Role of Cluster Front Line Demonstrations (CFLDs) in summer green gram production in Faridabad district of Haryana, India

Abstract:

In India among different cropping systems Rice–wheat cropping is the major agricultural production system. After harvest of wheat summer green gram could be a great option for the farmers in rice- wheat system. The production of green gram in district Faridabad is very less as compared to state and national average. For large scale popularization of improved technologies, front line demonstrations are an important tool in agriculture. From 2020 to 2022 during summer seasons a three-year study was carried out in various villages of Faridabad district of Haryana by conducting cluster front line demonstrations at farmers' fields. With the participation of farmers, a total of 175 demonstrations were laid out in three years in 70-hectare area with the objective of improving yield productivity and to demonstrate the impact of improved technologies of pulses production potential to the farmers.

Latest variety of moong seed MH 421 was treatment with fungicide Thiram and bio fertilizers like *rhizobium* and Phosphorus Solubilizing Bacteria, weed management by means of chemical i.e. pendimethalin, balanced fertilizers application and integrated pest management were the improved technologies used. Three years study results showed that there was found a positive impact of CFLDs was on the yield of summer green gram and other aspects. Yield was recorded higher under demonstrated trials as compared to farmer's local practices.

Average Summer green gram yield for the years 2020 to 2022 was recorded higher (627 kg/ha) under improved technologies than under farmers practice (463 kg/ha).

In gap analysis there was technological gap, extension gap and technology index were also observed. Higher gross return, net return and benefit cost ratio was found under improved technologies over farmer's practices.

Present study has improved the economic aspects of farming community under cluster front line demonstrations over farmers' practices.

Key words: Economics, Yield,Gap %, Extension gap, Technology index, Technology gap, CFLD, Summer green gram.

Introduction:

It is well proved that pulses are important food crops for human being. Pulses are considered as important in cropping systems because of their ability to fix atmospheric nitrogen and produce good number of yields.India is having a leading role in major pulse producing countries in the world. In 2018 (FAO,2018) the production of pulses in India is 23.02 MT and productivity is 745 kg/ha which is lower than most of the major pulse producing countries. Pulses production in India has not been so impressive due to which import has been increased to the tune of 3.0 to 5.0 million tones (Suresh & Reddy 2016).In Haryana area, production and productivity of moong was found 28.5 thousand hectare, 19.6 thousand tones and 688 Kg/ha respectively in the year 2020-21.Pulse production in India has increased significantly during last decade but to fulfill the domestic demand it is a challenge for maintaining that trend for all researchers, extension agencies and policy makers.

In India among pulse crops, green gram is the third important crop. It is sown as both as kharif and summer crop. To fit in rice-wheat cropping system there is a big opportunity for cultivation of paddy-wheat-summer green gram based cropping system due to short duration

UNDER PEER REVIEW

released varieties of green gram, In India, summer green gram , therefore, have always received fair attentions due to suitable fitment in between rice-wheat system and good demand by consumers.

The improved technologies having higher production potential under the paddy-wheat-summer green gram cropping system can be popularized through cluster front line demonstrations. This study was conducted to evaluate the difference between practices followed by the local farmers in summer green gram crop and demonstrated improved technologies. Low productivity is common problem in pulses in India as well as in Haryana.

While planning the experiment it was found that the major reasons for the lower productivity of green gram was use of local varieties, broadcasting of seeds, ,no seed treatment with fungicides and bio-fertilizers i.e Rhizobium and PSB, no application of nutrients particularly DAP by farmers at sowing time, Poor management of pests and diseases erratic rainfall, cultivation of crops under poor and marginal lands, non-availability of season based quality seeds resulting in increased pest and disease incidence particularly yellow mosaic virus (Sengupta and Biswas, 2017).

Keeping these points in mind this investigation was carried out in this area for popularizing the current technologies of pulse production by incorporating summer green gram in between rice-wheat system and also with objective of increase productivity of summer green gram.

Materials and Methods:

A field study was carried out for three years i.e from 2020 - 2022 by the Krishi Vigyan Kendra, Bhopani, Faridabad of Chaudhary Charan Singh Haryana Agricultural University, Hisar during summer seasons on the farmers' fields of Faridabad district. There were 175 cluster front line demonstrations(CFLDs) conducted in 70 ha of area in different villages by making clusters and soil was analyzed before start experiment (Details of farmers practice and technological intervention and gap percentage among these intervention are given in Table 1 and details of year wise demonstrations conducted given in table 2). Materials for the present study with respect to CFLDs was on following

(i) Improved variety (Green gram-MH421)
(ii) Seed treatment with fungicide followed by Rhizobium and Phosphorus solubilizing bacteria
(iii) Pendimethalin chemical used (3.3litre/ha pre-emergence) for weed management
(iv) Fertilizers (N: P) 20:40 kg/ha
(v) Integrated Pest Management
(vi) The improved technology included modern varieties, seed treatment and maintenance of optimum plant population etc. The sowing was done during April 5-15 in green gram during both the years. The spacing was 45 x 10 cm and seed rates was 25 kg/ha in green gram. The fertilizers were used as per recommended practices. Weed management was done with Pendimethalin 30 % EC chemical (3.3 litre/ha pre-emergence. On soil test basis fertilizer was used under trials and Different pests were minutely observed at different stages of crop growth and controlled by adopting integrated pest management techniques.

The crops were harvested in the presence of Scientists of Krishi Vigyan Kendra at perfect maturity stage by manual and some were harvested by mechanical method. In general, soils of the fields under trials were light to medium in texture particularly sandy loam, sandy with low fertility status in Nitrogen and Phosphorus and medium to high in Potash. In district Faridabad average rainfall was 515 mm. Critical inputs were given by KVK in the form of quality seed of MH 421, Seed treatment with fungicide followed by Rhizobium and Phosphorus solubilizing bacteria, Pendimethalin 30 % EC for weed management and insects' pests control. Under gap analysis technology gap, extension gap andtechnology index was calculated as

UNDER PEER REVIEW

suggested by Samui, *et al*. (2000).

Technology gap = Potential yield- Demonstration yield

Extension gap = Demonstration yield-Farmers yield

$$\text{Technology index (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

Table.1 Details and percent gap of Summer green gram grown under farmers practice and technological intervention under CFLDs.

Particulars	Farmers Practice	Technology intervention	Gap %
Variety	SML 668	MH421	40
Seed rate (per hectare)	15 kg/ha	25-30 kg/ha	55
Sowing method	Broadcasting/Line	L-L (20-25cm)	30
Seed Treatment	No seed treatment	Seed treatment with fungicide Thiram@4 gram/Kg seed fb by bio fertilizers like Rhizobium and PSB.	90
Fertilizer application	No fertilizers.	Application (20 kg N + 40 kg P2O5 / ha.	90
Weed Management	Hand weeding or No chemical use	Weeds management by Pendimethalin 3.3L/ha as pre-emergence after sowing. + two manual weed management @ 20-25 DAS & 35-40 DAS	60
Plant protection	No application of Plant protection chemicals	Need based plant protection Chemicals were used.	70

Table 2. Year wise details of Cluster Front Line Demonstrations (CFLDs).

Sr. No.	Year	Name of crop	Variety	Variety	Area (ha)	Number of Demonstrations
1	2020	Summer Green Gram	MH 421	SML 668	30	75
2	2021	Summer Green Gram	MH 421	SML 668	20	50
3	2022	Summer Green Gram	MH 421	SML 668	20	50

Results and discussion:

Productivity

After analyzing data under farmers practices and under technological intervention a gap analysis was done to find out major factors were identified for the trial and a gap from 30-90 percent (Table 1) was found under different practices and on that bases different technological interventions were applied in these demonstrations and on the three years pooled data the average yield of green gram was found higher (627 kg/ha) than farmers practice (463 kg/ha) (Table 3).This clearly shows that it is due to higher number of yield attributing characters i.e pods per plant, grains per pod and branches per plant under scientific production technologies

UNDER PEER REVIEW

than farmers practices. Three years data shows that the average percentage yield increased under demonstrations over farmer's practices was 36.30 percent over district average. This clearly shows that farmers' productivity of summer moong was increased by adopting scientific production technologies. The results showed that there was a clear cut impact of Cluster front line demonstrations on yield and also on economic parameters over the farmers practices in Faridabad district as they were motivated by adopting the improved agricultural technologies in the CFLDs fields (Table 3). Similar results are also presented by Poonia and Pithia (2011).

Table 3: Effect of CFLDs on the Yield and yield attributes of summer green gram.

Year	Pods /plant	Grains/pod	Branches/plant	Yield under Demonstrations (q/ha)	Yield under Farmers practices (q/ha)	Yield Increase (%)
2020	24.3	11.8	4.4	5.80	3.90	48.7
2021	25.1	11.9	4.5	5.82	4.50	29.3
2022	26.9	12.7	5.1	7.20	5.50	30.91
Average	25.43	12.1	4.7	6.27	4.63	36.30

Gap analysis

Extension gap

In Faridabad district (Table 4) during three years study the range of extension gap was found between demonstrated technology and farmers' practice from 1.20 to 1.90 q/ha and on an average extension gap of 1.60 q/ha was found during this period while during the year 2020 the average highest extension gap 1.90 q/ha was observed. This stressed the requirement to educate the farmers through different means for the development of adoption of improved technologies to reverse this trend of wide extension gap. There is need of use of innovation production technologies with high yielding varieties will subsequently change this alarming trend to extension gap.

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

Technology gap

During three years the average technology gap was 4.72 q/ha, while technology gap was highest during the year 2020 (5.20 q/ha). The minimum technology gap has been recorded during the year 2022 (3.80 q/ha) Table 3.

The observed technology gap may be due to different factors like not similarity in soil fertility status of demonstrated plots, change in the location of demonstration plots every year, Variability in disease and pest attack. The differences in technology gap were also found may be due to more feasibility of recommended technologies during different years.

Technology index

For all the demonstrations the technology index was calculated during different year were in accordance with technology gap. The highest technology index in the year 2020 was 47.27 per cent recorded and the lowest was observed in the year 2022 which was 34.54 per cent. Hence, it can be concluded that during the advancement of study period the impact of awareness and adoption of improved varieties with recommended scientific package of

UNDER PEER REVIEW

practices have increased the yield and net returns of the farmers. The present findings results validate the results of Meena et al., (2012), Raj et al. (2013),Meena and Singh (2017) and Gaur et al (2020).

Table 4: Technological Gap analysis of summer green gram under CFLDs.

Year	Extension gap(q)	Technologygap (q)	Technologyindex (%)
2020	1.90	5.20	47.27
2021	1.20	5.18	47.09
2022	1.70	3.80	34.54
Average	1.60	4.72	42.96

Profitability

The inputs and outputs prices prevailed during the study of demonstrations were taken for calculating cost of cultivation, gross return, net return and benefit cost ratio (Table 5). On an average basis of three years data, we can conclude that higher net return of Rs. 23810/ha under improved technologies of summer green gram gave as compared to farmers practices i. e of Rs.15700/ha and the benefit cost ratio of 2.23 was observed under improved technologies of summer green gram as compared to 1.88 under farmers' practices. This may be due to higher yields obtained under improved technologies compared to local check (farmers practice). This finding is in validation with the findings of Kumar et al. (2020), Mokidue et al, (2011).

Table 5: Economic analysis of summer green gram under CFLDs.

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
2020	17725	16400	39440	30600	21715	14200	2.22	1.86
2021	17725	16400	39440	30600	21715	14200	2.22	1.86
2022	22450	19800	50400	38500	28000	18700	2.25	1.94
Mean	19300	17533	43093	33233	23810	15700	2.23	1.88

Conclusion:

The adoption of improved technologies gave a significantly effect on the yield, yield

UNDER PEER REVIEW

attributing traits and economic parameters. yield as well as yield attributing traits of crop and also the net returns was found higher than the farmer's practices. These results verify the findings of Reager et al. (2020) in green gram. The impact was also observed on the area expansion of summer green gram in the district Faridabad from 250 ha to 350 ha.

The study shows that adoption of improved varieties with recommended scientific package of practices have increased the yield, yield attributing traits and net returns of the farmers during the three years study. So, we can conclude that in field conditions for getting higher yield there is a requirement to disseminate the improved technologies among the farmers with effective extension methods like training and demonstrations. More efforts are to be needed at farmer level so that more farmers can be encouraged to adopt the recommended package of practices realizing for higher returns. These finding were in confirmative with the results of Vikas Hooda and Pooja Rani (2024)

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc have been used during writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

UNDER PEER REVIEW

References:

FAO STAT (2018). FAOSTAT - Statistical Database, 2018.

1. Gaur Vinay and Jadav Prabhatsinh (2020). Impact of demonstrations on productivity and profitability of greengram in Gandhinagar district of Gujarat. J. Krishi Vigyan 8 (2) : 174-177.

2. Hooda,Vikas and Rani, Pooja (2024). Impact of cluster frontline demonstrations on green gram for productivity enhancement and dissemination of technology in Hisar district of Haryana. The Journal of Rural and Agricultural Research 24 (1), 35-38 (2024).

3. Kumar S, Dev J, Singh R, Kumar S (2020). Role of cluster front line demonstrations in enhancing

blackgram productivity under rainfed conditions in the district Bilaspur of Himachal Pradesh. J. Krishi Vigyan 9 (1): 293-297.

4. Meena, M.L. and Singh, D. (2017). Technological and extension yield gaps in greengram in Pali district of Rajasthan, India. Legume Research 40(1): 187-190.

5. Meena, O.P., Sharma, K. C., Meena, R.H. and Mitharwal, B.S. (2012). Technology transfer through FLDs on mung bean in semi-arid region of Rajasthan. Raj. J. Extn. Edu. **20**: 182-186.

6. Mokidue, I., Mohanty, A.K. and Kumar, S. (2011). Correlating growth, yield and adoption of urad bean technologies. Indian J. Ex. Edu. **11(2)**: 20-24.

7. Poonia, T.C. and Pithia M.S. (2011). Impact of front line demonstrations of chickpea in Gujarat. Legume Res. **34(4)**: 304-307.

8. Raj, A.D., Yadav, V., Rathod, J.H. (2013). Impact of front line demonstrations (FLD) on the yield of pulses. International Journal of Scientific and Research **3(9)**: 1-4.

9. Reager ML, Kumar Upender, Mitharwal, BS, Chaturvedi, BS. (2020). Productivity and sustainability of green gram as Influenced by improved technology of CFLD under hyper arid partially irrigated zone of Rajasthan. International Journal of Current Microbiology and Applied Science9 (5): 1978-1986.

10. Samui, S.K., Maitra, S., Roy, D.K., Mondal, A.K. and Saha, D. (2000). Evaluation on front line demonstration on groundnut (Arachis hypogea L.). J. of Indian Soc. of Coastal Agriculture Research **18**: 180-183.

11. Sengupta K and Biswas S. 2017. Pulse Production and Ecology: The Issues of Community Mobilisation in India. Agricultural Extension Journal 1(1): 31-34.

12. Suresh, A. and Reddy, A. (2016). Total factor productivity of major pulse crops in India: implications for technology policy and nutritional security. Agric. Econ. Res. Rev., **29** : 87-98.

UNDER PEER REVIEW