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Impact of cluster frontline demonstrations (CFLD) on yield of black gram (*Vigna mungo*) under rainfed conditions in Kathua district of Jammu and Kashmir

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Abstract
The study was carried out by Krishi Vigyan Kendra, Kathua, to know the yield gaps between improved package and practices under cluster front line demonstration (CFLD) and farmer's practice (FP) of Black gram crop under rainfed conditions. Cluster Front line demonstrations on Black gram were conducted on farmer's fields during Kharif seasons of twosequentialyearsi.e2017 and 2018 under National Food Security Mission (NFSM), Govt. of India to demonstrate the impact of enriched agro-techniques on production and economic benefits under rainfed conditions. CFLD's were conducted in 10 hectare area for two years with active involvement of farmers and scientific staff of KVK. According to analysis of data the highest grain yield was obtained in demonstrated plots with an average of 9.45 q/ha as compared to local check with an average of 6.2 q/ha. An average mean of extension gap, technology gap and technology index were calculated as 3.25 q/ha, 5.55q/ha, 36.66 percent, respectively. Adoption of improved package of practices in black gram cultivation recorded average higher B:C ratio (5.45) as compared to Farmers Practice (3.61) during the period of study. Thus, the productivity of black gram could be increased with the adoption of recommended improved package of practices. The study resulted in satisfying the farming community for higher productivity and returns.

Keywords: Black gram, front line demonstrations, technology gap, impact, yield

Introduction
Kathua district of Jammu and Kashmir in India is situated at 320 17' to 320 55' North Latitude and 750 70' to 760 16' East Latitude with an elevation of 393 metres (1,289ft). India is the world's largest producer as well as consumer of black gram. It produces about 2.93 million tonnes of black gram annually from about 4.49 million hectare of area. with an average productivity of 651 kg/ha (Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India 2016-2017). Black gram is an important kharif pulse crop of rainfed region of Kathua district of Jammu and Kashmir The productivity of pulses in the district is low as compared to national average, mainly due to poor crop management practices, untimely and inadequate availability of quality seed of improved black gram varieties and other inputs. Besides this lack of technical knowledge further incites the problem of poor productivity (Kumar *et al*. 2014) [8]. Black gram (*Vigna mungo*) is a widely grown legume, it is a short duration crop mainly grown in summer season. It has special characteristics of restoring soil fertility through fixing atmospheric nitrogen in symbiotic association with Rhizobium bacteria present in root nodules. PU-31 is bold seeded and resistant to yellow vein mosaic virus with crop duration of 80-85 days depending on the environmental conditions. KVKs are grass root level organisations meant for spreading of technology through refinement, assessment and demonstration of proven production technologies under different micro- farming situations (Das, 2010) [3]. The main aim of Krishi Vigyan Kendra is to reduce the time lag between generations of technology at the research and its transfer to the farmers for increasing productivity and income from agriculture and allied sectors. The main objective of Cluster Front Line Demonstration under National Food Security Mission was to demonstrate improved Crop Production Technologies of Pulses on the farmers' fields and to popularize the newly

notified and improved varieties/technologies for varietal diversification and efficient management of resources. The present investigation was undertaken to study the impact of Cluster Frontline Demonstrations on yield of black gram (*Vigna mungo*) under rainfed Conditions in Kathua District of Jammu and Kashmir with the objectives of increasing productivity and executed to narrow down the time lag and ensured speedy adoption of technologies in District

Materials and Methods

Cluster Front Line demonstrations (CFLDs) on improved farm technology (Table 1) were conducted by Krishi Vigyan Kendra Kathua of SKUAST-Jammu in blackgram (PU-31) during Kharif 2017 and Kharif 2018 under rainfed conditions on 20 ha. area of Kathua district covering 100 farmers. The soil of CFLD's was sandy loam to sandy clay loam and the pH of soil is near about 6.8 to 7.4.The improved technology such as method of line sowing, improved variety, seed treatment with bio-control agent, weed management and integrated pest management practices was maintained during period of study. Seed treatment was done with *Trichoderma* @ 4g/kg of seed before sowing to protect the crop against fungal diseases upto 15-20days after sowing. The seed rate of black gram was kept 20kg/ha in demonstration plots. The sowing of black gram was done during 18th July to 25th July during the study period. The spacing between row to row and plant to plant was kept 30x10cm for the cluster front line demonstrations. The fertilizers were also given as basal dose. Spraying of Pendimethalin as pre-emergence @ 3lt./ha. to check the weed growth and IPM Practices like use of pheromone traps, yellow sticky traps for controlling of white flies, spraying of Neem oil as preventive measures and rouging were practised in the demonstrated plots. The data were collected from beneficiary farmers through personal interviews and after that data was tabulated and analysed to find out the findings and conclusion. The yield increase in demonstrations over farmer's practice was calculated by using the following formula.

$$\text{\% Yield increase over farmer's practice} = \frac{\text{Demonstration average plot yield} - \text{Farmer's average plot yield}}{\text{Farmer's average plot yield.}}$$

Estimation of technology gap, extension gap and technology index: The estimation of technology gap, extension gap and the technology index were worked out by using following formula (Kadian *et al.* 1997; Samui *et al.* 2000) [6, 10]

- Technology yield gap= Potential yield – Demonstration plot average yield
- Extension yield gap= Demonstration plot average yield – Farmer's plot average yield
- $\text{Technology index} = \frac{\text{Technology yield gap}}{\text{Potential Yield}} \times 100$

Results and Discussion

The findings of the study as well as relevant discussion have been conferred under following points:

Grain Yield: Data presented in Table 2 revealed that transfer of improved technology under Cluster frontline demonstrations in black gram resulted in higher yield as compared to farmer's practice. The higher yield in demonstration plot was due to improved variety of seed, seed treatment with biocontrol agent, Integrated Pest Management practices. The average seed yield of demonstration plots was 9.45q/ha (Table 2) which was higher as compared to farmers practice (6.2q/ha). The increased yield percentage over control was 52.41% in cluster Front Line Demonstrations over local check. However, the seed yield of 9.45q/ha in CFLD's was low as compared to potential yield (15q/ha) of black gram variety PU-31 due to attack of pod borer and infestation of yellow mosaic virus. The yield enhancement through adoption of improved technology has also been reported in earlier studies of FlD's (Kothyari *et al.* 2018) [7] and Kumar *et al.* 2019 [9]. Yield of the front line 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) [5].

Extension yield gap: An average extension gap between demonstrated practices and farmers practices was recorded 3.25q/ha (Table 2). Higher extension gap in present study suggested that there is a need to motivate and aware the farmers for adoption of improved technologies in blackgram over existing local farm practices. The similar results were also reported by Bairwa *et al.* 2013 [1] and Ganga Devi *et al.* 2018 [4].

Technology yield gap and Technology index: The technological gaps, generally appear even if the CFLD's were conducted under the strict direction of farm scientists on the farmer's field. The data presented in table 2 showed that the value of technological gap was higher (5.6q/ha) during the year 2018-2019 while during 2017-2018 the technology gap was 5.5qha. The technology gap observed may be attributed to the dissimilarity in soil status, lack of irrigation facilities, non congenial weather conditions, disease and pest attacks and change in the position of demonstration plots every year. Technology index specified the feasibility of the generated technology at the farmer's fields under existing agro-climatic conditions (Vedna *et al.* 2007) [11]. The results of table 2 revealed that value of technology index was 36.6% and 37.33% during 2017-2018 and 2018 -2019 respectively, where as the average value of technology index was recorded 36.6%. Lower the value of the technology index more is the feasibility and applicability of the tested technology. This showed that a gap existed between technology evolved and technology adopted at farmer's field The similar results were also observed by Gangadevi *et al.* (2018) [4] and Choudhary *et al*. 2009 [2].

Table 1: Technology demonstrated in CFLD's and Farmer's Practice

S. No	Practice	Demonstrated practice	Farmers Practice
1	Field Preparation	2 Ploughings	Single Plough
2	Method of Sowing	Line Sowing	Broad casting
3	Variety	PU-31	Him Mash
4	Seed treatment	*Tricoderma* @ 5gm/Kg of seed	No seed treatment
5	Seed rate and spacing	20Kg/hectare and 30X10 cm	35 Kg/hectare and 22X8 cm

6	Fertilizer dose	NPK as basal dose Urea 10 kg/ha and DAP 80-100Kg/ha	Urea – Nil DAP- Nil
7	Weed Management	Pendimethalin @ 3ltr/ha	No Pre emergence Herbicide
8	IPM Measures	IPM practices like use of Pheromones traps, yellow sticky traps, spraying of neem oil and rouging	More use of pesticides
9	Technical Guidance	time to time	Nil

Table 2: Year wise productivity, extension gap, technology gap and technology Index of Black gram as grown under CFLD's and existing package of Practices

Years	Yield q/ha		Increase yield % over Control	Extension gap (q/ha)	Technology Gap (q/ha)	Technology Index %
	Demo	Farmer's practice				
2017-18	9.5	5.7	66.66%	3.8	5.5	36.66
2018-19	9.4	6.7	40.30%	2.7	5.6	37.33
Mean	9.45	6.2	52.41	3.25	5.55	36.66

Table 3: Cost of cultivation, Gross return, Net return and B:C Ratio of Black gram as grown under CFLD's and existing package of practices

Years	Cost of Cultivation (Rs/ha)		Gross return (Rs/ha)		Net Return (Rs/ha)		B:C Ratio	
	Demo	Farmer's practice	Demo	Farmers Practice	Demo	Farmers Practice	Demo	Farmers Practice
2017-18	11,500	6,800	61,750	37,050	50,250	25,550	5.3	3.2
2018-19	12,500	7,000	70,500	50,250	58,000	37,750	5.6	4.02
Mean	12,000	6,900	66,125	43,650	54,125	31,650	5.45	3.61

Economic analysis of Cluster Front Line Demonstrations: Average cost of cultivation of demonstration plot (Rs.12,000/ha.) is more as compared to Farmer's Practice (Rs.6900/ha.). The data in table 3 clearly clarified the implication of Cluster front line demonstration at farmer's field during the period of study in which higher average net return (Rs. 54,125/ha) were acquired under demonstration plots as compared to farmer's practice (Rs. 31,650/ha). Benefit cost ratio recorded was also higher in demonstration plots (5.45) as compared to farmer's practice (3.61). Increased monetary returns as well as Benefit Cost (B:C) ratio through improved farm technology have also been reported by various workers (Vedna *et al*., 2007 and Bairwa *et al*., 2013) [11, 1].

Conclusion
The present study indicated that the incorporation of improved farm technology practices along with active participation of farmer's of the area has positive effect on increase ng the grain yield and Economic return of Black gram in Kathua district. The economic viability of suitable technology for increasing the productivity of Black gram motivated the farmers towards adoption of technologies demonstrated at farmers field.

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