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Impact of Yield, Yield Gap and Economics of Cluster Front-line Demonstration on Green Gram (*Vigna radiata* L.) in Sirohi, Rajasthan

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ABSTRACT: The study aimed at assessing the performance of cluster frontline demonstration in terms of yield, technology gap, extension gap, technology index and economics analysis in green gram during *Kharif* 2018-19, 2019-20 and 2020-21 in Sirohi district with evaluating the performance of GAM-5 and GM-6 variety with all essential technical inputs. The result showed that average grain yield under demonstration were 5.41, 6.56 and 7.04 qha^{-1} as compare to 3.87, 4.78 and 4.92 qha^{-1} recorded in farmer's practice. Average yield increases of 39.79, 37.24 and 43.09 per cent, and additional return of 13945, 12548- and 15255-rupees ha^{-1}, respectively. Therefore, the results revealed that new varieties and improved package and practices with scientific intervention under cluster frontline demonstration programme remarkable increase the area, production and productivity of Green gram in Rajasthan by reducing the technology gap.

Keywords: Frontline demonstration, Greengram, Extension gap, Technology index.

INTRODUCTION

Pulses represent commodity group of crops that provide high quality protein complementing cereal proteins for pre-dominantly substantial vegetarian population of the country. India is the major pulse producing country in world, it cover 35 percent area and 25 per cent of production (Reager *et al*., 2020). Although, production and productivity of pulses in India is relatively lower in comparison to total cereal crops productions. The productivity of pulse in India (694kg/ha) is lower than most of major pulse producing countries. In year 2018-19 the total pulse area 29.16 Mha with production in India was 22.08 million tonnes with productivity 757kg ha^{-1} (GOI, 2020). Rajasthan ranks first in pulse production 32.96 lakh Ha area and 14.32 lakh tonne production in kharif pulses. Sirohi district covers 6419 ha area, 1964 tonne production and very low productivity 306 kg/ha so Green gram or mung bean (*Vigna radiata* L.) is the major pulse.

Front line demonstration technology is a approach to provide a direct connection between scientist and farmer for the technology transfer (Mishra *et al*., 2018). Inscribe this concern of significance, National food security mission programme launched by Indian government for enhance the area of pulses through cluster front line demonstration programme. The main aim of the Mission is to favoured improved technologies, *i.e*., seed, micro- nutrients, soil amendments, weed management, integrated pest management, farm machinery and implements, micro irrigation devices along with capacity building of farmers (Mitnala *et al*., 2018; Singh and Singh 2020).

Cluster Front Line Demonstration on greengram during *kharif* 2018-19, 2019-20 and 2020-21 has conducted by KVK Sirohi ,to assess the performance of GAM-5 and GM-6 green gram variety in Sirohi district and record the feedback from farmers. The Subject matter specialists have conducted 225 Cluster frontline demonstration in 90 hectares area by the participation of farmers. The main objective of cluster front line demonstration was to increase the greengram area and production by improved package and practices.

MATERIALS AND METHOD

The study was carried out in the Sirohi district situated in south west of Rajasthan between parallels of 24°21′ and 25°17′ North latitudes and 72°16′ and 73°10′ East longitudes. This district occupies prominent place in the agro- climatic zone II A *i.e*. 'Transitional Plain of Luni Basin 'comprising three blocks of the district *viz.* Sheoganj, Reodar and Sirohi and Zone IV A *i.e*. "Sub Humid southern Plain and Aravali Hills comprising two blocks *viz.* Pindwara and Aburoad. Cluster frontline demonstrations (CFLD's) were conducted during 2018-

19, 2019-20 and 2020-21 with evaluation the performance of integrated crop management in green gram in Sheoganj, Reodar, Sirohi, Aburoad and Pindwara blocks of the district. In this study, 225 farmers were selected from aforesaid block's during consecutive years under cluster frontline demonstration of green gram. All the technological intervention were taken as per prescribed package and practices for integrated crop management of greengram crop (Table 1). The grain yield, gap analysis, input cost, net return and additional gain parameters were recorded (Table 2 and 3).

Assessment of gap and adaptation level study was done before conduct the CFLD. The training programme was organized for farmer's selection and development of skill about technological intervention for successful mustard cultivation. Farmer's field were visited regularly cluster frontline demonstrations fields by subject matter specialists. The farmer's feedback information was also recorded. The extension activities *i.e*. Training programme, kisan goshthi and field days were organized at the cluster frontline demonstrations villages. The information were computed from the farmer's farm and analyzed to comparative performance of frontline demonstrations and farmer's practice. To find out gaps, different parameters were calculated by following formula (Singh and Singh 2020).

Extension gap = Demonstrated yield-Farmers' practice yield

Technology gap= Potential yield- Demonstration yield

Additional return = Demonstration return – Farmers practice return

Technology index =

$$\frac{\text{Potential yield - Demonstration yield}}{\text{Potential yield}} \times 100$$

RESULTS AND DISCUSSION

Grain Yield. During the period of three years, demonstration results of grain yield revealed that in 2018-19, 2019-20 and 2020-21 were 5.41, 6.56 and 7.04 qha^{-1} as compare to 3.87, 4.78 and 4.92 qha^{-1} recorded in farmer's practice, average yield increase of 39.79, 37.24 and 43.09 per cent, and additional return of 13945, 12548 and 15255 qha^{-1}, respectively. The observation reveals that the average grain yield of demonstrated field's was higher from farmer's practice in all blocks of Sirohi district. The similar results were in accordance with findings of other worker (Singh and Singh, 2020; Reagar *et al*., 2020; Mitnala *et al*., 2018). The higher yield in cluster frontline demonstrations field may be due to capacity building programme and follow of package and practices accordingly (Table 1).

Table 1: Detail of package and practices for green gram Cultivation.

Component	Recommended Practices	Farmers Practices
Variety	IPM-02-03, GM-4, GAM-5, MH-421	Existing/Old recommended cultivar
Seed rate	15 kg/ha	20 kg/ ha
Seed treatment	Carbendazim@ 2.0g/kg	No seed treatment
Soil inoculation	Trichoderma viride @ 2.5 kg/ha along with 1.25 qtl.FYM	No soil inoculation
Plant geometry	30 cm × 10 cm	Broadcasting
Fertilizer dose	Balanced fertilization as per soil test value (STV) 30-40 kg N:10-15 kg P	Imbalance use of fertilizer
Water management	Water management at critical stages (Branching, flowering and pod formation)	Water stress during critical stages
Plant protection	Seed and soil inoculation with bio fungicide (T.viridae), Imidacloproid 200 SL @150 ml/ha for management of sucking pest.	No judicious use of insecticide and fungicide

Technology Gap. The technology gap is the difference between demonstration yields over potential yield. The technology gap was ranged from 959 kg/ha in 2018-19, 844 kg/ha in 2019-20 and 796 kg/ha in 2020-21. The technology gap may be attributed to the dissimilarity in the soil fertility status and weather conditions and similar finding were found by Mukherjee (2003); Mitra and Samajdar (2010).

Extension Gap. The results revealed that extension gap ranged from 1.54- 2.12 qha^{-1} in demonstrated villages of Sirohi district which showed that capacity building programme is required for adoption of improved production technology in green gram. Vittal *et al*. (2005), also supported that frontline demonstrations is better than farmer practices. Singh and Singh, 2020 revealed that by reducing the extension gap through scientific intervention improved the production and productivity of greengram.

Technology Index. The technology index reveals the accessibility of the technology at the farmer's field. The lower the value of technology index more is the feasibility. As such, fluctuation in the technology index was ranged from 63.93% in 2018-19, 56.27 in 2019-20 and 53.07 in 2020-21 (Table 2). These findings same with the findings of Mokidue *et al*. (2011).

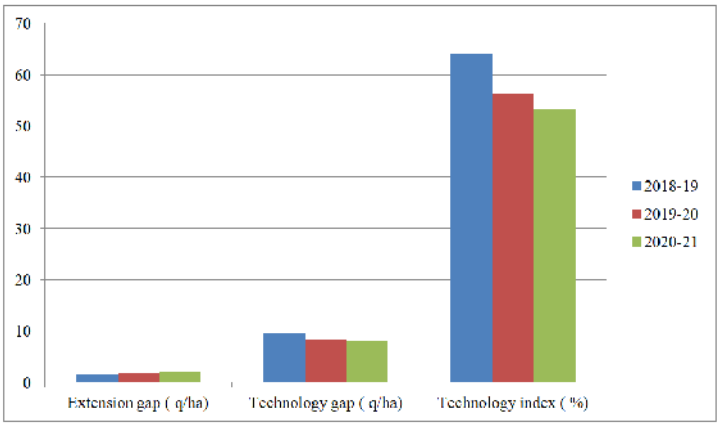

Fig. 1.

Table 2: Grain yield and gap analysis of cluster front line demonstrations on Greengram.

Year	Crop	Variety	Area (ha)	No. of Demo.	Average Yield (Ha)		% increase over FP	Techno-logy Gap q/ha	Extension Gap q/ha	Technology Index (%)
					RP	FP				
2018-19	Green gram	GAM-5	50	125	5.41	3.87	39.79	9.59	1.54	63.93
2019-20	Green gram	GAM-5	20	50	6.56	4.78	37.24	8.44	1.78	56.27
2020-21	Green gram	GM-6	20	50	7.04	4.92	43.09	7.96	2.12	53.07

Economics. Table 3 represents the economic analysis of cluster frontline demonstration on green gram organized by Krishi Vigya Kendra. It is summerized from the data that the gross return from recommended practice in 2018-19, 2019-20 and 2020-21 were 37730, 46248 and 50660 Rs ha^{-1} as compared to 23785, 33700 and 35405 Rs ha^{-1} in farmer's practice, respectively. Average additional return ranged from 13945-15255 Rs ha^{-1} in recommended practice proved beneficial in respect of yield and economics of green gram in consecutive years of Sirohi District in Rajasthan Plains. The findings are in same with those of Kumar *et al*., (2014); Singh *et al*. (2019). Singh *et al.* (2015) reported that the improved package and practices gave higher gross return, net return with higher benefit cost ratio as compared to farmer's practices. Similar findings were reported by Raj *et al*. (2013); Singh *et al*. (2017) in their study.

Table 3: Economic analysis of cluster front line demonstrations on Green gram.

Year	Gross return (Rs ha^{-1})		Cost of cultivation (Rs ha^{-1})		Net return (Rs ha^{-1})		Additional gain (Rs ha^{-1})
	Demonstration	Farmers Practice	Demonstration	Farmers Practice	Demonstration	Farmers Practice	
2018-19	37730	23785	19381	16563	18349	7222	13945
2019-20	46248	33700	20500	17840	25748	15860	12548
2020-21	50660	35405	22100	19700	28560	15705	15255

CONCLUSION

The assessment of above study revealed that Integrated crop management of green gram gave higher yield and net returns in recommended practice than farmers practice in all block's Sirohi district. Economic analysis on given parameters also showed that gross return, net returns and additional return were recorded higher in cluster front line demonstration, which entails that the cluster front line demonstration is an effective tool for enhance the area, production and productivity of pulses and changing the knowledge and skill of farmers. Hence, these improved technologies needs to be disseminate for wider adoption among the farmers in their respective agroclimatic system.

FUTURE SCOPE

If farmers adopt these recommended package and practices for enhance the area of pulses then this will be helpful in the doubling production and income. The KVK and other extension institutes should demonstrate effects of new technology in pulses production and motivate farmers for adoption of new technology to minimize this wide yield gap and extension gap through capacity building programme.

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Conflict of Interest. None.

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