Original Research Article

Pulse Productivity And Profitability as influenced by Cluster Front Line Demonstrations at Farmers Field in District Kupwara

Abstract

The 88 cluster frontline demonstrations (CFLDs) on Rajmash and Greengram were conducted by Krishi Vigyan Kendra, Kupwara, J&K during 2021. The critical inputs were identified in existing production technology through farmers meetings and group discussion. The findings in respect of Rajmash and Greengram overall yield trend of demonstrations ranged from 5.5qtls./ha to 11 *q/ha* and 6.00q/ha to 9.00 *q/ha* with the yield increase of 30.43 per cent and 33.33 per cent to 57.91 per cent over the local practices yield, respectively. The yield levels were considerably lower under local practices because of considerable variation in the extent of adoption of recommended technology depending upon the amount of risk involved in terms of cost, convenience, skill and knowledge about the concerned practice. Average extension gap, technology gap and technology index of pigeon pea and chickpea were found 4.07, 10.66 *q/ha* and 42.64 per cent and 5.87, 6.45 *q/ha* and 26.85 per cent, respectively. Average gross returns and net returns of demonstration in pigeon pea and chickpea crops were 39.63 and 57.42 per cent and 56.57 and 88.28 per cent higher than the farmers' practices respectively. Average benefit cost ratio was found higher throughout the study in pigeon pea and chickpea *i.e.* 3.47 and 3.27 respectively. Variations in the technology gap and index percentage were observed due to variation in agro-climatic parameters, soil fertility, biotic stresses, and socio-economic status and management practices. This variation can be narrowed down by encouraging the farmers to adopt sustainable technological practices for enhancing the production and productivity of pulse crops. The performance of improved technology was found most effective in controlling least number of affected plants/m2 as well as least number of pods/plants with the application of pesticide. The productivity was better over local practice under demonstrations. Hence, pulses production and protection technology have a broad scope for increasing the area and production of pulses at each and every level *i.e.*, Farmers, State and National level.

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Keywords:CFLD on pulses,rajmash ,greengram technology and extension gap

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Introduction

Pulses are rich in proteins(ranging from 20 to 24 per cent, depending upon the crop species) and are found to be main source of protein to vegetarian people of India. Pulses also contain essential minerals, vitamins and dietary fibres. It is second important constituent of Indian diet after cereals. They can be grown on all types of soil and climatic conditions. They play an important role in crop rotation, mixed and intercropping, as they help in maintaining the soil fertility. They add organic matter into the soil in the form of leaf mould. Pulses are generally not manured or requires less manuring. They are helpful in checking the soil erosion as they have more leafy growth and close spacing. They serve as additional source of fodder to cattle.Some pulses are turned into soil and serve as green manure crops.Majority of the pulsecrops are short durational and it is possible to take second crop on the same land in a year.Pulses provide raw material tovarious industries.e.g. Dal industry, Roasted grain industry, Papad industry etc. India is the largest producer in the world, with 26 per cent share in the global production by producing 25.23 million tonnes of pulses from an area of 29.99 million hectares. The average productivity of country is about 841 kg/ha against the average global productivity of 1023 kg/ha (DES, 2018). The average productivity of pulses in the Union territory of J&K is about 9.00 kg/ha (APR Pulses ATTARI Ludhiana).The important pulse crops are Chickpea,Pigeon pea,Urdbean,Mungbean,Lentiland Field pea. The major pulse producing states are Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka, Andhra Pradesh, Gujarat, Jharkhand Tamilnadu and Telangana forming about 91 per cent of the total pulse production (DES, 2018).

Average productivity of pulses in Kashmir valley is very low but it forms an important part of the diet of the people particularly during winters when the valley remains snow covered and there is hardly any fresh vegetable available in the market.Among the pulses mostly rajmash and greegram are cultivated by the farmers of the valley.In Kashmir valley there is a good scope for further improving the pulse production Farmers cultivate pulses as intercrop in Apple orchards and as an intercrop/ mixed crop alongwith maize Some of the areas in district Kupwara like Machil, Jumgund and other rainfed areas of lolab,Karnah and Keran are famous for quality pulse production rajmash in particular.

The major reasons responsible for declining of potential yield of pulse crops is lack of improved varieties ,adoption of traditional farming system, non-adoption of recommended production technologies,lack of knowledge and conviction about latest technologies, major abiotic and biotic stresses. cluster front-line demonstration is an effective extension intervention to demonstrate the production potential of improved technologies in pulse crops on farmers' field. Therefore, it is recommended that the extension agencies engaged in transfer and application of agricultural technologies on farmer's field should give priority to organize frontline demonstrations on cluster basis for harnessing the productivity potential of pulse crops, reduce the technology gap, technology adoption and minimizing the disease and insect infestation.

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Materials & Methods:

Cluster front line demonstrations is one of the most powerful methods of extension because farmers, in general believe on seeing.The main objective of cluster frontline demonstrations is to demonstrate newly released improved varieties ,crop production and protection technologies and its management practices in the farmer's field.The 88 cluster frontline demonstrations (CFLDs) on Rajmash(50) and Greengram (38) were conducted by Krishi Vigyan Kendra, Kupwara, J&K during Kharif season of 2021.Meetings with farmers and group discussionwere held to identify the critical inputs in existing production technology. Krishi Vigyan Kendra,Kupwara SKUAST-K conducted the cluster front line demonstrations on pulse crops. The Krishi Vigyan Kendra had organized 50 CFLDs on rajmash and 38 CFLDs on greengram in different areas of District Kupwara . The total area of 50.00 ha and 38.00 ha was covered for the rajmash and greengram demonstrations, respectively. A list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspects of recommended production and protection technologies. The technological interventions on pulse crops comprised of suitable improved variety of rajmash Var. Shalimar Rajmash -1 and greengram Var. KM-331 and demonstrated with full package of practices viz. proper tillage, proper seed rate time of sowing and sowing method, balanced dose of fertilizer (18 kg Nitrogen 46 kg P_2O_5/ha), proper irrigation, weed management and improved plant protection measure were applied at farmers' fields. The plots of rajmash and greengram next to demonstration plots were taken as control plots, where farmers practices were carried out(use of local varieties, broadcasting sowing method,use of imbalanced fertilizer, one hand weeding and indiscriminate use of plant protection measures). The demonstrations on farmers' fields were monitored by scientists of Krishi Vigyan Kendra, Kupwara right from sowing to harvesting. These visits were also utilized to collect feedback information for further improvement in research and extension programme. The yield data was collected from the demonstrations and control plots and analyzed with the suitable statistical tools for different parameters using following formula as given below: -

$$TR\ (IT) - TR\ (FP) > TC\ (IT) - TC\ (FP)$$

$$DR\ (IT) > DC\ (FP);\ TR = \Sigma\ P_i.Y_i$$

$$TC = \Sigma\ P_j.X_j$$

Where, TR (IT) = Total return from the improved technological intervention (IT),TR (F) = Total returns from farmers' practice plot; TC(F) = Total cost recorded in farmers' practice plot; DR (IT) = Change in the revenue due to improved technology; DC(FP) = Change in the revenue due to farmers' practice; TR (IT) = Total return from the improved technology plot; TC(IT) = Total cost from the improved technology plot; P_i = Price of the ithoutput (i= 1,….,n) ; Y_i = quantity of the ithoutput (i= 1,….,n) ; P_j = Price of the jthinput (j= 1,….,n) and X_j = quantity of the jthinput (j= 1,….,n).

The yield gap was also comprising at least two components i.e. Yield gap I and Yield gap II. Yield Gap I refer to the difference between potential yield and farm yield obtained at demonstration plots, while Yield Gap II, reflecting the effects of biophysical and socio-economic constraints, was the difference between yield obtained at the demonstration plot and actual yield obtained on farmers' fields. The yield gaps were estimated as follows:

$$\text{Yield Gap I} = [(YP-YD)/YP]x100$$

$$\text{Yield Gap II} = [(YD-YF)/YD]\ 100$$

where, YPis the potential yield

YD is the demonstration plot yield

YF is the existing farmers yield

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Yield parameters of both demonstrations and check involving farmers practices were recorded. The extension gap, technology gap and technology index were calculated as suggested by Samui et al., (2000) and Dayanand et al., 2012

Extension gap (Eg)= Demonstrated yield (Dy) – Farmers' practice yield (Fpy)

Technology gap (Tg)= Potential Yield (Py) - Demonstrated Yield (Dy)

Technology index (Ti %) = Py – Dy/ Py x100 Additional cost in improved technology (ACIT in `/ha) = Cost of improved technology (Cit) - Cost of farmers practice (Cfp)

Additional returns (Area) = Net returns of improved technology (Nrit) -Net returns of farmers practice (Nrfp) Effective gain (Eg in `/ha) =Additional returns of improved technology (Arit) -Additional cost of improved technology(Acit)

Benefit cost ratio (BCR) = Grossreturns /Gross expenditure

Incremental cost benefit ratio (ICBR) = Additional net returns in /ha (Anr)/ Additional cost of improved technology (Acit) in `/ha

RESULTS AND DISCUSSION

Table-1: Technological adoption gaps between Farmers practices and Front Line demonstrations.

S.No.	Particulars	Technological interventions		Existing Practice	Technological Gap
		Rajmash	Greengram		
1	Land Preparation	Threeploughings with cultivator and one rotavator	Three ploughings with cultivator and one rotavator	One to two cultivator ploughing	Partial Gap
2	Time of sowing	From Mid May to Mid June	From Mid May To Mid July	Asper recommendation	No gap
3	Variety	Shalimar rajmash-1	KM-332	Local	Full gap 100%
3	Seed rate (Kg/ha)	65kg/ha	25kg/ha	Higher seed rate	Full gap 100%
4	Sowing method	Line Sowing	Line Sowing	Broadcasting	Full gap 100%
5	Fertilizer dose (Kg/ha)	As per recommendation	Asper recommendation	Imbalanced use of fertilizers	Full gap 100%
6	Irrigation	Rainfed, irrigated at critical stages in abscence of rain.	Rainfed, irrigated at critical stages in abscence of rain.	Untimely and excessive irrigation	Partial gap

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7	Weed management	Scientific weed management	Scientific weed management	One weeding only	Partial gap
8	Plant protection	Need based scientific plant protectionmeasures	Need based scientific plant protection measures	Unscientific Plant protection measures.	Partial gap

From the study it could be inferred that full technological gaps were observed for the technological interventions comprising of variety, seed rate, sowing method and fertilizer dose and partial gap was recorded for the technologies viz, land preparation , irrigation, weed management and plant protection measures, while as no gap was observed for the time of sowing of rajmash and greengram. The full or partial gaps could be attributed to the fact that the farmers have no knowledge about the scientific cultivation of rajmash and greengram due to lack of awareness and farmers use to cultivate local varieties of pulses with low yielding potential due to lack of quality seed of improved varieties leading to low production of pulses in the UT of J&K in general and district Kupwara in particular.Famers were much concerned about the incidence of anthracnose disease in rajmash and in time availability of quality seeds. Burman *et al.* (2010) has reported that there is a gap in adoption of technology in major pulse crops both in rain fed and irrigated cropping system.

Table-2: Gap in grain yield production of pulse crops under cluster front line demonstration (C-FLD)

Name of crop	Technology demonstrated	Potential yield of variety (q/ha)	Under C-FLD Programme		Average yield (q/ha)		Impact (% change)	TG (q/ha)	EG (q/ha)	TI (%)
			No. of Demo.	Area (ha)	DP	FP				
Rajmash	Variety+INM+Sowing method	12	50	10	11	7	36.36	1	4	8.33
Greengram	Variety+INM+Sowing method	10	38	8	9	6	33.33	1	3	10

Technology Gap:

Technology gap is the difference between the potential yield of the variety and yield of demonstration. It could be inffered from the data that the technology gap for rajmash and moong was recorded as 1q/ha (Table -2). It indicates that there is a little gap in technology demonstration as a result of which the potential yield of the improved practices could not be attained by the farmers. This could be

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attributed to difference in the soil fertility status, agricultural practices and climatic situation. Same findings were reported by Vijaya Lakshmi et al. (2017) and Singh, et al., 2019.

Extensions gap

Extension gap is the difference in yield of demonstration and farmers practice plots. Extensions gap of 4q/ha and 3 q/ha was recorded for rajmash and moong each (Table -2).The average extension gap was recorded the different extension methods should be adapted to further minimize this gap. Information on improved practices need to be disseminated through training programmes, Awareness programmes, etc.. The increased awareness created by the extension functionaries would motivate the farmers to adopt improved practices and thereby reduce the extension gap. These findings are in corroboration with the

findings of Singh, et.al., (2019).

Table-3: **Impact of technological interventions in terms of productivity enhancement inpulse crops**

Crop Name	**Year**	**Average Yield (q/ha)**		**District Yield (DY)**	**State Yield (SY) q/ha**	**National Yield (NY) q/ha**	**Impact (% Change over EP)**	**Impact (% Change over DY)**	**Impact (% Change over SY)**	**Impact (% change over NY)**
		Demo. Plot (DP)	**Existing Practice**							
Rajmash		11	7	6.5	8.00	9.00	57.14	69.23	+37.5	22.22
Moong		9	6	4.5	5.00	7.00	50.00	100	80.00	28.57

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Impact of technological interventions on productivity of pulse crops:

The technological interventions comprising high yielding varieties seeds, recommended seed rate,seed treatment, time and method of sowing, recommended dose of fertilizers, weed management and proper plant protection measures were used as per package and practices in pulse crops. Impact of technological interventions in terms of productivity enhancement in pulse crops as shown in Table-3. The yield parameter also compared at district, state and national level productivity, it reflected significantly more over district, state and national level productivity in both the crops. The result clearly indicated that the average rajmash productivity was recorded as 11 q/ha from demonstrated plot. The demonstrated

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technology of rajmash yielded average productivity by 57.14, 69.23,37.5 and 22.22 per cent more over existing practice, district, state and national yield, respectivel. The results of demonstrated technologies of moong elicited in Table 4 that moong yielded average productivity i.e.9.00 q/ha from demonstrated plot. The demonstrated technology of moong gave average productivity by 50.00, 100 ,80.00 and 28.87 per cent more over existing practice, district, state and national yield, respectively. Dwivedi et al.,(2011)and Singh et al. (2018) also reported similar findings in chickpea crop.

Table-4:IMPACT OF CLUSTER FRONTLINE DEMONSTRATIONS ON PULSES PRODUCTIVITY AND PROFITABILITY IN FARMER'S FIELD

Crop	Cost of Cultivation		% Increase in CoC over FP	GR		% increase in GR	NR		% increase in NR	BCR	
	DP	FP		DP	FP		DP	FP		DP	FP
Rajmash	90000	45000	100	130000	90000	44.44	85000	50000	70.00	1.88	1.25
Moong	35567	22513	57.98	88320	36000	145.33	52953	13487	289.55	1.45	0.59

DP=Demo Practice, FP=Farmers Practice, CoC=Cost of cultivation,GR=Gross returns.NR=Net returns, BCR=Benefit cost ratio,IBCR=Incremental Benefit cost ratio.

Economic performance :

The economics of pulse crops production under cluster frontline demonstration were estimated and the results have been presented in Table 4. Different variables like high yielding varieties seed, fertilizers, bio-fungicide, bio-insecticide and chemical pesticides etc. were considered as a technological intervention. The average cost of cultivation increased by 100 per cent and 57.98 per cent in rajmash and moong respectively with improved technolo-gical interventions as compared to farmers practice. The comparative profitability of different pulse crops also revealed that gross monetary return i.e. Rs.130000 /ha was realized from rajmash followed by moong with Rs.88320/ha as gross return. The net returns of demonstration for rajmash was Rs.`85000/ha as compared to farmers practices with ` Rs.50000/ha whereas in moong net return was Rs.`52,953/ha as compared to farmers practice with ` Rs.13487/ha.

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Average gross monetary return increased by 44.44 per cent and 145 per cent in rajmash and moong crops respectively indicating the importance of improved technologies. The higher gross monetary return realized by the farmers indicate the economic feasibility of the technology. The data presented in Table 4 also revealed the expenditure involved in the demonstrated plot is higher than the farmers' field due to additional cost of cultivation but the yield obtained is also higher in the demonstrated plot that is confirmed by the comparative result obtained by calculating the cost benefit ratio. The average benefit cost ratio was recorded as 1.88 and 1.25 from demonstration plots of rajmash and Moong respectively while as it was 1.25 and 0.59 from farmers practice. Similar findings were also reported in frontline demon-strations on pulse crops by Dwivedi et al., (2011) and Dwivedi et al., 2014.Singh et al. (2018) and Singh, et al., (2019) also reported higher yield and net returns as well as benefit cost ratio as compared to local practices

CONCLUSION:

Organization of frontline demonstrations in cluster approach is good practice to influence not only the participating farmers but also the neighbouring farmers. As the demonstrations are conducted under the supervision of the scientist in farmers' fields, they are more authentic and results could be generalized to that vicinity. The demonstrated improved practices are superior when compared to farmers practice. The farmers expressed positive attitude towards the demonstrations through their perception on the technology. There was a technological gap between technological intervention and existing practices in pulse production technology due to lack of knowledge and conviction of improved technologies. Technology and extension gap showed that the farmers were not aware about improved package and practices of pulse production technologies, therefore it is recommended that the farmers should be aware for adoption of improved technologies through various extension aids (training, demonstration etc.). The technology index shows the feasibility of the technology demonstrated at farmer's field. The lower technology index showed that the good performance of technological intervention. So, it is concluded that the technology needs to be popularized to decrease the extension gaps, technology gap, technology index, adoptions gaps and there by yield gap so as to increase the income of farmers. The economic details of the demonstrations give us a green signal to further popularize them among the farming community for large scale adoption. Therefore, under this situation, extension agencies can also play a significant role to transfer improved technologies among farming communities for sustainable production and productivity. Thus, it can be concluded, that the adoption of improved package of practices of pulse production technology may result in higher productivity per unit area.

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