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Increasing Greengram Production through Frontline Demonstrations under Rainfed Conditions of Rajasthan

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ABSTRACT

The study was conducted at farmers' fields in 5 villages *viz*., Balara, Bedkallan, Boyal, Kushalpura and Balara of Pali district to demonstrate production potential and economic benefit of improved production technologies comprising sowing method, nutrient management and chemical weed control and adoption of complete package of practices for green gram. After sowing, application of weedicide Pendimethalin @ 1.0 kg/ha in 500 l of water used for effective control of the weeds during *kharif* season under rainfed condition. The findings of the study revealed that improved technology recorded a mean yield of 982 kg/ha which was 35.5 per cent higher than obtained under farmers' practice (755 kg/ha). Higher mean net income of Rs. 46030/ha with a Benefit: Cost ratio of 4.3 was obtained with improved technologies in comparison to farmers' practices (Rs. 38775/ha). Further, it was found that the adoption of improved technologies significantly increased the yield as well as yield attributing traits of green gram crop and also the net returns to the farmers. Hence, there is a need to disseminate the improved technologies among the farmers with effective extension methods like training and demonstrations. The farmers' should be encouraged to adopt the recommended package of practices for realizing higher returns.

Key Words: Adoption, Frontline demonstration, Green gram and Gap analysis.

INTRODUCTION

Pulses are important food crops for human consumption and animal feed. Being leguminous in nature, they are considered to be important components of cropping systems because of their viability to fix atmospheric nitrogen, add substantial amounts of organic matter to the soil and produce reasonable yields with low inputs under harsh climatic and soil conditions. Moong-wheat cropping system is predominant and is continuously practiced by the farmers in the arid zone of Rajasthan. There is evidence of system productivity stagnation, nutrient water imbalances and increased insect-pest and diseases incidence due to prolonged use of this cereal dominated system source. Green gram (*Vigna radiate* L. Wilczek.) is the third important pulse crop in India. It can be grown both as kharif green gram and summer green gram. With the advent of short duration, MYMV (Mungbean yellow mosaic virus) tolerant and synchronous maturing varieties of green gram (55-60 d), there is a big opportunity for successful cultivation of green gram in green gram-wheat rotation without affecting this popular cropping pattern.

Green gram has strong root system and capacity to fix the atmospheric nitrogen into the soil and improves soil health and contributes significantly to enhancing the yield of subsequent crops (Meena *et al*, 2012). However the production and productivity is very low in green gram mainly due to its cultivation in resource poor lands with minimum inputs, non-synchronous maturity and indeterminate growth habit. Green gram yield is also affected by insect-pests and diseases, especially by green gram yellow mosaic virus (MYMV) and Cercospora leaf spot (CLS). The green gram production among pulses was 3.73 lac tons from the area of 8.85 ha in Rajasthan during the year 20015-16. The major cultivation of green gram is based upon rainfed conditions. Pali district stands first rank in term of area and production of green gram in the state. In this district, the green gram crop is grown in an area

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of 2.46 lac ha with an annual production of over 1.30 t.

The front line demonstration (FLD) is an important method of transferring the latest package of practices in totality to farmers. Further, these demonstrations are designed carefully where provisions are made for speedy dissemination of demonstrated technology among farming community through organization of other supportive extension activities, such as field days and farmers convention. The main objective of the FLD is to demonstrate newly released crop production and protection technologies and management practices at the farmers' field under different agro-climatic regions and farming situations. During demonstration, the scientists study the factors contributing to higher crop production, field constraints, generate production data and feed-back information. FLD are conducted in a block of two to four hectares of land in order to have better impact of the demonstrated technology on the farmers and field level extension functionaries with full package of practices. Keeping in view, the present study was undertaken to increase the green gram productivity by conducting the FLDs.

MATERIALS AND METHODS

A total of 40 FLDs were conducted at farmers' field in 5 villages namely Balara, Bedkallan, Boyal, Kushalpura and Balara Jaitaran of Pali district of Rajasthan, during kharif season 2014, 2015 and 2016 under raifed conditions. Each demonstration was conducted on an area of 0.4 ha, and 1.0 ha area adjacent to the demonstration plot was kept as farmers' practices. The package of improved technologies like line sowing, nutrient management, seed treatment and whole package were used in the demonstrations. The variety of greengram IPM-02-3 was included in demonstrations methods used for the present study with respect to FLDs and farmers' practices are given in Table 1. In case of local check plots, existing practices being used by farmers were followed. In general, soils of the area under study were sandy loam and medium to low in fertility status. The spacing was 30 cm between rows and 10 cm between plants in the rows. The thinning and weeding was done invariably 30-35 d after sowing to ensure recommended plant spacing within a row because excess population adversely affects growth and yield of crop. Sowing was done in the first week of July with a seed rate of 15-20

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

Operation	Existing practice	Improved practices demonstrated
Line sowing	Broad casting of seed	Spacing 40 cm between rows and 10 cm between plants.
Use of variety	Local/ K 851	HYV IPM 02-3 for better production
Weather effect	For normal condition	Drought and heat tolerance variety
Seed treatment	No seed treatment	Seed treatment with Bavistin 2gm/kg seed
Weed management	No weed management	Weeds control by using herbicide Pendimethaline 1kg/ ha in 500 liter of water as pre-emergence treatment for effective control of weeds within two days after sowing.
Nutrient management	Only FYM and no fertilizer application	10 tons/ha farm yard manure and 20kg/ha nitrogen
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 kharif crop by CAZRI, Jodhpur, were followed for raising the crop

Table 2. Yield attributing traits of green gram.

Year	Number of pods/plant			Number of seeds/pods			Seed weight of 100 pods (gm)		
	IT	FP	Per cent increase	IT	FP	Per cent increase	IT	FP	Per cent increase
2014	25.8	19.7	30.9	10.5	6.7	56.7	55.7	39.8	39.9
2015	22.6	17.3	30.6	9.0	5.9	52.5	60.0	42.7	40.5
2016	24.2	18.9	28.0	9.5	6.5	46.1	55.0	35.4	55.4
Average	24.2	18.6	29.8	9.7	6.4	51.8	56.9	39.3	45.3

IT= Improved Technology; FP = Farmers Practice

kg/ha. Other management practices were applied as per the package of practices for kharif crops by Department of Agriculture, Agro-climatic Zone IIb Jalore (DOA, 2016). 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 economic. 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

Technology index = $\frac{Potential\ Yield - Demonstration\ Yield}{Potential\ Yield}$ x 100

Additional cost = demonstration Cost

Effective gain = Additional Returns Additional cost

Additional returns = Demonstration returns Farmers' practice returns

Incremental B: C ratio = $\frac{Additional\ Returns}{Additional\ Cost}$

RESULTS AND DISCUSSION

Yield attributing traits

The number of productive pods per plant under improved technology were 25.8, 22.6 and 24.2 as against local check (farmers' practices), 19.7, 17.3 and 18.9 (Table 2) during the year 2014, 2015 and 2016, respectively. There was an increase of 30.9, 30.6 and 28.0 per cent in number of productive pods under demonstration of improved technology over farmers' practice. The average number of productive pods per plant in improved technology was 24.2 and 18.6 under farmers' practice, thus there were 29.8 per cent more pods per plant under improved technology demonstrations. The findings confirm with the findings of Yadav *et al* (2007).

Seed yield

The productivity of green gram under improved production technology ranged between 920-1045 kg/ha with mean yields of 982 kg/ha (Table 3). The productivity under improved technology was 920, 1045 and 980 kg/ha during 2014, 2015 and 2016,

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

Year	Area (ha)	Demonstration (No.)	Yield kg/ha		Additional yield (kg/ha) over farmer's practice	Per cent increase
			IT	FP		
2014	05.5	10	920	785	135	17.2
2015	10.5	15	1045	730	315	43.2
2016	10.5	15	980	750	230	30.2
Average	08.8	13.3	982	755	267	35.4

Table 4 Technological gap analysis of frontline demonstrations on greengram farmers' field.

Year	Number of FLDs	Potential yield (kg/ha)	FLD yield (kg/ha)	FP yield (kg/ha)	Per cent increase	EG (kg/ha)	TG (kg/ha)	TI (kg/ha)
2014	10.5	1350	920	785	17.2	135	430	31.9
2015	15.5	1350	1045	730	43.2	315	305	22.6
2016	15.5	1350	980	750	30.2	230	370	27.4
Average	08.8	1350	982	755	35.4	267	368	27.3

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

respectively as against a yield range between 730 to 785 kg/ha under farmers' practice. In comparison to farmer's practice, there was an increase of 17.2, 43.2 and 30.2 per cent in productivity of greengram under improved technologies in 2014, 2015 and 2016, respectively. The increased grain yield with improved technologies was mainly because of line sowing use of nutrient management and weed management. The findings were in line with Singh and Meena (2011), Poonia and Pithia (2011), Meena *et al* (2012).

Gap analysis

The study (Table 4) revealed that an extension gap of 284 to 320 kg/ha was found between demonstrated technology and farmers' practice and on average basis the extension gap was 267 kg/ha. The extension gap was highest (315 kg/ha) during 2015 and lowest (135 kg/ha) during 2014. Such gap might be attributed to adoption of improved technology especially high yielding varieties sown with the help of seed cum fertilizers drill 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 (305 kg/ha) during 2015 and highest (430 kg/ha) during 2014. The average technology gap of all the years was 368 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. On the basis of three years study, overall 27.3 per cent technical index was recorded, which was reduced from 31.9 per cent, 22.6 and 27.4 during 2014, 2015 and 2016, respectively. Hence, it can be inferred that the awareness and adoption of improved varieties with recommended scientific package of practices have increased during the advancement of study period. These findings were in the conformity of the results of study carried out by Chandra (2010), Meena and Dudi (2012), Meena and Singh (2016), Meena and Singh (2017), Khedkar *et al* 2017 and Dayanand *et al* (2012).

Economics

Different variables like seed, fertilizers, bio-fertilizers and pesticides were considered as cash input for the demonstrations as well as farmers practice and on an average additional investment of Rs. 1533/- per ha was made under demonstrations. Economic returns as a function of gain yield and MPS sale price varied during different years. The maximum returns (Rs. 8784/-) during the year 2015 were obtained due to high grain yield and higher MPS 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. The lowest and highest incremental benefit cost ratio (IBCR) were 5.7 and 3.1 in 2013 and 2014, respectively (Table 5) depends on produced grain yield and MPS sale rates. Overall average IBCR was found to be 4.3. The results were in confirmity with the findings of front line demonstrations on pulses by Yadav *et al* (2004), Gauttam *et al* (2011), Lathwal (2010), Chaudhary (2012), Dayanand *et al* (2012), Meena and Dudi (2012).

CONCLUSION

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

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