Bridging the yield gap of Mung Bean through Cluster Frontline Demonstration in Erode District

Abstract

Mung bean (*Vigna radiata L*) or green gram is one of the important pulse crops 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 demonstration conducted continuously for the past 6 years (2017-2022) in 225 locations. The results showed that the average higher grain yield of 811.20 kg/ha recorded in demonstration plots compared to 715 kg/ha in farmers practice with a yield advantage of 13.59 per cent over the farmer practices. The average extension gap, technology gap and technology index were 97 kg / ha, 61.83 kg/ ha, and 7.08 percent respectively. The integrated crop management practices gave higher benefit cost ratio of 2.23 compared to farmer practices. Considering the above facts, cluster frontline demonstrations were carried out in a systematic and scientific manner on farmer's field to show the worth of a new variety and the potentialities of improved production management technologies in mung bean for further adoption.

KEY WORDS: mung bean, Frontline demonstration, yield gap, cost economics

Introduction

Green gram (*Vigna radiata* L.) alternatively known as mung beans, green bean, moong bean, golden gram belongs to the family leguminaceae and sub family papilionaceae, is being grown as one of the principal crops since ages in our state as well as in the country. The crop is native to Indian subcontinent where it was domesticated as early as 1500 BC but spread to other parts of the world through migration and trade routes. The annual world production area of mung bean is about 5.5 million hectares. India is the primary green gram producer and contributes about 75% of the world's production (Taunk et al., 2012). 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 dual (Bhowaland and Bhowmik, 2014). Despite of this features, the productivity of crop is below the average owing to several inherent soil related constraints such as low organic matter and poor soil fertility. Hence, it requires sincere efforts to enhance its productivity. The climatic change and global warming have deleterious effects on crop production in terms of period of maturity and yield (Singh and Sharma, 2014). Mung bean is the only pulse crop which can be grown throughout the year in three cropping seasons (Bhowaland and Bhowmik, 2014).

Adoption levels for several components of the improved technology of the crop were low emphasizing the need for better dissemination (Kiresur et al 2001). The productivity of the crop could be increased by adopting the improved production technologies, management practices and suitable varieties (Ranawat et al., 2011). Hence to overcome the problems of the farmers, frontline demonstrations were laid out to demonstrate the yield gap reduction and improve the production potential of mung bean variety with improved package of practices under the real farm situations over the locally cultivated varieties in the farmers' holdings of Erode District of Tamilnadu.

Materials and Methods

Frontline demonstrations on integrated crop management in mung bean were conducted by Krishi Vigyan Kendra during Kharif 2017 to Kharif 2023 in the farmers' field of selected villages. A total of 225 demonstrations were conducted with an area of 0.4 ha and adjacent to the farmers' fields in which the crop was cultivated with farmer's practice/variety. The selected progressive 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 detailed of scientific interventions demonstrated under frontline demonstration were presented in Table 1. The seeds were treated with bio-fertilizers and then taken for sowing. Optimum plant populations were maintained in the demonstrations. The demonstrated fields were regularly monitored and periodically observed by the scientists of KVK.

Table 1: Scientific Interventions Demonstrated in Frontline Demonstrations

Sl.No	Scientific interventions	Recommendations
1.	High yielding suitable variety	CO -8
2.	Seed rate	8 kg / ha
3.	Seed treatment	Seed treatment with rhizobium @ 600 gram / ha seed
4.	Plant protection	As per the requirement
5.	Micronutrient management	Foliar application of Pulse wonder @ 5 kg / ha

Pulse wonder is a combination of micronutrients developed by TamilNadu Agricultural University, Coimbatore, TamilNadu which was recommended to spray at the time of flowering and pod initiation stage

At the time of harvest yield data were collected from both the demonstrations and farmers practice. Cost of cultivation, net income and benefit cost ratio were worked out. To study the impact of frontline demonstrations, data from FLD and farmers practices were analyzed. The extension gap, technology gap and technology index were calculated using the formula as suggested by Samui et al. (2000).

$$\textbf{Extension gap}\left(\frac{\textbf{qtl}}{\textbf{ha}}\right) = \textbf{DY}\ (\textbf{Qtl}\ /\textbf{Ha}) - \textbf{LY}\ (\textbf{Qtl}/\ \textbf{Ha})$$

$$\textbf{Technology gap}\left(\frac{\textbf{qtl}}{\textbf{ha}}\right) = \textbf{PY}\ (\textbf{Qtl}\ /\textbf{Ha}) - \textbf{DY}\ (\textbf{Qtl}/\ \textbf{Ha})$$

$$\textbf{Technology Index}\ (\%) = \frac{\textbf{PY}\ (\textbf{Qtl}\ /\textbf{Ha}) - \textbf{DY}\ (\textbf{Qtl}/\ \textbf{Ha})}{\textbf{PY}\ (\textbf{Qtl}\ /\textbf{Ha})} \times \textbf{100}$$

Where,

DY = Demonstration Yield
LY = local Check Yield
PY = Potential Yield of variety

Results and Discussions

The yield range varied from 828 to 803 kg /ha due to varied agro climatic conditions during the cropping period. The average yield of mung bean under demonstration was 811.20 kg / ha (Table 2) was higher than the average yield of farmers practice (714.17 kg/ha). The integrated crop management practices showed that 13.59 percent yield increase over the farmers practice. These results indicated that the frontline demonstrations gave good impact over the farming community in Erode district as they were motivated by the improved production technologies applied in the demonstration plots. The findings of the present study are in line with Rai et al, (2015) and Jyothi Swaroopa et al, (2016).

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

Year	Demo yield	Farmers Practice	Percent yield increase
2017	803.00	706.00	13.74
2018	807.00	723.00	11.62
2019	810.00	705.00	14.90
2020	814.00	716.00	13.69
2021	805.00	720.00	11.81
2022	828.00	715.00	15.80
Average	**811.20**	**714.17**	**13.59**

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 97 kg / ha (Table 3). The extension gap shows the gap between the demonstration yield and local yield and it was 97.00 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). More and more use of latest production technologies with high yielding variety will subsequently change this alarming trend. The new technologies will eventually lead to discontinue the old technologies and to adoption of new technologies by the farmers.

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	873.00	803.00	706.00	97.00	70.00	8.02
2018	873.00	807.00	723.00	84.00	66.00	7.56
2019	873.00	810.00	705.00	105.00	63.00	7.22
2020	873.00	814.00	716.00	98.00	59.00	6.76
2021	873.00	805.00	720.00	85.00	68.00	7.79
2022	873.00	828.00	715.00	113.00	45.00	5.15
Average	**873.00**	**811.17**	**714.17**	**97.00**	**61.83**	**7.08**

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 was 7.08 percent. The findings of the present study are in line with the findings of Raghav et al, (2021) and Rai et al, (2015).

Economics

It was found that the average cost of cultivation under improved crop management practices was Rs. 22616.00 / ha (Table 4) and an average cost of Rs. 23257.70 /ha in farmers practice. The demonstrated field recorded the higher mean gross return of Rs.50792.00 /ha and the net return of Rs. 28334.50 /ha with the high benefit cost ratio of 2.23. These findings are in line with the findings of Saravanakumar (2021) Hiremath and Nagaraju (2009) and Sreelakshmi et al. (2012). These results are clearly indicated that the adoption of improved package of practices was enhancing the mung bean production and economic returns in Erode district.

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

Year	Gross cost (Rs/ha)		Gross Return (Ra/ha)		Net Return (Ra/ha)		BCR	
	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 13.59 percent yield increase was noticed over farmers practice in the demonstration plots. Thus, it can be concluded that the demonstrations of high yielding mung bean variety along with integrated crop management practices reduces the yield gap and enhances the productivity of mung bean and motivate the other farmers of the district to adopt the improved / recommended practices.

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