Bridging the Yield Gap of Mung Bean through Cluster Frontline Demonstration in Erode District

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ABSTRACT: Mung bean (*Vigna radiata L*) or green gram is one of the important pulse crop cultivated over 2000 ha area in Erode district of TamilNadu. Attempts were made to bridge the yield gap of mung bean by adopting integrated crop management practices through cluster frontline demonstrations. The integrated crop management practices comprised of introduction of high yielding variety, seed treatment, integrated nutrient and plant protection measures were demonstrated. The cluster demonstrations were conducted during 2017-2022 in 225 locations. The results showed that higher seed yield of 811 kg/ha was recorded in demonstration plots compared to 715 kg/ha in farmers' practice with a yield advantage of 13.6%. The average extension gap, technology gap and technology index were 97 kg/ha, 61.8 kg/ha and 7.1%, respectively. The integrated crop management practices gave higher benefit cost ratio of 2.23 compared to farmers' practices.

Keywords: Economics, frontline demonstration, mung bean, yield gap, technology index.

Introduction

Green gram (*Vigna radiata* L.) alternatively known as mung bean, green bean, golden gram belongs to the family leguminaceae and sub family papilionaceae, is being grown as one of the principal crops in Tamil Nadu. It is highly nutritious pulse crop having nearly 24 to 25% protein in seed. It is commonly grown in rainy and summer seasons in India. The requirements of pulses is expected to rise further mainly due to increasing population and preference for pulses as the cheapest source of dietary protein. It contains 24.5% protein and 59.9% carbohydrate. It also contains 75 mg calcium, 8.5 mg iron and 49 mg R-carotene per 100 g of split dal (Bhowal and and Bhowmik, 2014). However, the productivity of crop is poor owing to several factors such as use of local varieties, imbalanced nutrient management, cultivation in marginal soils etc. Adoption levels for several components of the improved technology of the crop were low emphasizing the need for better technology dissemination (Kiresur *et al.,* 2001). The productivity of the crop could be increased by adopting suitable varieties with matching production technologies (Ranawat *et al.,* 2011). Hence, frontline demonstrations were conducted to showcase yield gap reduction and enhance the production potential of improved mung bean varieties, with improved management practices in Erode district, Tamil Nadu.

Materials and Methods

Frontline demonstrations on integrated crop management in mung bean were conducted by Krishi Vigyan Kendra during *kharif* 2017 to kharif 2022 in the farmers' fields of selected villages. A total of 225 demonstrations were conducted with an area of 0.4 ha each. The selected farmers were trained on all scientific mung bean cultivation aspects before starting of frontline demonstrations. The improved variety of mung bean (CO-8) was selected for demonstration. The details of improved practices demonstrated under frontline demonstrations are presented in Table 1. The seeds were treated with bio-fertilizers before sowing. Optimum plant population was maintained in the demonstrations. The demonstrated fields were regularly monitored by the scientists of KVK.

Table 1: Improved practices demonstrated in frontline demonstrations

Interventions	Recommendation
High yielding variety	CO-8
Seed rate	8 kg/ha
Seed treatment	Seed treatment with *Rhizobium* @ 600 g/ha
Plant protection	As per the requirement
Micronutrient management	Foliar application of pulse wonder @ 5 kg/ha

At the time of harvest, yield data were collected from both the demonstrations and farmers practice. The extension gap, technology gap and technology index were calculated using the formulae suggested by Samui *et al.* (2000).

$$\text{Extension gap} = DY - LY$$

$$\text{Technology gap} = PY - DY$$

$$\text{Technology Index (\%)} = \frac{PY - DY}{PY} \times 100$$

Where, DY = Demonstration yield (kg/ha); LY = Local check yield (kg/ha) and PY = Potential yield of variety (kg/ha)

Results and Discussion

The seed yield ranged from 803 to 828 kg/ha in different demonstrations across farmers' fields. The average yield of mung bean under demonstration was 811 kg/ha (Table 2) compared to 714 kg/ha under farmers' practice with a yield advantage of 13.6%. These results indicated that the frontline demonstrations had good impact on the farming community in Erode district as they were motivated by performance of the improved production technologies in the demonstration plots. The findings of the present study are in line with Dayanand *et al*. (2012), Rai *et al*. (2015) Jyothi Swaroopa *et al*. (2016) and Saravanakumar (2021).

Table 2: Yield of mung bean as influenced by ICM practices

Year	Demo yield (kg/ha)	Farmers practice (kg/ha)	% yield increase
2017	803	706	13.7
2018	807	723	11.6
2019	810	705	14.9
2020	814	716	13.7
2021	805	720	11.8
2022	828	715	15.8
Average	811	714	13.6

Technology gap and extension gap

The technology gap shows the gap between the potential yields of the crop over demonstrated yield. The technology gap was Recorded as 61.83 kg/ha (Table 3). The extension gap, the gap between the demonstration yield and local yield, was 97 kg/ha. The observed extension gap and technology gap may be attributed due to dissimilarities in soil fertility levels, pest and disease incidence, improper usage of manures and fertilizers in this region (Mukherjee, 2003). Increasing the adoption of modern production technologies alongside high-yielding varieties will help reverse this concerning trend, leading farmers to adopt improved production technologies.

Technology index

Technology index shows the feasibility of the variety at the farmers' field. The lower the value of the technology index more is the feasibility. Table 3 revealed that the technology index value, averaged across six years, was 7.08%. The findings of the present study are in line with the findings of Rai *et al.* (2015), Mansoor Hussain *et al.* (2018) and Raghav *et al.* (2021).

Economics

It was found that the average cost of cultivation under improved crop management practices was **₹.** 22616/ha (Table 4) compared to **₹.** 23258/ha in farmers' practice. The demonstrated field recorded the higher mean gross return of **₹.** 50792/ha, net return of **₹.** 28334/ha with benefit cost ratio of 2.23. These findings are in line with the findings of Raghav *et al*. (2022) and Yadava *et al.* (2022). These results clearly indicate that the adoption of improved package of practices enhanced production and economic returns of mung bean in Erode district.

Table 3: Yield, extension gap, technology gap and technology index of the demonstration

Year	Potential yield (kg/ha)	Demo yield (kg/ha)	Farmers' practice yield (kg/ha)	Extension gap (kg/ha)	Technology gap (kg/ha)	Technology index (%)
2017	873	803	706	97	70	8.02
2018	873	807	723	84	66	7.56
2019	873	810	705	105	63	7.22
2020	873	814	716	98	59	6.76
2021	873	805	720	85	68	7.79
2022	873	828	715	113	45	5.15
Average	873	811.17	714.17	97	61.83	7.08

Table 4: Cost of cultivation, gross return, net return and benefit cost ratio as influenced by improved crop management practices

Year	Cost of cultivation (₹./ha)		Gross return (₹./ha)		Net return (₹./ha)		B: C ratio	
	Demo	check	Demo	check	Demo	check	Demo	check
2017	23750	24200	52200	44508	28450	20308	2.20	1.84
2018	19350	19668	40888	36638	21538	16970	2.12	1.87
2019	22750	23500	53460	45120	30710	21620	2.35	1.92
2020	25000	25200	53500	45500	29450	21350	2.14	1.80
2021	21096	22178	48400	41000	27305	18822	2.30	1.85
2022	23750	24800	56304	45760	32554	20960	2.26	1.84
Average	22616	23257.7	50792	43087.7	28334.5	20005	2.23	1.85

Conclusion

There was a 13.6% yield increase over farmers' practice in the demonstration plots with additional net returns. Thus it can be concluded that the demonstration of high yielding mung bean variety along with integrated crop management practices reduce the yield gap, enhance the productivity of mung bean and motivate the other farmers of the district to adopt the improved / recommended practices.

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