www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(8): 1081-1084
© 2023 TPI
www.thepharmajournal.com
Received: 18-06-2023
Accepted: 30-07-2023

Rajpaul
District Extension Specialist, Department of Soils Science, KVK, Mahendergarh, CCS Haryana Agricultural University, Hisar, Haryana, India

Ramesh Kumar
Principal Extension Specialist, Department of Agronomy, KVK, Mahendergarh, CCS Haryana Agricultural University, Hisar, Haryana, India

Ashish Shivran
District Extension Specialist, Department of Agronomy, KVK, Mahendergarh, CCS Haryana Agricultural University, Hisar, Haryana, India

Poonam Yadav
District Extension Specialist, Department of Home Science, KVK, Mahendergarh, CCS Haryana Agricultural University, Hisar, Haryana, India

Narender Kumar
District Extension Specialist, Department of Pathology, KVK, Mahendergarh, CCS Haryana Agricultural University, Hisar, Haryana, India

Jai Lal Yadav
Principal Extension Specialist Department of Entomology, KVK, Mahendergarh, CCS Haryana Agricultural University, Hisar, Haryana, India

Ashok Kumar
District Extension Specialist (F.M), KVK, Mahendergarh, CCS Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author:
Rajpaul
District Extension Specialist, Department of Soils Science, KVK, Mahendergarh, CCS Haryana Agricultural University, Hisar, Haryana, India

Impact analysis of front-line demonstration on yield and economics of clusterbean in Mahendergarh district of Haryana

Rajpaul, Ramesh Kumar, Ashish Shivran, Poonam Yadav, Narender Kumar, Jai Lal Yadav and Ashok Kumar

Abstract
During the kharif seasons of 2019, 2020, and 2021, Krishi Vigyan Kendra, Mahendergarh, performed Front Line Demonstration (FLD) in the farmers' fields in the villages of the districts. Through meetings and talks with farmers, the crucial inputs in the production technique that is now in use were determined. The soil in the demonstration fields was sandy loam, low in organic cabon content, low in nitrogen, medium in phosphorus, and medium in potash. The crops that were rotated included pearl millet, cluster beans, and mung beans along with mustard and wheat. Clusterbean crop yield in district Mahendergarh was found to be poor for a number of reasons, including delayed sowing, inappropriate seed rate and unbalanced fertilizer application, unchecked weed growth, and a lack of plant protection measures. The remaining factors, including the technological impact, the economic impact, and the extension gap, were examined in the same order in order to determine the impact of the front-line demonstration on the clusterbean crop and the viability of the proven technologies at the local level. The findings of three years showed that the variety performed very well in the first year (2019), with average yields of 11.9 q/ha, 13.10% greater than the check variety (10.50 q/ha). Based on the first year's results, the demonstration was extended the following year, namely in 2020 and 2021. The grain yield of the HG 2-20 variety rose above the yield attained under farmers' practice by 1.4 q/ha (2019), 1.30 q/ha (2020), and 0.98 q/ha (2021), The average three year data between the farmers' methods and the displayed plots, there was an extension gap that ranged from 0.98 to 1.4 qtl per hectare across the years. On average, this extension gap was 1.23 qtl per hectare. Depending on generated grain yield and MSP selling prices, the incremental benefit cost ratio (B: C) was 1.99, 2.77 and 2.96 in 2019, 2020, and 2021, respectively. It was found that farmers received an average return of Rs. 4535/ha with an extra investment of Rs. 805, which is so little that even small and marginal farmers could afford it.

Keywords: Demonstration, economics of clusterbean, Mahendergarh district of Haryana

Introduction
Cluster bean makes a unique addition to pulse crops. It is cultivated in Uttar Pradesh, Gujarat, Haryana, and Rajasthan. In terms of area and output of cluster beans in India, Rajasthan takes the top spot. The crop yields guar gum, a kind of gum that is sold to other nations. Its seeds have an endosperm that is roughly contains 30–33% gum and 18–28% protein, 32% fiber. India is the world's top producer of cluster bean seed, accounting for around 75–80% of global guar output. Cluster beans are produced on 4.10 million hectares of land in India, with a productivity of 451 kg/ha, and they account for 1.85 million tonnes of the country's yearly output, or over 80% of all bean production worldwide. It is grown on 5.7 thousand hectares of land in the Mahendergarh district of the state of Haryana, with an average yield of 8.60 q/ha. Cluster bean productivity is currently insufficient due to a number of biotic and abiotic stresses, as well as the lack of timely access to high-quality seeds from improved varieties and poor crop management techniques brought on by ignorance of and failure to implement recommended production and plant protection technologies by the farmers. Many production technologies have been developed by agricultural universities and research institutes, but the productivity of cluster beans is still low due to poor technology transfer from the points of its development to the points of its utilization; as a result, there is a significant gap between knowledge of production and knowledge of utilization. The Front Line Demonstration (FLD) is a practical strategy to hasten the adoption of tried-and-true technologies in farmers' fields in a participatory manner with the goal of exploring the full range of crop production resources and also of bridging productivity gaps by increasing the

production of the national basket. Krishi Vigyan Kendra, Mahendergarh performed 135 cluster bean crop demonstrations on farmer's fields from kharif 2019 to kharif 2021. KVK conducted a PRA study in KVK adopted villages to encourage farmers to embrace contemporary technologies. It was found that clusterbean production is poor owing to usage of an ancient variety, prevalence of root rot and bacterial leaf blight disease and imbalanced or no use of fertilizers. The following were the study's goals:

1. Increasing Clusterbean Production in the Mahendergarh District
2. Increasing the productivity and fertility of particular farms' soil,
3. Increasing agricultural profits and revenue,
4. Gather farmer feedback to make additional improvements,
5. Encourage farmers to adopt better techniques.

Materials and Methods

To increase adoption of modern technologies by the farmers, KVK, conducted PRA survey in KVK adopted villages and it was observed that yield of clusterbean is low due to use of old variety, incidence of root rot and imbalance or no use of fertilizers. The operational area for front line demonstration is listed in table 1.

Table 1: Operational area and partner famers

Year	Villages	Area(ha)	Farmers (No)
2019	Rambass, Khudana, Nawan, Bucholi	20	50
2020	Pali, Jarwa, Dewas	14	35
2021	Shyampura, Barda, Malada Bass	20	50
	Total	54	135

Farming situation and nutrient status of the selected farmer's field was recorded and analyzed. The data revealed that O.C and N content in all the samples was deficient in all the selected fields and ranged between 0.18-3.3%. P and K content were low to medium in range. Cropping pattern and nutrients status is tabulated in table 2.

Table 2: Cropping sequence and Nutrient Status

Crop Sequence	Soil Type	Nutrient Status
Pearlmillet-Mustard Pearlmillet- Wheat	Loamy Sand-Sandy Loam	O.C- 0.18-3.3% N - 90-130kg/ha P_2O_5 -7.5-11.0 kg/ha K_2O- 100-225kg/ha

The purpose of the research was to evaluate the performance of variety HG 2-20 in comparison to older, established varieties and farmer-used private-sector cultivars. Since the enhanced variety (HG 2-20) has several unique qualities, such as resistance to bacterial leaf blight, root rot, and alternaria blight, it was utilized in demonstrations. The crop lasts 90–100 days and produces an average of 8–9 q/ha. The crop was cultivated using the suggested equipment and procedures. Farmers get free access to essential supplies including seed, bavistin (a fungicide) for seed treatment, and bio fertilizers. Trainings on seed treatment techniques as well as package and practice adaption were done with high awareness among the chosen farmers. Field days and group gatherings were also planned prior to crop harvest to provide other farmers the chance to see first-hand the advantages of the technologies that were being used.

Results and Discussion

For calculating gap analysis, costs, and returns, the data output were gathered from both FLD plots and control plots along with other parameters given by Yadav *et al*. (2004) [6] and Verma *et al*. (2014) [4]. The following is the analytical method used to evaluate how well the FLD performed on gram:

Technology gap (kg/ha) = Potential yield minus Demonstration yield.

Extension gap (kg/ha) = Demonstration yield minus Farmers' yield.

Technology index (%) = Technology gap/Potential yield) X 100.

Additional Return (Rs/ha) = Demonstration return minus farmers' practice return.

Incremental B: C ratio = Additional return/Additional cost.

Crop yield

The increase in grain production compared to the farmer's traditional methods was between 9.39 and 13.10%. In comparison to farmers' methods and technology demonstrated an average production advantage of 11.1% over clusterbean growers. Clusterbean grain yield rose above the yield attained by farmers' practice by 1.4 q/ha (2019), 1.30 q/ha (2020), and 0.98 q/ha (2021).The outcome is consistent with Chaudhary *et al*.'s (2018) and Tiwari *et al*.'s (2003) [3] findings. These findings demonstrate that the yield of clusterbean might be boosted with knowledge and the application of suitable technologies, such as high yielding varieties, seed treatment with fungicide and biofertilizers, use of a balanced dosage of fertilizer, correct weed control, etc.

Analysis of gaps

Technology gap is the difference between prospective yield and yield produced under enhanced technology demonstration, while extension gap is a metric to know the yield discrepancies between the exhibited technology and farmers' practices. The technology gap is more important than other criteria since it reveals implementation limitations and flaws in our practice package, which may be environmental or genetic in nature. Between the farmers' practices and the displayed plots, there was an extension gap that ranged from 0.98 to 1.4 qtl per hectare across the years (Table 4). On average, this extension gap was 1.23 qtl per hectare. The extension gap was lowest in kharif 2021 (0.98 qtl/ha) and largest in year 2019 (1.4 qtl/ha). This discrepancy may be related to the demonstrators' use of new techniques, which produced greater grain yields than the farmers' techniques. The varying viability of suggested technologies over the course of three separate years may account for the variation in the technological gap. Similar to this, the technology index for every demonstration throughout several years matched the technological gap. A higher technology index highlighted the need to inform farmers via a variety of channels about the adoption of better / suggested production technology in order to close the gaps.

Economic feasibility

For the demonstrations and farmers' practices, several factors like seed, fertilizer, biofertilizers, and pesticides were taken into consideration as financial input. During successive years, economic returns as a function of grain output and minimum support price (MSP) selling price changed. According to generated grain yield and MSP selling rates, the lowest and greatest incremental benefit cost ratios (B: C) were 1.99, 2.77, and 2.96 in 2019, 2020, and 2021, respectively (Table 5). It has been noted that farmers received an average return of Rs. 4535/ha with an extra investment of Rs. 805 per ha. Higher grain yields brought about by new technology, non-financial variables, timely crop cultivation activities, and scientific monitoring were responsible for the returns. This rise came with an additional cost of just Rs 805 per hectare, which even small and marginal farmers could pay. Therefore, illiteracy is the main factor preventing farmers from adopting cutting-edge technology, not cost. Such a yield gap is best described as an extension gap. Therefore, the FLD program was successful in modifying farmers' attitudes, abilities, and knowledge toward better/recommended methods of growing cluster beans. Additionally, this strengthened the bonds of trust between farmers and scientists and improved their interactions.

Table 3: Correlation of the demonstrated package with the current farming methods used by cluster bean FLDs

Sr. No.	Technology	Recommended practice	Farmers Practice	Percent Gap
1.	Variety	HG 2-20	HG 2-20, HG 75, HG 365, Tulsi guar, X6, X10, Local seeds (35%)	35
2.	Seed Rate	5 kg	5 kg	0
3.	Seed Treatment	Carbendazim (12g) + Streptocycline (6g)	No application (80%)	80
4.	**Fertilizers application**			
	Nitrogen	8 kg	No application (90%)	90
	Phosphorus	16 kg	16 kg (40%), 8 kg (20%), No application (40%)	50
	Zinc	8 kg	No application (100%)	100
	Biofertilizers (Rhizobium + PSB)	50 ml each	No application (100%)	100
5.	Weed management	2 hoeing	1 hoeing (90%)	60
6.	Insect-Pest management (BLB)	Spray of COC (200g) + streptocycline (30g) per 200 liter of water	No application (65%)	65

Table 4: Performance of the cluster-bean in crop technology trials (Kharif 2019-2021)

Years	Demonstration figures	Area (ha)	Avg. Yield (qt/ha		% Increase	Potential Yield (qt/ha)	Technology index (%)	Technology Gap (qt/ha)	Extension Gap(qt/ha)
			Local Check	Demonstration					
2019	50	20	10.5	11.9	13.10	20	40.5	8.1	1.4
2020	35	14	12.1	13.4	10.74	20	33	6.6	1.3
2021	50	20	10.44	11.42	9.39	20	42.9	8.58	0.98
Average	135	54	11.01	12.24	11.1	20	38.8	7.76	1.23

Table 5: Economic study of Cluster-bean front-line demonstrations (Kharif 2019 -2021) (Rs./ha)

Years	Demonstration figure	Area(ha)	Cost of cultivation		Gross return		Net Return		B: C ratio		Additional return
			Local check	Demonstration	Local check	Demonstration	Local check	Demonstration	Local check	Demonstration	
2019	50	20	20590	21754	40950	46410	20360	24656	1.99	2.13	4296
2020	35	14	21400	22250	59190	64260	37790	42010	2.77	2.89	4220
2021	50	20	21900	22300	64764	70252	42864	47952	2.96	3.15	5088
Average	135	54	21296	22101	54968	60307	33671	38206	2.57	2.72	4535

Production restrictions for cluster beans

Production of cluster-bean crops was severely limited by the lack of sufficient high yielding variety (HYV) seed and the unpredictability of monsoon rains/drought. It was also shown that other limitations, such as poor fertility and post-harvest management, lower cluster-bean yield.

Conclusion

Based on three years' cluster bean yield data of FLDs, it can be said that adopting the suggested package of practices under demonstration may boost cluster bean production by 11.90% compared to farmer practices. The rise was noted with just a little amount of additional investment of Rs. 805 per hectare, yielding an additional return on demonstration yield of 4535/ha. The fundamental cause for this adoption of new technology is ignorance and unawareness, which is why the terms "yield gap" and "extension gap" are particularly appropriate. Moreover, by implementing such technology under FLD, the extension gap may be reduced. The B: C ratio is high (2.72), which will encourage farmers to use technology. Therefore, farmers' attitudes, skills, and knowledge of better cluster bean farming techniques, including adoption, were found to be changed by front-line demonstrations of the crop. This enhanced the interaction between farmers and scientists and increased their mutual trust. Demonstration farmers are a reliable supply of high-quality seed in the region and adjacent areas for the next season as well as a solid main source for growing cluster beans. Front-line demonstration aids in the quick and widespread transmission of upgraded, well-proven technologies among farmers. By educating the farming community about these technologies through ongoing campaigns, extensive cluster demonstrations, the distribution of literature in the local tongue, and the creation of farmer success stories using ICT tools like video conferencing, Kisan Mela, Kisan Gosti, Kisan Mobile Sandesh, and WhatsApp messages, among other things, etc., the farming community could be encouraged to adopt these technologies on a large scale.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Singh RK, Kumar H. On farm evaluation of front line demonstrations on mustard in Eastern Plane Zone of Uttar Pradesh. Indian Journal of Extension Education. 2012;48(3-4):115-117.
2. Tiwari KB, Saxena A. Economic analysis of FLD of oilseed in Chhindwara. Bhartya Krishi Anusandhan Patrika. 2001;16(3-4):185-189.
3. Tiwari KB, Singh V, Parihar P. Role of FLD in transfer of gram production technology. Maharashtra Journal of Extention Education. 2003;22(1):19.
4. Verma RK, Dayanand Rathore RS, Mehta SM, Singh M. Yield and gap analysis of wheat productivity through front line demonstrations in Jhunjhunu district of Rajasthan. Annuls of Agriculture Research. 2014;35:79-82.
5. Kumar V, Jakhar DS. Impact assessment of front line demonstrations on mustard (Brassica juncea) in Bhiwani district of Haryana. International Journal of Current Microbiology Applied Sciences. 2020;9(4):395-402.
6. Yadav DB, Kamboj BK, Garg RB. Increasing the productivity and profitability of sunflower through front line demonstration in irrigated agro ecosystem of eastern Haryana. Haryana Journal of Agronomy. 2004;20:33-35.