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ORIGINAL ARTICLE

Impact of Cluster Frontline Demonstration on Productivity of Chickpea (*Cicer arietinum*) at farmer's field under Rainfed conditions of Kathua District, UT of Jammu and Kashmir

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ABSTRACT
Cluster Frontline demonstration is an appropriate means for demonstration and form of applied research to demonstrate the latest released varieties as well as transfer of improved agricultural technologies on cluster basis in farmer's field to show the potentiality of the technologies to farmers and to analyses the production performance. The cluster frontline demonstrations on chickpea were conducted by Krishi Vigyan Kendra during Rabi seasons of 2019 and 2020 respectively covering 10 ha area each during both the years. In the transfer of improved chickpea production technology, a great emphasis was paid by the scientists toenhance the productivity of chickpea in the area. The results revealed that cluster frontline demonstrations conducted proved immensely useful in increasing the production and productivity of the chickpea crop in the district. According to examination of data the highest grain yield was obtained in demonstrated plots with an average of 15q/ha as compared to local check with an average of 10.35q/ha. An average extension gap, technology gap and technology index were calculated as 5.15q/ha,7.9q/h and 33.7 percent respectively. Benefit cost ratio for demonstration and farmer's practice was 5.77 and 4.17 respectively. It can be concluded that the chickpea production could be enhanced by encouraging the farmers through adoption of recommended technology which were followed in the CFLD's.
Keywords: *Pulses, CFLD's, Yield, Chickpea, economics, technology index.*

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INTRODUCTION

Pulses are important commodity group of food crops and are mostly cultivated under rain fed conditions. Pulses are rich in protein, improve soil fertility and physical structure of soil. It is the 2nd most important group after cereals which play a key role in Indian agriculture. Chickpea (*Cicer arietinum*) is the premier pulse crop widely consumed in India. Chickpea is commonly known as gram and is an important rabi season pulse crop having extensive geographical distribution and contributing 39 percent to the total production of pulse in the country [1]. Maize- Wheat is the important cropping system of unirrigated areas of district Kathua. The adverse impactsof Maize- Wheat system is being realized not only by the scientist but also by the farmers so the issue of crop diversification is now a day, getting very popular. Thus the existing Maize-Wheat cropping system has to be changed and farmers have to be encouraged to include chickpea as the 2nd crop after Maize in order to bring more area under chickpea, increase annual production and at the same time to sustain the soil health. The pulse crops are well adapted to agro-climatic conditions of district Kathua, so cultivation of chickpea can play a crucial role in crop diversification. Chickpea has broad adaptation and is widely distributed. It is the most resistant cool season grain legume that is commonly grown rain fed on stored soil moisture. Cluster Front line Demonstration (CFLD's) is introduced by the Indian Council of Agricultural Research, New Delhi with inception of technology mission of pulse and oilseed crops during mid-eighties. The major objective of conducting CFLD's is to demonstrate the productivity potential and profitability of the technologies that are recommended for chickpea production and existing extensiongaps in adoption of these improved technology under field conditions. Through Farmer Scientist Interaction Programme, Farm diagnostic visits at farmer's field, training programmes for

farmer/ farmwomen it was realized that there were so many reasons for low productivity of pulses like unawareness about Integrated Pest Management Practices (IPM), lack of improved varieties, imbalance use of fertilizers, no seed treatment before sowing etc. The gram pod borer is also a major pest that cause yield reduction.To overcome the causes of yield reduction and technology gap, cluster frontline demonstrations on chickpea were organized by Krishi Vigyan KendraKathua at farmer's field during the year 2019-2020 and 2020- 2021.

MATERIAL AND METHODS

The present investigation of CFLD's was conducted during Rabi season of 2019-2020 and 2020-2021 by the KrishiVigyan Kendra Kathua of SKUAST-Jammu in chickpea under rain fed conditions. Six villages namely Kunthal, Chainpura, Kalyari, Badholi, Loukhali and Kannah were selected for laying out Cluster Front line demonstration (CFLD's). Total two hundred fifty farmers were selected for the demonstration programme. Farmers were instructed to follow the package and practices of chickpea cultivation as recommended by the State Agriculture Universities and need based input also provided to the farmers (Table 1) for successful conduct of CFLD's. During these two years 20 ha area under chickpea were demonstrated with improved management practices using variety GNG- 2144.This variety is esi type chickpea with medium bold seeds and has tolerance to Fusarium wilt disease and mature in 133 days. In general the soil of the area under study was sandy loam to sandy clay loam. The components of demonstration comprised of land preparation , improved variety, line sowing using seed cum fertilizer drill, proper spacing , proper fertilization, Seed treatment with Trichoderma @4g/kg seed + Pseudomonas @ 4g/kg of seed before sowing to protect the crop against fungal diseases, weed management, proper irrigation and Plant protection measures. In the demonstration one control plot was also kept in which the farmer's practices were carried out. The sowing of chickpea was done during 15th November to 30th November during the study period. The spacing between row to row and plant to plant was kept 30x10cm.The demonstrations on farmer's field wereregularly monitored by scientific staff of Krishi Vigyan Kendra Kathua right from sowing to harvesting of field. The data were collected through personal contact with farmers at farmer's field and after that tabulated and analysed to find out the findings. The yield increase in demonstrations over farmer's practice was calculated by using thefollowing formula.

% Yield increase over farmer's practice = Demonstration average plot yield – Farmer's average plot yield /Farmer's average plot yield.

Estimation of technology gap, extension gap and technology index: The estimation of technology gap, extensiongap and the technology index were worked out by using following formula [2].

Technology yield gap= Potential yield – Demonstration plot average yield

Extension yield gap= Demonstration plot average yield – Farmer's plot average yieldTechnology yield gap

$$\text{Technology index} = \frac{\text{Technology yield gap}}{\text{Potential Yield}} \times 100$$

RESULTS AND DISCUSSION

The results of the study have been discussed under following points:

Grain Yield: Data presented in Table 2 showed that transfer of technological intervention under cluster frontline demonstrations in chickpea resulted in higher yield as compared to farmer's practice. The average seed yield of demonstrated plots was 15.50q/ha which was higher as compared to farmer's practice 10.35q/ha (Table-2). The increased yield percentage over control was 49.80% in cluster frontline demonstration over local check. However , the seed yield of 15.50q/ha was low as compared to potential yield (22.8q/ha) of chickpea variety GNG-2144 due to incidence of fungal disease and due to attack of pod borer. On other side yield of demonstrated plot was high as compared to practice due to adoption of improved variety of seed, seed treatment with Trichoderma@4g/kgof seed + Pseudomonas fluorescens @4g/kg of seed, proper spacing, Integrated Pest Management practices. The similar findings of yield enhancement in frontline demonstration of pulse crop have been documented by Dwivedi etal., 2014 and [3].

Extension yield gap

The difference between demonstrated yield and yield under existing farmers practice is extension gap. An average extension gap between demonstrated and farmer's practice was recorded 5.15q/ha(Table 2) during demonstration period. The average extension gap should be filled by various extension methods. Information on improved technological interventions need to be disseminated through farmer/farmwomen training programmes, kissan goshties, Communication through print and electronic media etc. Hence there is need to motivate the farmers to adopt improved technologies and there by reduce the extension gap. The similar findings were also reported by [4, 5].

Technology yield gap:

The gap difference between the potential yield of the variety and yield of demonstration is technology gap. The average technology gap was observed as 7.3q/ha. It indicates that still there is gap in demonstrated plot as a resultof which the potential yield of the improved practices could not be reaped by the farmers who participated in frontline demonstration programme. The technology gap may be attributed to non congenial weather conditions, disease and pest attack, dissimilarity in soil status etc. The findings are in line with reported by [6-8].

Technology index

The ratio between technology gap and potential yield expressed as percentage is technology index. Technology index specified the feasibility of the evolved technology at the farmer's field under existing agro-climatic conditions. The value of technology index was observed 33.33percent during 2019-2020 and 34.21 percent during 2020- 2021where as the average value of technology index was recorded as 33.77 percent in chickpea crop. Higher technology index reflected the inadequate transfer of improved technology to growers and insufficient extension services for transfer of technology. This showed a gap existed between technology evolved and technology adopted at farmer's field. The above findings were support with the findings of [9].

Table 1: Technological intervention in CFLD's and Farmer's Practices:

S.No.	Practice	Technological Intervention	Farmer's Practice
1	Land Preparation	Ploughing and harrowing	Ploughing
2	Variety	GNG-2144	HC-1
3	Sowing method	Sowing	Broadcasting
4	Seed treatment	Trichoderma@4g/kgof seed + Pseudomonas fluorescens @4g/kg of seed	No seed treatment
5	Spacing	30x 10 cm	22x8 cm
6	Fertilizer dose NPK Kg/ha	20:40:20	Imbalanced use
7	Weed management	Pre-emergence application of Pendimethalin @ 3lt/ha	No pre-emergence herbicide
8	Irrigation	One at pre flowering and one at pod development stage	One irrigation
9	IPM Practices	IPM Practices like use of Pheromone traps, sticky traps, neem oil and rouging	Indiscriminate of application of pesticides
10	Technical guidance	Time to time	Nil

Table 2: Year wise productivity, extension gap, technology gap and technology index of chickpea as grown under CFLDs and existing package of practices.

Years	Yield q/ha		Increase yield % over control	Extension yield gap(q/ha)	Technology yield gap(q/ha)	Technology Index %
	Demo	Farmer's Practice				
2019-2020	16.00	10.20	56.86	5.80	6.8	29.82
2020-2021	15.00	10.50	42.85	4.50	7.8	34.21
Mean	15.50	10.35	49.80	5.15	7.3	32.01

Table 3: Cost of cultivation, Gross return, Net return and B:C ratio of chickpea as grown under CFLD's and existing package of practices.

Years	Cost of cultivation(Rs./ha)		Gross return		Net return		B:C Ratio	
	Demo	Farmer's Practice	Demo	Farmer's Practice	Demo	Farmer's Practice	Demo	Farmer's Practice
2019-2020	15,300	14,000	80,000	51,000	64,700	37,000	5.22	3.64
2020-2021	15,500	14,200	82,500	57,750	67,000	43,550	5.32	4.06
Mean	**15,400**	**14,100**	**89,000**	**54,375**	**65,850**	**40,275**	**5.27**	**3.85**

Economic analysis

The input and output prices of commodities prevailed during each year of demonstration were taken for calculating cost of cultivation, gross return, net return and benefit cost ratio (Table 3). The economic analysis of the data over two years revealed that chickpea under cluster frontline demonstrations recorded higher gross return. Cost involves in adoption of technology varies and was more profitable. The data in table 3 revealed that cultivation of chickpea under improved technologies gave higher average net return (Rs. 65850/ha) as compared to farmer's practice in which average return is Rs.40275/ha. Average cost of cultivation of demonstration plot (Rs. 15400/ha.) is more as compared to Farmer's Practice (Rs. 14100/ha). The increase benefit cost ratio was also calculated. The average benefit cost ratio recorded was also higher in demonstration plots (5 .27) as compared to farmer's practice (3.85). Thus it was clearly showed that the demonstration of chickpea with improved technological intervention was better than farmer's practices. Similar results have been reported earlier by [9-11].

CONCLUSION

The present study showed that the integration of improved technological interventions among the farmers through training programmes and active participation of farmer has a positive effect on increasing the seed yield and economic return of chickpea crop in Kathua District. The percent increase in yield of chickpea in demonstrated plot over the farmer's practice created great awareness and motivated the other farmers to adopt the improved packageof practice of chickpea.

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