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Demonstration of yield, profitability and cost economics of cluster bean (*Cyamopsis tetragonoloba* L.) var. MDU1 under Ramanathapuram district of Tamil Nadu

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Abstract
The present study conducted on Demonstration of yield, profitability and cost economics of cluster bean var. MDU1 at farmers' field under Ramanathapuram district, Tamil Nadu during the year 2015-16, 2016-17 and 2017-18. The objective of the present study is to assessing the performance of newly released high yielding variety and adoption of new innovation technology. The present study results revealed that yield of cluster bean var. MDU1 ranging between 128.80 to 132.35 q/ha with a mean yield of 130.45 q/ha when compared to farmer practices (90.52 q/ha). In the case of powdery mildew incidence registered the lowest range in demonstrated plot (1-6%) whereas it was recorded the highest in farmer practices (15-20%). The extension gap ranged from 38.8 to 41.45 q/ha. The technology gap of demonstrated plot ranged from 39.65 to 43.20 q/ha. Technology index of demonstration varied from 23.05 to 25.11 per cent. Regarding cost economics, net returns found to the highest in demonstrated plot for three years ranged between Rs. 21500 to Rs. 35400. Benefit cost ratio (B:C) recorded the highest ranged from 2.50 to 2.66 under demonstrated practice, while it was the lowest range from 1.84 to 2.18 under farmer practices. The demonstrated plot had exhibited 43.34 per cent mean yield enhancement demonstrated plots. Hence, demonstrated technologies have proved more remunerative and economically feasible and this will be extended more areas at Ramanathapuram district during ensuing season.

Keywords: Cluster bean, yield, productivity, cost economics, B:C ratio

Introduction
Cluster bean (*Cyamopsis tetragonoloba* L.) is an important leguminous crop, highly suitable for arid and semi arid regions. It has a tremendous potential for vegetable purpose (tender pods) and more specifically for its industrial usage (gum). India becomes the leading producer of gaur with 60 per cent of the world production (Rao, 2001) [10]. Cluster bean is extensively cultivated at Rajasthan, Haryana, Gujarat, Tamil Nadu, Andhra Pradesh, Maharashtra and Punjab in larger areas. In Tamil Nadu, cluster bean is cultivated at Tirunelveli, Thoothukudi, Madurai, Tiruchirapalli, Theni, Dindigul, Salem, Namakkal, Coimbatore, Cuddalore, Ramanathapuram, and Virudhunagar districts. It is relatively tolerant to saline, alkaline soils and drought condition. Ramanathapurm farmers are unaware about newly released high yielding varieties and new innovative technologies and cultivated local and private varieties and getting low yield and low income. With this background, Krishi Vigyan Kendra, Ramanathapuram has conducted Demonstration of yield, profitability and cost economics of cluster bean var. MDU1 under Ramanathapuram district during 2015-16, 2016-17 and 2017-18.

Materials and Methods
The present demonstrations was conducted by Krishi Vigyan Kendra, Ramanathapuram at identified farmers' fields of Manjakollai and Vazhuthur villages of Bogalur and Mandapam blocks during Rabi season during the year 2015-16, 2016-2017 and 2017 – 2018. The aim was to introducing newly released high yielding cluster bean variety to get higher yield, profitability and doubling the farmers income. Each demonstration was conducted in an area of 0.4 ha. During the year 2015-16, demonstration was conducted ten farmers field, 2016-17 five farmers field and 2017-18 fifteen farmers field. The difference cultivation practices between the demonstration package and existing farmers practices are mentioned in Table 1. MDU 1 seeds were purchased from Agricultural College and Research Institute, Madurai and distributed to the identified farmers.

The field was thoroughly ploughed and applied well decomposed farmyard manure at the rate of 25 t/ha during the last ploughing. The seeds of cluster bean var. MDU 1 were sown at a spacing of 60 x 30 cm on one side of the ridges. The traditional practices were taken as a local check. Arka vegetable special was purchased and foliar application during 30th and 60th days after sowing. *Pseudomonas fluorescens* @ 2.5 kg were applied to the soil at the time of last ploughing. Azospirillum @ 2.5 kg/ha and Phosphobacteria @ 2.5 kg /ha were applied at the time of last ploughing. Regular field visits were made by the team of KVK scientists.

Biometric observations such as yield per ha (q/ha), powdery mildew incidence, net returns (Rs.) and BCR were recorded. The data on output were collected from demonstrated plots as well as control plots and extension gap, technology gap, technology index and cost economics with benefit cost ratio were worked out as per formula suggested by Dayanand *et al.* (2012) [2].

Results and Discussion

The yield characters of present results are depicted in Table 2. It has been observed that the yield per ha of cluster bean in Ramanathapuram district under improved production technologies ranged from 128.80 to 132.35 q/ha with a mean yield of 130.45 q/ha when compared to farmer practices (90.52 q/ha). Yield enhancement is indicated that the significant difference was observed before and after conducting of FLD as well as wider adoption of demonstrated technologies. These findings were in line with the findings of Yadav *et al.* (2004) [15]; Singh and Bisen (2020) [13]; Rajamanickam (2020) [8]. The per cent yield enhancement under improved production technology ranged from 42.20 to 44.96 per cent in the respective years. Yield enhancement of cluster bean over farmer practices mainly due to introduction of high yielding variety, timely adoption of good management practices, need based application of fertilizers and fungicides to control powdery mildew disease. This is in accordance with findings of Rajamanickam (2019) [6] under Ramanathapuram condition. The powdery mildew incidence recorded the lowest under demonstrated plot (1 – 5%) where as the highest incidence was noticed in farmer practices (15 – 20) in the respective three years. The result revealed that the positive effects of implementation of improved crop management practices at demonstrated plot over the existing practices. The similar findings were reported by Rajamanickam (2019) [6]; Singh *et al.* (2011) [11].

The extension gap ranged from 38.8 to 41.05 q/ha during the present study period which emphasized that need to educate the farmers through adoption of innovative horticultural practices. In the present demonstration, technology gap ranged from 39.35 to 43.20 q/ha were noticed. This might be due to farmer's cooperation was carrying out such demonstration with encouraging results in subsequent years. Similar findings were noticed by Singh *et al.* (2016) [12]. The technology index varied from 23.05 to 25.11 per cent. The mean technology index was observed during the study periods (three years) of 24.15 per cent which showed that efficacy of good performance of technological interventions. The present study in line with the findings of Mitra *et al.* (2010) [4] and Rajamanickam *et al.* (2023) [9].

Economics

The cost economics of the present demonstrations for the three years periods are depicted in Table 3. The present demonstration observed that cost of production of cluster bean var. MDU1 under demonstrated plot varied from Rs. 20750/ha to Rs. 22350/ha with an average of Rs. 21433 as against of Rs. 17800/ha to 178100/ha with an average of Rs. 17500/-under local check. This might be due to additional cost increased in the demonstrated plot was mainly due to more cost involved for the input applications. This finding was in corroborated with the findings of Rajamanickam (2020) [7] in chilli, Mokidue *et al.* (2011) [5] in urd bean and Tomar (2010) [14] in chickpea. The present demonstration results revealed that net return recorded the highest in the demonstrated plots for three years period of Rs. 32895, Rs. 35400, Rs. 33525 were substantially higher than farmer practices (Rs. 14400, Rs. 15380, Rs. 17800). Benefit cost ratio observed the highest in demonstrated plot of 2.54, 2.66 and 2.50 from the three years period where as the lowest benefit cost ratios had exhibited in farmers practice (2.18,1.84, 2.00). It was found that demonstrated plot registered the highest yield, fetches higher returns over farmers practice. The similar findings were also reported by Chaudhary *et al.* (2018) [1], Rajamanickam, (2019) [6] and Jiaul Hoque *et al.* (2023) [3].

Table 1: Cultivation practices followed for improved practices and farmers practices under FLD

Sl. No.	Technology	Technology Improved practices	Farmers practice	GAP (%)
1.	Farming situation	Irrigated	Irrigated	No gap
2.	Variety	MDU-1	Local	Full gap (100%)
3.	Land preparation	Ploughing followed by rotavator and Farmyard Manure applied @ 25 t/ha.	Deep ploughing and application of Farmyard Manure.	No gap
4.	Time of sowing	October 1st week	October 1st week	No gap
5.	Seed rate	10 kg per ha.	12 kg per ha.	20% more than recommendation
6.	Method of sowing	Seeds were sown at an one side of the ridges at a spacing of 60 x 30 cm	Seeds sown at an one side of the ridges and spacing not followed.	Full gap (50%)
7.	Application of Arka vegetable @ 5g/litre of water (micronutrient mixture)	Foliar application of Arka vegetable special during 30th and 60th days after sowing.	No foliar application of micronutrient mixtures	Full gap (100%)
8.	Application of biofertilizers	Azospirillum @ 2.5 kg and Phosphobacteria @ 2.5 kg /ha were applied at the time of last ploughing.	No application of biofertilizers to the field	Gap (100%)
9.	Nutrients application	N:P:K @ 25:50:25 kg/ha as basal and top dressing of 25 kg N/ha 30 days after sowing.	NPK were applied once on 25 days after sowing as basal and top dressing not being followed.	Gap (50%)

10.	Weed management	First weeding about 2-3 weeks after sowing, second weeding on 6-7 weeks after sowing and 3rd weeding on 60 days after sowing.	One weeding was made 2-3 weeks after sowing	Gap (50%)
11.	Plant protection measure	As per recommendations of crop production guide	Indiscriminate use of pesticides and fungicides	Full gap (100%)

Table 2: Technology gap, Extension gap, Technology index and Productivity enhancement in cluster bean var. MDU1

Year	Yield (q/ha)			(%) Increase in productivity	Incidence of powdery mildew disease (%)		Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
	Potential	Demonstration	Control		Recommended practices	Farmers practice			
2015-16	170	128.80	90.00	42.20	1-3.5	15-20	38.80	43.20	25.11
2016-17	170	130.20	90.24	42.85	1-5	16-22	39.96	41.80	24.30
2017-18	170	132.35	91.32	44.96	1-6	18-20	41.05	39.65	23.05
	170	130.45	90.52	43.34			39.94	41.55	24.15

Table 3: Demonstration of cluster variety MDU1 for yield and cost economics traits at Ramanathapuram district

Years	Yield (q/ha)		Gross cost (Rs.)		Gross income (Rs.)		Net returns (Rs.)		B:C ratio	
	Demonstration	Check	Recommended practices	Farmers practice	Recommended practices	Farmers practice	Recommended practices	Farmers practice	Recommended practices	Farmers practice
2015-16	128.80	90.00	20,750	17,100	53,345	31,500	32,895	14,400	2.54	2.18
2016-17	130.20	90.24	21,200	17,600	56,600	32,580	35,400	15,380	2.66	1.84
2017-18	132.35	91.32	22,350	17,800	55,875	35,600	33,525	17,800	2.50	2.00

Conclusion

Demonstration was more effective than farmer practices and changing of farmers towards the adoption of integrated crop management practices. The present demonstration it was concluded that demonstrated plot recorded the highest yield per plant, yield per ha, net returns and B:C ratio over farmers practice. Demonstrated plot registered the mean yield enhancement of 43.34 per cent over the farmer practices. Hence, this demonstration to be popularized as large scale adoption during ensuing season for the benefit of farming communities.

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