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# Effect of Cluster Front Line Demonstrations (CFLDs) on the Pulses (Black Gram & Chickpea) Production and Productivity in Reasi and Udhampur Districts of Jammu & Kashmir, India

***Banarsi Lal[1*] and Lobzang Stanzen[2]***
*[1]Senior Scientist & Head, KVK, Reasi, SKUAST-J (J&K), India.*
*[2]SMS, KVK, Reasi, SKUAST-J (J&K), India.*

*(Corresponding author: Banarsi Lal* dr.banarsi2000@gmail.com, 7889875590)*
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**ABSTRACT: The present study was conducted to evaluate the performance of Cluster Frontline demonstrations (CFLDs') on pulses production and productivity in Reasi and Udhampur distts. of Union Territory of Jammu & Kashmir. Pulses productivity in the Union Territory of Jammu Kashmir, India is lesser than the national averages because of rain fed conditions, hilly terrains, lack of crop management practices and lack of availability of seed of improved varieties. Cluster Frontline Demonstration (CFLD) programme initiated by the Govt. of India is an ideal and efficient tool for the transfer of technology in an effective way. This initiative is helpful to bridge the technological yield gaps in pulses. Cluster Frontline demonstrations (CFLDs') on blackgram (*Vigna mungo*), and chickpea (*Cicer aeritinum*) were laid in different locations of Udhampur and Reasi distts. of Union Territory of J&K from 2020-21 to 2022-23 in total of 498 demonstrations in 51.36 ha by Krishi Vigyan Kendra (KVK), Reasi of SKUAST-J (J & K). The CFLDs were laid under rainfed conditions and different varieties of pulses were evaluated on the basis of production and productivity. The technological extension yield gaps in pulses crops were studied for 3 years during 2020-21 to 2022–2023 under CFLD programme in Reasi and Udhampur Districts of Jammu Kashmir, revealing that there was a wide yield gap between potential demonstration yields due to technology extension yield gaps. In case of black gram in 2020-21, 2021-22 and 2022-23, the % increase in yield was 63.04 %, 69.50 % and 64.58 % respectively while in case of chickpea the percentage increase in yield was 57.41 %, 60.00 % and 64.31 % respectively during the same period. Therefore, the result indicates that improved farm technology contribute to increase the production and productivity of pulses through Cluster Frontline Demonstrations (CFLDs) programme in hilly distts. Reasi and Udhampur of Union Territory of Jammu and Kashmir.**

**Keywords:** Pulses, Production, CFLDs, Extension, Adoption.

## INTRODUCTION

Agricultural sector dominates the Indian economy. Although Indian agriculture has made remarkable progress but still the Indian agriculture depends on the monsoons to yield the sufficient agricultural returns. Wheat and paddy are the major crops grown in India with pulses as the second choice for the farmers for cultivation. India is the largest producer and consumer of pulses in the world, accounting for about 25% of global production, 27% of consumption and 34% of food use (F.A.O.). India is also the top importer with 11% share of global imports during 1995-2001 (Gregory *et al.,* 2003). Over a period of time, a number of improved varieties and production technologies of pulses have been developed. Full potential of these varieties and technologies could not be exploited due to rain fed condition, low rate of adoption and low yields. Thus, there is need to popularize these varieties and production technologies for pulses. The objective of CFLDs is to increase production and productivity of pulses through transfer of farm technology. The endeavors were taken with planning, execution and follow-up action of pulses production technology through Front Line Demonstrations (Sumathi, 2012).

Both the hilly districts namely Reasi and Udhampur of fall in the mid hill zone of Union Territory of Jammu & Kashmir. Krishi Vigyan Kendra (KVK), Reasi is catering the farming problems of farmers in both of these distts. Majority of area (about 93 per cent) of both the districts is rain fed with only about 7 per cent as irrigated area. Maize, wheat, paddy, mustard and pulses like black gram (mash) and chickpea are the major pulse crops of both the districts. Both the districts are endowed with a wide variety of agro-climatic conditions, soil types that enable the cultivation of different types of pulses in the area. Black gram (*Vigna mungo* L) and chickpea (*Cicer aeritinum* L) are the main pulses crops grown in both the districts. The productivity of pulses in both the districts is low as compared to national global average, mainly due to their cultivation under rain fed conditions, hilly terrains

besides lack of proper crop management practices (Sanjeev *et al.,* 2014; Sharma *et al.,* 2012). The average yield of pulses in Jammu and Kashmir is 535 kg $ha^{-1}$ which is far behind than the national average *i.e.*764 kg $ha^{-1}$ the world average productivity of 871 kg $ha^{-1}$ (*Directorate of Economics & Statistics, M/A, GoI 2014-15*). It is also due to the lack of availability of quality seeds of pulses. Besides this, lack of technical know-how, lack of adoption of improved plant protection techniques, integrated nutrient management, integrated weed management further aggravate the problem of poor productivity of pulses in the district (Kumar *et al.,* 2016; Kumar *et al.,* 2014). Pulses are important component of Indian agricultural economy next to food grains and oilseeds in terms of acreage, production economic value (Choudhary, 2009).

Pulse production in India has fluctuated widely leading to a steady decline in the per capita availability over last 20 years (Gregory *et al.,* 2003). Thus, there is a great challenge for policy makers, agricultural scientists, extension functionaries and farmers to enhance the pulses production and productivity to mitigate the pulses requirements in our daily diet. The Cluster Frontline Demonstrations (CFLDs) is a novel approach to provide a direct link between the scientist and the farmer for the transfer of technologies and get feedback from the farmers. CFLDs in pulses is a unique programme initiated by the Govt. of India to increase the pulses production. The proposed Centrally Sponsored Scheme 'National Food Security Mission (NFSM) is to eperationalise the resolution of NDC and enhance the production of rice, wheat and pulses (Anonymous, 2011). The concept of CFLDs was put forth under this scheme. The scheme is implemented in a mission mode through a farmer centric approach. Major objective of CFLDs' on pulses is to demonstrate and popularize the improved farm technology at farmers' fields under varied farming conditions, for effective transfer of generated technology, fill the gap between improved technology and indigenous technologies to enhance pulse productivity, farm gains for sustaining the production systems especially under rain fed farming (Choudhary *et al.*, 2009b).

Krishi Vigyan Kendra (KVK), Reasi was established in 2005 under Sher-e- Kashmir University of Agricultural Sciences & Technology (SKUAST-J) of Jammu with the main mandate to layout Front Line Demonstrations (FLDs) on various crops. Before the establishment of KVK, there was less area under pulses in both Reasi and Udhampur districts of Jammu & Kashmir and farmers were using the traditional varieties. Krishi Virgin Kendra (KVK), Reasi introduced many improved varieties of both both Rabi and Kharif season pulses in both Reasi and Udhampur districts. Cluster Front Line Demonstrations (CFLDs) on black gram and chickpea were conducted in both the districts during 2020-2021-2022-23 with area (13.10 ha), (area 18.26 ha) and (area 20.00ha) respectively. There is need of expansion of area, increase in production and productivity of pulses in Reasi and Udhampur distts. of J&K.

Keeping in view the above facts, the present investigation was undertaken to demonstrate and transfer the generated farm technology through CFLDs' in pulses under rain fed production systems with the objectives of enhancing production, productivity and profitability narrowing in the extension yield gaps. Technological extension yield gaps under pulses in this comprehensive study are also presented in this paper for framing appropriate extension strategy for effective transfer of technology to target farmers of both Reasi and Udhampur districts of Jammu & Kashmir.

## MATERIALS AND METHODS

Cluster Frontline demonstrations (CFLDs') on improved farm technology (Table 1) were conducted by Krishi Vigyan Kendra (KVK), Reasi of SKUAST-J, J&K in Kharif and Rabi pulse crops namely black gram (*Vigna mungo*) and chickpea (*Cicer aeritinum*) during 2020-21, 2021-22 and 2022-23 under rainfed conditions in 51.36 ha area of Reasi and Udhampur districts of Jammu & Kashmir covering 498 farmers (Table 2). In CFLDs' plot, full package of recommended practices was followed whereas, in the adjoining farmers' fields, crops were grown as per the practices followed by the farmers which served as control/local check (Table 1). The study area is located in the North-Western Himalayas with tropical to sub-tropical conditions.

Before the introduction of interventions under pulses, PRAs were conducted in the different villages. Awareness-cum-training programmes were organised while conducting the CFLDs. Finally field days were also conducted by involving the beneficiaries, other farmers in the village, scientists of KVK and other extension functionaries. The primary data on grain yield farmers' practices was collected from the beneficiary farmers by personal interviews. The yield increase in demonstrations over farmers' practice was calculated by using the following formula:

% **Yield increase over farmers' practice** = Demonstration average plot yield—farmers average plot yield × 100/ %Farmers average plot yield

**Economic analysis of Cluster Front Line Demonstrations (CFLDs) on pulses:** Cost of cultivation of pulses include cost of inputs such as seeds, fertilizers, pesticides and weedicide purchased by the farmers (in farmers' practice)/supplied by the Krishi Vigyan Kendra, Reasi (in demonstration plots) as well as hired labour (if any), sowing charges of bullocks/tractor (if any) post harvest operation charges (if any) paid by the farmers. The farmers' family labour was not taken into consideration in the present study. The gross net-returns were worked out accordingly by taking cost of cultivation price of grain yield of respective pulses into consideration. Similarly, the Benefit-Cost-Ratio (BCR) was also worked out as a ratio of net-returns corresponding to the costs of cultivation as followed by Vedna *et al.* (2007).

## RESULTS AND DISCUSSION

**Grain yield:** Improved package and practices on pulses are more important with technological interventions for production and productivity of pulses. Data presented in Table 2 revealed that transfer of improved farm technology under Cluster Frontline Demonstrations

(CFLDs') in pulses (both Kharif and Rabi) resulted in invariably higher grain yield of pulses under demonstration plots than farmers' plot yield, which may be attributed to the adoption of recommended agro technologies in CFLDs' during study period. Sagar and Chandra (2004); Sharma *et al.* (2012), Choudhary (2009b); Bezbaruah and Deka (2020); Lal *et al.* (2021); Shukla *et al*. (2022) have also reported yield enhancement by the use of recommended agro-technologies in FLDs'. Data in Table 2 revealed that percent yield increased in pulses in demonstration plots over farmers' plots was lowest in chickpea var. GNG-2144(57.14%) during 2020-21 while it is highest in blackgram var. PU-31 (69.56 %) during 2021-22. This study indicated that with the adoption of improved farm technologies in pulse crops, the productivity increased from 5.60 to 9.53 q $ha^{-1}$ in chickpea var., GNG-1581.

**Table 1: Differences between technological interventions (demonstration plot) and farmers practices under CFLDs in Pulses in Reasi and Udhampur districts of Jammu and Kashmir.**

| Crop | Technology Component | Demonstration Plot | Farmers Practice |
|---|---|---|---|
| **Chickpea** | Variety | GNG-1581/GNG-2144 | Local/own seed |
| | Seed Rate | 50Kg/ha | 60-70kg/ha |
| | Sowing Method | Line Sowing/Broadcasting | Broadcasting |
| | Fertilizer Dose | 90Kg DAP/ha in inorganic Conditions or 7.5 t/ha of vermicompost or 10 t/ha FYM In organic fields | No DAP |
| | Plant Protection | Seed Treatment with Carbondazim@2.5g/kg seed or trichoderma 5gm/kg of seed in Demonstration average plot yield—farmers average plot yield | NIL |
| | Technical guidance | Time to time | Rarely |
| | | | |
| **Blackgrm** | Variety | PU-31/Uttra | Local/own seed |
| | Seed Rate | 15Kg/ha | 40kg/ha |
| | Sowing Method | Line Sowing/Broadcasting | Broadcasting, deep sowing |
| | Fertilizer Dose | 90Kg DAP in inorganic conditions /ha or 7.5 t/ha of vermicompost or 10 t/ha FYM in organic fields | Fertilizers: NIL |
| | Plant Protection | Seed Treatment with Carbondazim@2.5g/kg seed or trichoderma 5gm/kg of seed in Neem oil in organic fields/ imidaclorprid 200SL or fipronil 5 SC (0.3%) in inorganic fields | NIL |
| | Technical guidance | Time to time | NIL |

In case of black gram there was 63.04 % increase in yield in 2020-21 of var.PU-31, 69.56 % in 2021-22 of Var.PU-31/Uttra and 64.58 % in 2022-23 of Var.PU-31 over the farmers plots while in case of chickpea there was 57.14 % increase in yield in 2020-21 of Var.GNG-2144, 60.00 % in 2021-22 of Var. GNG-2144 and 64.31 % in 2022-23 of Var.GNG-1581 over the farmers plots. The yield enhancement through adoption of improved farm technology has also been reported in earlier studies of FLDs' (Kumar *et al.,* 2014; Kumar *et al.,* 2016; Kumar *et al.,* 2015**;** Vedna *et al.*, 2007; Sharma *et al.,* 2012; Choudhary, 2009a 2009b; Lal *et al*., 2021).

**Table 2: Year wise Crop wise result of demonstrations of pulses.**

| *Crop* | *Variety* | *Farming situation* | *No. of Demo.* | *Area (ha)* | *Yield (q/ha)* | | | | *% Increase* | **Economics of demonstration (Rs./ha)* | | | | **Economics of check (Rs./ha)* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Demo* | | | *Check* | | *Gross Cost* | *Gross Return* | *Net Return* | *** BCR* | *Gross Cost* | *Gross Return* | *Net Return* | ***BCR* |
| | | | | | H | L | A | | | | | | | | | | |
| Pulses (2020-21) | PU-31 | Rainfed | 23 | 3.1 | 7.8 | 5.7 | 7.5 | 4.6 | 63.04 | 16700 | 51600 | 34900 | 01:03.1 | 15200 | 39600 | 24400 | 01:02.6 |
| | GNG-2144 | Rainfed | 88 | 10 | 12.2 | 5.6 | 8.8 | 5.6 | 57.14 | 9630 | 44900 | 35270 | 01:04.7 | 9240 | 31100 | 21860 | 01:03.4 |
| Pulses (2021-22) | PU-31/Uttra | Rainfed | 51 | 8.26 | 9 | 6.4 | 7.8 | 4.6 | 69.56 | 17900 | 59600 | 41700 | 01:03.3 | 15600 | 40200 | 24600 | 01:02.6 |
| | GNG-2144 | Rainfed | 96 | 10 | 12.6 | 5.8 | 9.12 | 5.7 | 60 | 10900 | 47900 | 37000 | 01:03.3 | 9740 | 31000 | 21260 | 01:03.2 |
| Pulses (2022-23) | PU-31 | Rainfed | 92 | 10 | 9.6 | 6.5 | 7.9 | 4.8 | 64.58 | 15900 | 43100 | 27200 | 01:02.7 | 18800 | 66300 | 47500 | 01:03.5 |
| | GNG-1581 | Rainfed | 148 | 10 | 13.5 | 6.2 | 9.53 | 5.8 | 64.31 | 12800 | 52700 | 39900 | 01:04.1 | 9920 | 33000 | 23081 | 01:03.3 |

**Economic analysis of front line demonstrations:** The average net return in case of black gram of Var.PU-31 in 2020-21 was Rs. 34900/ha while in case of chickpea of Var.GNG-2144 in 2020-21 it was Rs. 35270/ha. B: C ratio for the both crops were 01:03.1 and 01:04.7 respectively for both crops respectively in the same period. The average net return in case of black gram of Var.PU-31/Uttra in 2021-22 was Rs. 41700/ha while in case of chickpea of Var.GNG-2144 in 2021-22 it was Rs. 37000/ha. B: C ratio for the both crops were 01:03.3 and 01:03.3 respectively. The average net return in case of black gram of Var.PU-31 in 2022-23 was Rs. 27200/ha while in case of chickpea of Var.GNG-1581 in 2022-23 it was Rs. 39900/ha. B: C ratio for the both crops were 01:02.7 and 01:04.1 respectively in the same period.

## CONCLUSIONS

It is inferred that CFLDs on pulses is an effective tool in increasing the pulses production and productivity. CFLDs is a good practice to influence not only the participating farmers but also the other farmers of the neighbouring villages. The present study revealed that CFLDs have positive impact on the yield of pulses crops in both Reasi and Udhampur district of Union Territory of Jammu & Kashmir and farmers showed keen interest in the adoption of recommended technologies by the KVK, Reasi. The study emphasizes upon the transfer of location specific crop management improved technologies imbedded with high yielding varieties (HYVs') to improve pulse production, productivity and profitability in rain fed hilly areas of Reasi and Udhampur districts of J&K. This study also infers that extension personnel of both the districts have to strictly focus on dissemination of proven pulse production technologies to increase the pulses production and productivity besides strengthening the irrigation facilities so that resource poor farmers of hilly areas of Reasi and Udhampur distts. of Union Territory of Jammu & Kashmir can earn their livelihood on sustainable basis by diversifying their farming systems through pulses production. These demonstrations help to built relationship and confidence between farmers and scientists.

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