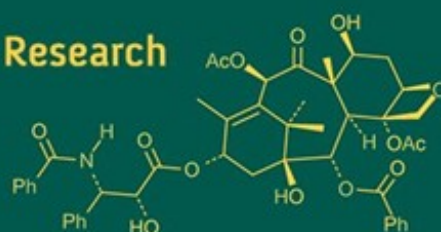
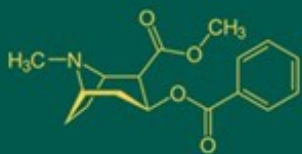


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
Indexing: Embase
IJABR 2026; 10(9): 1900-1903
www.biochemjournal.com
Received: 01-07-2026
Accepted: 10-08-2026
Published: 22-09-2026

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Impact of cumulative front line demonstrations on productivity of green gram in Mahendergarh district of Haryana

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sx.10106>

ABSTRACT

Cluster Frontline Demonstrations (CFLDs) are an effective extension tool to bridge the gap between research and farmers' practice by showcasing the potential of improved technologies under real farm conditions. The present study analyzed CFLDs on green gram crop conducted at Mahendergarh district of Haryana in 2019, 2020, 2021 and 2022 covering multiple villages across the district. Data were collected on farmers' practice (Local check) and demonstrated practice with respect to yield, cost of cultivation, gross and net returns, and benefit-cost (B:C) ratio. Results revealed that the demonstrated technologies consistently outperformed farmers' practices. Green gram yields under demonstration plots ranged from 6.5 q/ha in Kharif-2019 to 7.1 q/ha kharif 2022, compared to 4.80 q/ha to 5.4 q/ha under farmers' practice, with extension gaps of 1.75 q/ha and percentage increases of 36%. The cost of cultivation for demonstration plots was slightly higher than local check; however, average gross returns (₹42537.5) and average net returns (₹21113.75) were substantially higher under demonstrations. Correspondingly, the benefit-cost (B:C) ratio was 1.74 under local check to 1.99 under demonstration plot, highlighting the economic advantage of improved practices. These findings demonstrate that CFLDs effectively enhance green gram productivity, reduce yield gaps, and improve farmers' livelihoods. Strengthening extension efforts is recommended for large-scale adoption of improved green gram production technologies.

Keywords: Cluster Frontline Demonstrations, Green gram, Extension gap, Productivity, Benefit-cost ratio

Introduction

Pulses are an important source of protein and play a vital role in ensuring nutritional security and soil fertility through biological nitrogen fixation. Despite their importance, pulse productivity in India remains low due to traditional farming practices, limited adoption of improved technologies, and inadequate knowledge dissemination. Cumulative front line demonstration (CFLD) serve as a crucial extension approach to showcase improved varieties, nutrient management, and crop management practices under real farm conditions, helping bridge the gap between research recommendations and farmers' practices. The crop covers very marginal area. The area under sesame crop is likely to increase because of its better profitability. Production technology of these crops still needs to be transferred to the interested farmers. Available research findings show that the technology gap can be minimized considerably with the available technology and the new varieties along with close monitoring and supply of critical inputs. Transfer of technology by various modes is very essential to increase productivity and maintain sustainability in agriculture. One of the important mandate of Krishi Vigyan Kendras (KVKs) is to conduct cluster frontline demonstrations of various crops having production potential under specific conditions. Indian Council of Agricultural Research (ICAR) through its Agriculture Technology Application Research Institutes (ATTARI) has assigned the task of conducting the cluster frontline demonstrations on Pulses to the KVKs under National Food Security Mission Scheme. Keeping in view the above factors cluster frontline demonstrations were conducted on Green gram crop at farmers' fields in the district.

Objectives of this study were as follows

1. Enhancing Green gram production
2. Restoring soil fertility and productivity at the individual farm level.
3. Increasing farm income and profitability
4. Collection of feed back from farmers for further improvement
5. Motivate farmers for adoption of improved practices

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Material and method

To enhance adoption of modern technologies by the farmers, KVK, conducted PRA survey in KVK adopted villages of the district and it was observed that yield of Green gram is low due to use of old vari-

ety, incidence of root rot, yellow mosaic, bacterial blight and imbalance or no use of fertilizers. The operational area for cluster front line demonstration is listed in [table: 1](#)

Table 1. Operational area and partner famers

Year	Villages	Area(ha)	Farmers (No)
2019	Rambass, Siyana, Nawann, Bucholi	30	75
2020	Shyampura, Pali, Jarwa, Dewasn Surati Pilonia,	30	75
2021	Nangla, Gadarwas, Jarwa, Kakrala	20	50
2022	Chandpura, Saidpur, Garhi, Patharawa	30	75
	Total	54	135

Crop sequence

Since Mustard and Wheat are the major rabi season crops of the district, Green gram being the kharif season crop was seeded in fields vacated by these crops sowing was done with onset of monsoon rains in first fortnight of July.

Identification of technology adoption gaps

Participatory rural approach (PRA) techniques, field observation and interaction with progressive as well as marginal farmers were adopted to identify the technological gaps between the existing practices and

improved agricultural practices. In varietal adoption there was a 30% gap A major gap was also observed in seed treatment (85%) and fertilizer application. Particularly adoption of bio fertilizers resulting in 93-95% gap. In plant protection management a 75% gap was observed in control of insects. The identification of technology gap is given in [Table 2](#). These identification gaps provided a base for planning cumulative front line demonstration so that the gap can be minimised by organising farmers training, and other need based extension activities.

Table 2. Identification of technology gaps

S. No.	Technology	Recommended Practice	Farmers' practice	% Gap
1.	Variety	MH 96-1, Satya, Basanti, MH-421, MH-318	Satya = 50%, Basanti = 20% Local seed – 30%	30
2.	Seed Treatment	Thiram (4 g/ kg seed)	Seed treatment – 15 % No seed treatment – 85 %	85
3.	Fertilizers (kg/ha)			
	N	15 kg/ ha	25 kg/ ha – 15 % No application – 85 %	85
	P	40 kg/ ha	40 kg/ ha = 15% 30 kg/ha = 45% No Application – 40%	50
	Biofertilizer	Rhizotika (125 ml) PSB (125 ml)	5-7 % application	93-95
4.	Weed Management	Two hoeing Pendimethalin (3.3 L/ha) pre em.	One hoeing – 85% No hoeing – 10 % Pendimethalin – 5 %	60
5.	Insect - pest management	Malathion 1 ltr./ ha, Rogor 625 ml/ ha, Imidacloprid 250 ml/ ha	Malathion – 15 % Rogor – 10 % Imidacloprid – 0 % No application – 75 %	75

Critical inputs

The KVK provided quality seed of improved varieties, fertilizers use including bio fertilizers and Pesticides for control of diseases and insects are the critical inputs needed higher crop yield. Quality seed of MH-421 grown with recommended package of practices in demonstrations plots increased crop yield remarkably (36%) over other varieties grown in local check plots ([table 3](#)).

Technology demonstrated in CFLDs on pulses (Kharif – 2019 to 2022)

1. Improved variety (MH-421)
2. Seed treatment with Thiram (4.0 g/ kg seed)

3. Balanced use of fertilizers (20 kg N + 40 kg P₂O₅ / ha + biofertilizers – Rhizotika + PSB)
4. Weed Management – Pendimethalin (3.3 L/ha) pre em.
5. Management of sucking pests (Imidacloprid @ 250 ml/ ha)

Marketing

Farmers did not face any marketing problem for sale of green gram produce. The crop produce was sold by the farmers at Rs. 5500 / quintal.

Result and discussion

The data output were collected from both demonstrated plots as well as local check plots along with different parameters as suggested by [Yadav et al. \(2004\)](#) ^[1] and [Verma et al. \(2014\)](#) ^[2] for calculating gap

analysis, costs and returns. The analytical tool used for assessing the performance of the FLD on gram is as follows:

Technology gap (kg/ha): Potential yield – Demonstration yield

Extension gap (kg/ha): Demonstration yield – Farmers yield

Technology index (%): (Technology gap/Potential yield) × 100

Additional return (Rs/ha) = Demonstration return –
Farmers' practice return

Incremental B: C ratio = Additional return/Additional cost

The results presented in Table: 3 and graphically presented in fig:1 indicated that the demonstration technology resulted in higher grain yield than the local check during kharif 2019 to 2022. The average grain yield increased from 6.5 q/ha in 2019 to 7.1 q/ha in 2022 compared with 4.8 to 5.4 q/ha under local check. On an average demonstration technology gave 36.0% higher yield than local check. The higher was due to adoption of improved technology viz improved seed, balance fertilization, seed treatment and crop management practices.

The technology index in 2019 was 45.8% and declined to 40.8% in 2022 with an overall average of 43.1% which indicated progressive improvement in the feasibility and adoption of improved technology.

The extension gap which represents the difference between demonstration yield and local check yield 1.7 to 1.8 q/ha with a pooled value of 1.75 q/ha. The consistent extension gap from 2019 to 2022 shows the relative performance of improved/ demonstrated technology in

improving green gram productivity over the existing farmers practice, suggesting wider scope for adoption of improved practices for increasing productivity in the large area.

The potential yield of green gram was 12.0 q/ha throughout the study period. The difference between potential yield and demonstration yield representing technology gap remained higher, ranging from 4.9 q/h to 5.5 q/ha, with an average of 5.2 q/ha. The technology gap decreased, indicating gradual improvement in the performance of demonstration technology over farmers practice. The environmental variability, soil condition and rainfall distribution have been restricted the realization of potential yield of green gram in the district.

Overall, the finding demonstrated the increase in green gram yield in demonstrated plots over the check plots. However, the considerable technology gap highlighted the need for strengthening extension efforts to bridge the gap in terms of training and field days.

Table 3. Performance of Green gram in crop technology demonstrations (Kharif 2019 to Kharif 2022)

Year	Avg. Yield (q/ha)		Potential Yield (q/ha)	Technology index (%)	Technology Gap (t/ha)	Extension Gap (q/ha)
	Local Check	Demonstration plot				
2019	4.8	6.5	12.0	45.8	5.5	1.7
2020	4.9	6.7	12.0	44.1	5.3	1.8
2021	5.2	7	12.0	41.6	5.0	1.8
2022	5.4	7.1	12.0	40.8	4.9	1.7
Average	5.0	6.8	12.0	43.1	5.2	1.75

Table 4. Economic analysis in cluster front line demonstrations of green gram (Kharif 2019 to Kharif 2022)

Year	Cost of production (Rs./ha)		Gross return (Rs/ha)		Net return (Rs./ha)		B:C Ratio		Additional return (Rs/ha)
	Local Check	Demonstration plot	Local Check	Demonstration plot	Local Check	Demonstration plot	Local Check	Demonstration plot	
2019	16550	19540	31400	40750	14850	21210	1.89	2.08	6360
2020	17700	20655	31950	41850	14250	21195	1.80	2.02	6945
2021	20225	22350	33600	43500	13375	21150	1.66	1.94	7775
2022	21240	23150	34700	44050	13460	20900	1.63	1.90	7440
Average	18928	21423	32912	42537	13983	21113	1.74	1.99	7130

Economics

Average net returns worth Rs. 21113/ ha were obtained in demonstration plots and Rs. 13983 / ha in local check plots. Thus an additional income of Rs. 7130/- in demonstration plots were obtained with additional expenditure of Rs. 2495 / ha only. The benefit cost ratio was 1.99 (Table: 4).

Constraints in green gram production:

The unavailability of suitable high yielding variety (HYV) seed, uncertainty of monsoon rains/drought were the major constraints to clusterbean crops production. Other constraints such as low fertility and post-harvest management were also found to reduce green gram production.

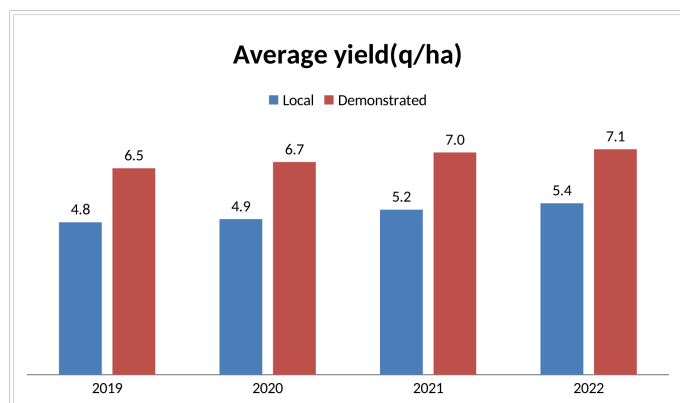


Figure 1. Performance of Green gram in crop technology demonstrations (Kharif 2019 to Kharif 2022)

Benefit–cost ratio trends

The B:C ratio was higher in all the four years 2019-2022 in demonstration plots over the local check plots (Fig: 2). On an average demonstrated technology resulted a B: C ratio of 1.99 compared to B:C ratio of 1.74 in local check plots or Farmers practice. Thus the demonstration provided an improvement of approximately 14.3% in the average B:C ratio. The increase in B:c ratio indicated that the demonstrated technology increased the economy efficiency of green gram cultivation. The results suggested that the demonstrated technology was economically viable and had good potential for adoption by farmers of the district.

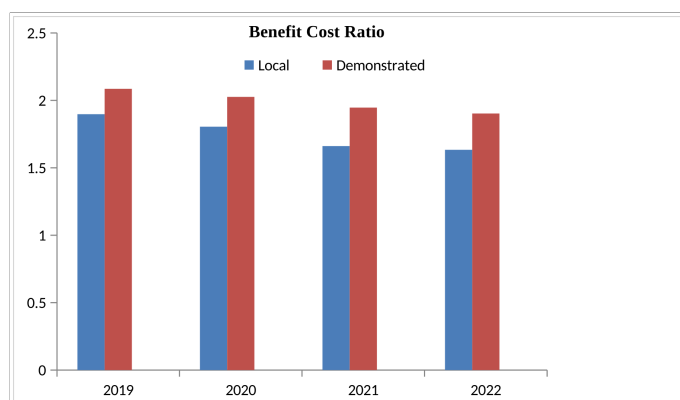


Fig:2 Benefit : Cost ratio trends

Reaction of farmers about each critical input supplied under demonstrations

1. Green gram variety MH-421 put a great impact for its short duration and better yield than other varieties grown by the farmers.
2. Farmers realize the importance of balanced application of fertilizers which was demonstrated at farmers' fields. Positive response was seen for application of Phosphorus and Bio-fertilizers.
3. Role of seed treatment with recommended fungicides in enhancing yield in demonstration plot put a great impact on farmers mindset for adopting this practice.
4. Application of pendimethalin controlled *Trianthema*, *Digera* and *Amaranthus* effectively but did not control cyperus.

Feed back for future research

1. Herbicides for effective control of cyperus are needed.

2. Rot rot disease was not controlled effectively by seed treatment with Thiram effective control measures are needed to be evolved.

3. Green gram variety with synchronous maturity are needed.

For development departments

1. Availability of seeds of improved varieties of green gram needs to be ascertained.
2. Availability of bio-fertilizers needs to be ascertained for easy availability to the farmers at local level.

For policy consideration

1. Purchase of produce at minimum support price needs to be taken up on priority.

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How to cite this article: Yadav R, Singh N, Shivran A. Impact of cumulative front line demonstrations on productivity of green gram in Mahendergarh district of Haryana. *International Journal of Advanced Biochemistry Research.* 2026;10(9):1900-1903. doi: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sx.10106>