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Productivity Enhancement of Green Gram by Cluster Frontline Demonstrations in Mahabubabad District of Telangana, India

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A B S T R A C T

Cluster frontline demonstrations (CFLDs) on greengram was conducted by Krishi Vigyan Kendra, Malyal in villages namely Redyala, Gudur, Gouraram Mulakalapalli, Apparajupalli of Mahabubabad district of Telangana state during the *rabi* season of 2016-2017, 2017-18 and 2018-19 respectively. The results revealed that the variety MGG-347 with seed treatment (*imidacloprid @ 2ml/kg* + carbendazim @1g/kg +*Rhizobium spp @* 25g/kg) + plant protection (Yellow sticky trap + Neem oil + insecticide) nutrient and weed management recorded average highest yield of 1397 kg/ha (2016-17) against the farmers practice of 1157kg/ha. The maximum gross returns of Rs. 82500/- and net returns of Rs. 57925/- during the year 2017-18 and minimum of Rs. 68000/- and net returns of Rs. 45500/- during the year 2018-19 were obtained due to variation in MSP sale rates as declared by GOI. The study revealed that an extension gap of 140 to 350 kg/ha was found between demonstrated technology and farmer's practice and on average basis the extension gap was 240 kg/ha. The study further exhibited a wide technology gap during different years. It was lowest (40 kg/ha) during 2016-17 and highest (140 kg/ha) during 2018-19. The average technology gap of all the years was 103 kg/ha. The difference in technology gap in different years was due to better performance of recommended varieties with different interventions and more feasibility of recommended technologies during the course of study. Similarly, the technology index for all demonstrations in the study was in accordance with technology gap. It can be concluded that the green gram production could be enhanced by encouraging the farmers through adoption of recommended technologies which were followed in the Cluster Front Line Demonstrations. Further, it was found that the adoption of improved technologies significantly increased the yield and net returns to the farmers. Hence, there is a need to disseminate the improved technologies among the farmers with effective extension methods like trainings and demonstrations.

Introduction

India is the largest producer, consumer and importer of pulses in the world. It accounts for 33 per cent of world area and 22 per cent of the total world production of pulses (Sandhu and Dhaliwal, 2016). Pulses are good and cheaper source of protein, which indicate

the great importance of pulses in our daily food habits. Pulse crops have ability to fix the atmospheric nitrogen and addition of organic matter to soil, which are important factors to maintain soil fertility (Kumar and Singh, 2014). Pulses are major sources of proteins among the vegetarians in India and complement the staple cereals in the diets with proteins, essential amino acids, vitamins and minerals. They contain 22-24 per cent protein, which is almost twice the protein in wheat and thrice that of rice. Pulses contribute 11 per cent of the total intake of proteins in India (Reddy, 2010).

National Food Security Mission (NFSM) was launched in 2007-08 to increase the production of rice, wheat and pulses by 10, 8 and 2 million tonnes, respectively by the end of 11th Plan through area expansion and productivity enhancement; restoring soil fertility and productivity; creating employment opportunities; and enhancing farm level economy. The Mission was continued during 12th Plan with new target of additional production of 25 million tones. The basic strategy of the Mission is to promote and extend improved technologies, i.e., seed, micro-nutrients, soil amendments, integrated pest management, farm machinery and implements, irrigation devices along with capacity building of farmers.

The major interventions/activities covered under NFSM include cluster demonstrations of rice, wheat, pulses and coarse cereals, distribution of improved varieties/hybrid seeds, need based inputs, resource conservation techniques / energy management, efficient water / application tools, cropping system based trainings and local initiatives; award for best performing districts etc. (Department of Agriculture, Cooperation & Farmers Welfare, Annual Report 2017-18). Over the last few years, the area and production of pulses in Telangana State increased tremendously due to inception of Cluster Front Line Demonstration concept at farmers' field. Front Line demonstration is a long term educational activity conducted in a systematic manner at farmers' fields to show worth of a new technology on "Seeing is Believing" principle. Traditional or farmer's practices are no longer sustainable towards pulse production as it shows huge gap in yields in comparison to scientific production technologies. Constant efforts are needed to bridge this gap through demonstration of improved production technologies.

Over a period of time, a number of improved pulse varieties and production technologies have been developed, but full potential of these varieties and technologies could not be exploited due to lack of awareness on varieties, low rate of adoption by the farmers leading to low yields. Pulses are the major source of protein compared to cereals, oilseeds and other crops. Pulse production is mostly from the crop raised under rain-fed conditions. Cultivation of pulses in marginal lands, limited area of pulses under irrigated conditions, limited high yielding varieties, pests and diseases and processing loss up to 6-8 per cent are some of the problems for the stagnation of pulse production over decades. Thus, factors limiting the productivity cannot be overlooked. Research and extension programmes need to be diverted to produce value additive pulses.

Materials and Methods

The present investigation of cluster frontline demonstrations (CFLDs) on greengram was conducted by Krishi Vigyan Kendra, Malyal in villages namely Redyala and Gudur (2016-17), Gouraram (2017-18), Mulakalapalli and Apparajupalli (2018-2019) of Mahabubabad District of Telangana state during the *rabi* season. The demonstration was conducted in

an area of 20 ha in every year, five locations against local variety in three years. 110 demonstrations in 60 ha (2016-17 to 2018-19) were conducted with active participation of farmers to demonstrate the improved technologies of Green gram in different villages so as to establish production potentials and expand the area under the crop in the district. Present study with respect to CFLDs and farmers' practices are given in Table 1.The soils in selected villages were sandy loam. Farmers were trained to follow the package of practices for green gram cultivation as recommended by the State Agricultural University and need based input materials provided to the farmers (Table 2).

Every year 20 hectares were taken for the demonstration of technologies in green gram crop along with farmers practice as check plot. Pre-sowing trainings were organized involving the selected farmers on the crops. Selected green gram variety, MGG-347 was high yielding (12.5 to 15q/ha), tolerant to yellow mosaic virus and suitable to all seasons. Critical inputs along with technologies like seed treatment, fertilizer application, water and weed management, integrated pest and disease management etc., were demonstrated at every stage of the crop with appropriate trainings. Regular visit by the scientist helped in proper execution of trials as well as collecting farmer's opinion on the demonstrated varieties. The performance of the varieties in the trials was judged visually as well as quantitatively by farmers themselves. Field days were conducted involving demonstration holding farmers, neighboring farmers, Scientists from University, Officials from Department of Agriculture and local extension functionaries to demonstrate the superiority of the technology. Crop yields were recorded from the demonstration and check plots at the time of harvest to identify the yield gaps between demo and check plots.

Table.1 Particulars showing the details of green gram grown under CFLD and farmers' practice

Operation	Existing practice	Improved practices demonstrated
Line sowing	Broad casting of seed	Spacing 30 cm between rows and 10 cm between plants.
Use of variety	MGG-295	MGG-347
Seed treatment	No seed treatment	Seed treatment with Imidacloprid @ 2ml/kg + Carbendazim@1g/kg +*Rhizobium spp* @ 25g/kg of seed
Yellow mosaic virus tolerance	No tolerance	Tolerant variety
Weed management	No Weed management	Weeds control by using herbicide Pendimethalin 1kg / ha in 500 liter of water as pre-emergence treatment for effective control of weeds within two days after sowing.
Nutrient management	No fertilizer application	Recommended dose of fertilizers
Whole package	Farmers are cultivating the greengram crop without adoption of any improved technology	All the crop (production and protection) management practices as per the package of practices for rabi crop by PJTSAU, Hyderabad were followed for raising the crop

Table.2 Details of need based inputs of green gram used in CFLD

Cluster	Number of demonstrations	Area in hectares	Variety	Year	Technology Demonstrated	Need based inputs
Redyala, Gudur	40	20	MGG-347	2016-17	• High yielding variety- MGG-347 • Seed treatment with Imidacloprid @ 2ml/kg + carbendazim @1g/kg +*Rhizobium spp* @ 25g/kg of seed • Fertilizer recommendation based on soil test results • Yellow sticky trap @ 10 Nos/acre • Neem oil + insecticide	• Treated seed • Rhizobium spp • Yellow sticky traps • Neem oil • Thiomethoxam • Multi-K (13:0:45)
Gouraram	25	20	MGG-347	2017-18		
Mulakalapalli, Apparajupalli	45	20	MGG-347	2018-19		

The data with respect to grain yield from FLD plots and from fields cultivated following local practices adopted by the farmers of the area were collected and evaluated. Potential yield was taken in to consideration on the basis of standard plant population (404440 plants/ ha) and average yield per plant 22.5 g/plant under recommended package of practices with 30 X 10 cm crop geometry (Chandra, 2010). Different parameters as suggested by Yadav *et al.*, (2004) was used for gap analysis, and calculating the economics. The details of different parameters and formula adopted for analysis are as under:

Extension gap = Demonstration yield - Farmers' practice yield

Technology gap = Potential yield - Demonstration yield

$$\text{Technology index} = \frac{\text{Potential yield - Demonstration yield}}{\text{Potential yield}} \times 100$$

Results and Discussion

Seed yield

The productivity of green gram under improved production technology ranged between 1170-1620 kg/ha, 1000-1500 kg/ha and1190-1520 kg/ha during the years 2016-17, 2017-18 and 2018-19 respectively as against a yields of 1320,1020,1130 respectively under farmers' practice. In comparison to farmer's practice, there was an increase of 23, 47 and 35 per cent in productivity of greengram under improved technologies during the years 2016-17, 2017-18 and 2018-19 respectively.

The difference in yield observed during different years was due to variation in available irrigation facility at different places, dissimilarities in soil fertility levels, pest and disease incidence, improper usage of manures and fertilizers. The increased grain yield with improved technologies was mainly because of line sowing, seed treatment, nutrient management and weed management. The findings were in line with Meena *et al.*, (2012) and Meena and Dudi (2018).

Economics

Economic returns as a function of gain yield and MSP sale price varied during different years. The maximum gross returns of Rs.

82500/- and net returns of Rs. 57925/- during the year 2017-18 and minimum of Rs. 68000/- and net returns of Rs. 45500/- during the year 2018-19 were obtained due to variation in cost of cultivation as labour charges increased year after year and MSP sale rates as declared by GOI. The higher additional returns and effective gain obtained under demonstrations could be due to improved technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring and also sale of seed to other farmers as a seed. The lowest and highest benefit cost ratio were 2.4 and 3.4 in 2017-18 and 2016-17, respectively (Table 4) depends on produced grain yield and MSP sale rates. The results were in confirmity with the findings of front line demonstrations on pulses by Chaudhary (2012), Meena and Dudi (2018).

Table.3 Seed yield of green gram under FLD and FP

Year	Area (ha)	Demonstration (No)	Yield obtained (kg/ha)			Yield kg/ha		Additional yield (kg/ ha) over farmer's practice	Per cent increase
			Max.	Min.	Av.	Demo	FP		
2016-17	20 ha	40	1620	1170	1460	1620	1320	**300**	**23**
2017-18	20 ha	25	1500	1000	1370	1500	1020	**480**	**47**
2018-19	20 ha	45	1520	1190	1360	1520	1130	**390**	**35**

Table.4 Economics of green gram under FLD and FP

Year	Variety	Farmer's Existing plot				Demonstration plot			
		Gross cost (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C Ratio	Gross Cost (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
2016-17	MGG-347	14,500	59,040	44540	3:1	16,250	73,000	56750	3.4:1
2017-18	MGG-347	25,000	55,000	30,000	1.2:1	24,575	82,500	57925	2.4:1
2018-19	MGG-347	25000	56500	31500	2.2:1	22500	68000	45500	3.0:1

Performance of FLD

Yield of frontline demonstration trials and potential yield of the crop was compared to estimate the yield gap further it was categorized into extension gap, technology gap and technology index. The extension gap and technology gap observed that it may be attributed due to dissimilarities in soil fertility levels, pest and disease incidence, improper usage of manures and fertilizers. Hence, to narrow down the yield gaps location specific technologies needs to be adopted.

The study (Table 4) revealed that an extension gap of 140 to 350 kg/ha was found between demonstrated technology and farmers' practice and on average basis the extension gap was 240 kg/ha. The extension gap was highest (350 kg/ ha) during 2017-18 and lowest (140 kg/ha) during 2016-17. Such gap might be attributed to adoption of improved technology especially with high yielding new varieties sown in line with balanced nutrition, weed management and appropriate plant protection measures in demonstrations which

resulted in higher grain yield than the traditional farmers' practices. The study further exhibited a wide technology gap during different years. It was lowest (40 kg/ha) during 2016-17 and highest (140 kg/ha) during 2018-19. The average technology gap of all the years was 103 kg/ha.

The difference in technology gap in different years was due to better performance of recommended varieties with different interventions and more feasibility of recommended technologies during the course of study. Similarly, the technology index for all demonstrations in the study was in accordance with technology gap. Higher technology index reflected the inadequate transfer of proven technology to growers and insufficient extension services for transfer of technology.

Hence, it can be inferred that the awareness and adoption of improved varieties with recommended scientific package of practices have increased during the study period. These findings were in the conformity of the results of study carried out by Chandra (2010), Meena and Singh (2017), Meena and Dudi (2018).

Table.5 Technological gap analysis of frontline demonstrations on green gram farmers' field

Year	Number of FLDs	Potential yield (kg/ha)	FLD yield (kg/ha)	FP yield (kg/ha)	EG (kg/ha)	TG (kg/ha)	TI (kg/ha)
2016-17	40	**1500**	1460	1320	**140**	**40**	**2.7**
2017-18	25	**1500**	1370	1020	**350**	**130**	**8.7**
2018-19	45	**1500**	1360	1130	**230**	**140**	**9.3**
Average		**1500**	1397	1157	**240**	**103**	**6.9**

EG= Extension gap; TG= Technology gap; TI= Technology index; FP= Farmers practices

It may be concluded that the frontline demonstrations conducted on green gram at farmer's field revealed that the adoption of improved technologies significantly increased the yield as well as gross and net returns to the farmers. Hence, there is a need to disseminate the high yielding varieties with improved technologies among the farmers with effective extension methods like training and demonstrations. The farmer's should be encouraged to adopt the recommended package of practices for realizing higher returns.

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