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Increasing green gram production through cluster frontline demonstrations in Hoshangabad district of Madhya Pradesh, India

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Abstract
Front line demonstration is an appropriate means for demonstration of improved technology and innovations in agriculture for large scale popularization among the farming community. National Food Security Mission, a centrally sponsored scheme on Pulses, enabled KVK Govindnagar, Hoshangabad to conduct Cluster Front line demonstration on greengram during summer 2017-18 to 2019-20 in 175 demonstration plots in 70 ha, at farmer's fields in villages i.e., Malhanwada, Anhai, Paliya Pipariya, Kharsali, Pachua, Sohjani of Hoshangabad district of Madhya Pradesh. The present study was conducted to demonstrate production potential and economic benefit of improved technologies comprising improved varieties, sowing method, nutrient management and integrated pest management and adoption of whole package of practices. The findings of the study revealed that the demonstrated technology resulted in a mean yield of 11.63 q/ha as compared to farmers practices 7.66 q/ha. The average yield increased 51.75 per cent over farmer's practices during the three years. The result indicated that the front line demonstration has given a good impact over the farming community of the district about 11.80 q/ha. Mean net income of Rs. 53828.83/ha with a benefit:cost ratio of 3.42 was obtained with improved technologies in comparison to farmers practices (29275.90). The frontline demonstrations conducted on greengram crop at farmer's field revealed that the adoption of improved technologies significantly increased the yield as well as yield attributing traits of crop and also the net returns higher than the farmer's practices. So, there is a need to disseminate the improved technologies among the farmers with effective extension methods like training and demonstrations. The farmers should be encouraged to adopt the recommended package of practices realizing for higher returns.

Keywords: Adoption, cluster frontline demonstrations, green gram, productivity, profitability

Introduction

Pulses are important food crops for human consumption and animal feed. Being leguminous in nature, they are considered to be important components of cropping systems because of their viability to fix atmospheric nitrogen, add substantial amounts of organic matter to the soil and produce reasonable yields with low inputs under harsh climatic and soil conditions (Rakhode *et al*., 2011) [7]. India is the largest producer (26%) of world's production and consumer (30%) of total pulses of the world. The frequency of pulses consumption in the country is much higher than any other source of protein, which indicates the importance of pulses in their daily food habits (Raj *et al*. 2013) [6]. Greengram (*Vigna radiate* L. Wilczek.) is the third important pulse crop in India. It can be grown both as kharif green gram and summer green gram. With the advent of short duration, mungbean yellow mosaic virus tolerant and synchronous maturing varieties of green gram (55-60 days), there is a big opportunity for successful cultivation of paddy-wheat-green gram based cropping system. In India, pulses, therefore, have always received due attentions both in terms of requirement by consumers and adequate programmatic support from the government at the production front. Addressing this concern of significance, the Ministry of Agriculture and Farmers Welfare, Govt. of India had initiated a nation-wide cluster frontline demonstration (CFLD) programme on pulses under National Food Security Mission-Pulses (NFSM-Pulses) since 2015-16. The basic strategy of the Mission is to promote and extend improved technologies, i.e., seed, micro-nutrients, soil amendments, integrated pest management, farm machinery and implements, irrigation devices along with capacity building of farmers. The ICAR through its Krishi Vigyan Kendras (KVKs) across the country has been implementing this CFLD programme on different pulse crops to boost the production and productivity of pulses with improved varieties and location specific technologies.

The major pulses grown in the region are green gram (*Vigna radiata*), black gram (*V. mungo*), pigeon pea (*Cajanuscajan*), chickpea (*Cicer arietinum*), lentil (*L. culinaris*) and field pea (*Pisum sativum*). The Krishi Vigyan Kendras (KVK) in this region have been successfully implementing this programme since Summer 2017-18 by conducting cluster frontline demonstrations in a systematic manner on farmers' field under the close supervision of their scientists to show the worth of new/ proven varieties with technological packages in their respective districts for enhancing production and productivity of pulse crops. With this background, the present investigation was undertaken with the specific objectives to assess the performance of CFLD on pulses in terms of grain yield, extension gap, technological gap and economic gains by the farmers so that the findings the study will be helpful to the concerned policy makers and other stakeholders to focus on the way forward for improving pulses production in the region, vertically and horizontally as well.

Materials and Methods

Present study was conducted on CFLD green gram in summer season in Hoshangabad district of Madhya Pradesh. During three years of study, an area of 70 hac was as covered under cluster frontline demonstration with active participation of total 175 farmers (Table 2). Total 175 cluster frontline demonstration were conducted at farmers' field in 6 villages namely Malhanwada, Anhai, Paliya Pipariya, Kharsali, Pachua, Sohjani of Hoshangabad district of Madhya Pradesh, during Summer season 2018, 2019 and 2020. Each demonstration was conducted on an area of 0.4 ha, and 1.0 ha area adjacent to the demonstration plot was kept as farmers' practices. Before conducting CFLD's a list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspects of cultivation. The package of improved technologies like improved varieties, line sowing, nutrient management, integrated pest management and whole package were used in the demonstrations. The varieties of greengram HUM-12, TMB-37, MH-421 was included in demonstrations methods used for the present study with respect to CFLDs and farmers' practices are given in Table 1. In case of local check plots, existing practices being used by farmers were followed. The spacing was 22.5 cm between rows and 7-10 cm between plants in the rows. Sowing was done in the first week of April with a seed rate of 20 kg/ha. The data were collected from both CFLD plots as well as plots of farmers using their traditional practices. Finally the extension gap, technology gap along with the benefit cost ratio were worked out. Different parameters as suggested by Yadav *et al* (2004) [8] was used for gap analysis, and calculating the economic. The details of different parameters and formula adopted for analysis are as under:

Extension gap = Demonstration yield - Farmers' practice yield.

Technology gap = Potential yield of variety - Demonstration yield

Technology index (%) = Potential yield - Demonstration yield/Potential yield x 100

Effective gain = Additional Returns - Additional cost

Additional returns = Demonstration returns - Farmers' practice returns

B:C ratio = Gross returns/gross Cost

Results and Discussion

Seed yield (q/ha)

The average yield of CFLD was 11.63 q/ha as compared to farmers practices 7.66 q/ha. The average yield increased 51.75 per cent over farmers practices during the three years. The result indicated that the cluster frontline demonstration has given a good impact over the farming community of the district about 11.80 q/ha. The average highest yield has been recorded during 2019-20 year, while the average yield was 7.85 q/ha in farmers practices during the year 2019-20. The farmers of the district have been motivated by the improved agriculture technologies applied in the CFLD these findings are in corroboration with the finding of many others (Table 3 and 4).

Gap analysis

Extension gap

Evaluation of findings of the study (Table 4) stated that an extension gap of 3.95 to 4.00 q/ha was found between demonstrated technology and farmers' practice and on The average extension gap 3.96 q/ha has been found during this period while the average highest extension gap 4.00 q/ha was recorded during the year 2017-18. This emphasized the need to educate the farmers through different means for the enhancement of adoption of improved technologies to reverse this trend of wide extension gap use of innovation production technologies with high yielding varieties will subsequently change this alarming trend to extension gap.

The results of technologies will ultimate lead to the discussion of farmers to discontinue the old technology to adopt the new technology.

Technology gap

The average technology gap was 3.36 q/ha during the three years, while it was highest 3.50 q/ha during the year 2017-18. The minimum technology gap has been recorded 3.20 q/ha during the year 2019-20.

The observed technology gap may be attributed dissimilarly in soil fertility status, disease and pest attack as well as the change in the location of demonstration plots every year. The differences in technology gap during different years could be due to more feasibility of recommended technologies during different years.

Technology index

The technology index for all the demonstrations during different year were in accordance with technology gap. The highest technology index per cent of 23.33 was recorded in the year 2017-18 and the lowest was observed in the year 2019-20 which is 21.33 per cent. Hence, it can be inferred that the awareness and adoption of improved varieties with recommended scientific package of practices have increased during the advancement of study period. The present findings confirm the Meena *et al*., (2012) [3], Raj *et al*. (2013) [6] and Meena and Singh (2017) [5]. They found more gain yield of CFLD plots than the existing practices.

Economic analysis

The input and output prices of commodities prevailed during the demonstration were taken for calculating gross return, cost of cultivation, NMR and benefit cost ration. Use of pricy seeds for crops, sowing date, sowing method, seed rate, seed treatment, recommended dose of fertilizer, Integrated pest management etc., all of these are the main reasons for high cost of cultivation in demonstration fields than local check. Therefore, the average cost of cultivation of 3 years increased in demonstration practices 22242.00 Rs/ha as compared to farmer practices 20895.33 Rs/ha (Table 4).

Table 1: Package of practices followed by farmers under front–line demonstrations

Particulars	Technology interventions	Farmer's practices
Variety	HUM-12, TMB-37, MH-421	Local cultivar
Seed rate	20 kg/ha	30 kg/ha
Seed treatment	Seed inoculation with Rhizobium culture @ 10 g/kg Seed	No seed treatment
Time of sowing	First week of April	Second week of April
Method of sowing	Line sowing, 22.5 cm ×10–15 cm	Broadcasting
Fertilizer management	15:40:0 (NPK kg/ha)	Use of urea 50 kg/ha and DAP 150 kg/ha
Weed management	Early post emergence application of imazethapyr 10 SL 500 ml/ha	No use
Water management	Light irrigation at flowering and pod formation stage	No use
Plant protection	Sucking pests–Neem oil 1500ppm @ 2.5 lit./ha, Yellow Stricky trap 40/ha	Products suggested by local pesticide dealers

Table 2: Detail of front line demostration conducted during 2017-18 to 2019-20

S. No.	Year	No. of farmers	Conducted FLD	Area (ha.)
1	2017-18	75	75	30
2	2018-19	50	50	20
3	2019-20	50	50	20
Total		175	175	70

Table 3: Productivity, extension gap, technology gap and technology index of green gram as grown under demonstration plots and farmers practices

Year	No. of FLD's	Variety	Potential yield (q/ha)	Demonstration yield (q/ha)	Farmers practices (q/ha)	Increase yield (%)	Extension gap (q)	Technology gap (q)	Technology index (%)
2017-18	75	HUM-12, TMB-37	15	11.50	7.50	53.33	4.00	3.50	23.33
2018-19	50	MH-421	15	11.60	7.65	51.63	3.95	3.40	22.67
2019-20	50	MH-421	15	11.80	7.85	50.32	3.95	3.20	21.33
Average			15.00	11.63	7.66	51.83	3.97	3.37	22.47

Table 4: Economic analysis of demonstration plots and farmers practices in green gram

Year	Cost of cultivation (Rs/ha)		Gross return (Rs/ha)		Net return (Rs/ha)		B:C ratio	
	IT	FP	IT	FP	IT	FP	IT	FP
2017-18	21400	20540	64112.5	41812.5	42712.5	21272.5	3.00	2.04
2018-19	22646	20646	80910	53358.7	58264	32712.7	3.57	2.58
2019-20	22680	21500	83190	55342.5	60510	33842.5	3.67	2.57
Mean	22242.00	20895.33	76070.83	50171.23	53828.83	29275.90	3.42	2.40

Economic returns as a function of gain yield and Minimum Support Price (MSP) sale price varied during different years. The cultivation of green gram crop under improved technology gave average higher net return of Rs. 53828.83/ha as compared to farmers practices Rs. 29275.90/ha. The average B:C ratio of green gram under improved technology was 3.42 as compared to 2.40 under farmers practices. The results confirm with the findings of front line demonstrations on pulses by Yadav *et al*., (2004) [8], Gauttam *et al*., (2011) [1], Lothwal (2010) [2], Meena and Dudi (2012) [3] and Meena and Singh (2017) [5].

The above results showed that the integration of improved technology along with active participation of farmers has a positive effect in increase the seed yield and economic return of green gram crop production. The suitable technology for enhancing the productivity of green gram crop and need to conduct such demonstration may lead to the improvement and empowerment of farmers. The demonstration traits also enhance the relationship and confidence between farmers and KVK scientists. The recipient farmers of CFLD's also play an important role as source of information and quality seeds for wider dissemination of the improved varieties of green gram for other nearby farmers. It is concluded that the FLD's programme is a successful tool in enhancing the production and productivity of green gram crop through changing the knowledge, attitude and skill of farmers.

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