Reager *et al*., (2020) [8]; Pawar *et al*., (2017 & 2018) [5, 6] in groundnut, and Shaktawat & Chundawat, (2021) [9] in oilseed crops and Singh (2022) [11] in wheat. From these results it is evident that the performance of the technology demonstrated was found to be better than the farmers practice under same environment conditions. The farmers were motivated by seeing the results in terms of productivity and they are now adopting the blackgram variety PU 31 with improved package and practices. The technology index showed the feasibility of evolved technology at the farmer's fields. The lower value of technology index the more is the feasibility of technology. As such fluctuation in technology index (ranging between 20.90-16.76%) during the study period in certain region may be attributed to the dissimilarity in soil fertility status, weather conditions, non-availability of water and insect pest attack in the crop. The benefit cost ratio of cluster front line demonstrations presented in Table 3 clearly showed higher benefit cost ratio of recommended practices than control plot in all the years of study. Hence, favourable benefit cost ratios proved the economic viability of the interventions and convinced the farmers on the utility of interventions.

Table 1: Performance of improved technology on pod yield, extension gap, technology gap and technology index in blackgram during *kharif* 2016 to 2021

Year	Demonstration	Varieties		Yield			Percent increase over local yield	Extension gap (%)	Technology gap (%)	Technology index (%)
		CFLD	Farmer's Practice	Potential	CFLD	Farmer's Practice				
2016	50	PU-31	T-9	12-14	800	500	60.0	300	500	38.5
2017	100	PU-31	T-9	12-14	857	550	55.8	307	443	34.1
2018	50	PU-31	T-9	12-14	853	579	47.3	274	447	34.4
2019	50	PU-31	Uttara	12-14	835	575	45.2	260	465	35.8
2020	50	PU-31	Uttara	12-14	912	605	50.7	307	388	29.8
2021	25	PU-31	Uttara	12-14	920	623	47.7	297	380	29.2
Average				13	863	572	51.1	290.8	437.2	33.6

Table 2: Impact of improved technologies on economics of blackgram during *kharif* 2016 to 2021

Year	Gross Cost (Rs./ha)		Gross Return (Rs./ha)		Net Return (Rs./ha)		B:C	
	CFLD	Farmers' practice	CFLD	Farmers' practice	CFLD	Farmers' practice	CFLD	Farmers' practice
2016	25000	20000	40000	24000	15000	4000	1.61	1.20
2017	35000	32000	68560	44000	33560	12000	1.96	1.37
2018	28700	20749	68240	46320	39540	18571	2.38	1.67
2019	30200	26200	66800	46000	36600	19800	2.21	1.76
2020	31000	27000	72960	48400	41960	21400	2.35	1.79
2021	31550	27700	82800	49840	51250	22140	2.62	1.80
Average	30241	25608	66560	43093	36318	16318	2.20	1.60

Conclusion

The Cluster Frontline Demonstrations organized by KVK, Bishnupur had significantly increased yield in Blackgram. The pod yield of blackgram was increased upto 47.0 percent in improved practices over the farmers' practice. It is concluded from the above findings of CFLDs on Blackgram var. PU 31, that the technology gap can be reduced to a considerable extent by adopting scientific methods of blackgram cultivation thus leading to increase productivity of blackgram in the district. It was observed that potential yield can be achieved by imparting scientific knowledge to the farmers, providing the quality need based inputs and their proper utilization. Horizontal expansion of improved technologies may be achieved by implementation of various extension activities like training programme, field day, exposure visit etc. organized in CFLD programmes in the farmer's fields. Moreover, Krishi Vigyan Kendra in the district need to play the lead role in providing proper technical support to the farmers through different educational and extension activities to reduce the extension gap for better pulse production in the district.

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