

Original Research Article

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## Scaling up of Green Gram Production under Front-Line Demonstrations in Jodhpur District of Western Rajasthan, India

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### ABSTRACT

Pulses being rich in quality protein, minerals and vitamins are inseparable ingredients of diet of majority of Indian population. Despite of their high nutritive value and important role in sustainable agriculture desired growth rate in production could not be witnessed. The domestic production of pulses is consistently below the targets and actual domestic requirements are also higher, due to this pulses are being imported. The Krishi Vigyan Kendra, Jodhpur-II has carried out frontline demonstrations on greengram crop covering an area of 40 ha at farmer's field to exhibit latest production technologies and compared it with farmer's practices. In this study, total 100 frontline demonstrations were conducted at farmer's fields in villages i.e., Palli-phanta, Bendokabera, Padasla and Kali-mali of Jodhpur district of Rajasthan state during 2018 and 2019, to demonstrate production potential and economic benefit of improved technologies comprising sowing method, nutrient management and weed management and adoption of whole package of practices. After sowing, application of weedicide Imazethapyr 10SL as early post emergence at 50 ga.i. per ha in 500 liters of water used for effective control of the weeds during kharif season under rainfed conditions. The findings of the study revealed that the demonstrated technology resulted in a mean yield of 905 kg/ha which was 36.3% higher than obtained with farmers practices (555 kg/ha). Mean net income of Rs. 41947/ha with a benefit:cost ratio of 3.86 was obtained with improved technologies in comparison to farmers practices (22227). The frontline demonstrations conducted on greengram crop at farmer's field revealed that the adoption of improved technologies significantly increased the yield as well as yield attributing traits of crop and also the net returns higher than the farmer's practices. So, 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 realizing for higher returns.

#### Keywords

Adoption, Frontline demonstrations, Greengram, Productivity, Profitability

#### Article Info

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### Introduction

Pulses are the major source of dietary protein for the majority of population in our country.

Besides being the source of protein, pulses contribute substantially to food production system by enriching the soil through biological nitrogen fixation and improving

soil physical conditions. Though pulses are consumed all over the world, its consumption is higher in those parts of the world where animal protein are scarce and expensive (Ofuya and Akhidue, 2005). Pulses are important food crop for human consumption and animal feed. Being leguminous in nature, they are considered to be important components of cropping system 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 (Rakhode *et al.*, 2011). Moong-wheat cropping system is predominant and it's continuously practiced by farmers in the arid zone of Rajasthan (Dhaka *et al.*, 2016). Greengram (*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, mungbean yellow mosaic virus tolerant and synchronous maturing varieties of green gram (55-60 days), there is a big opportunity for successful cultivation of green gram with wheat based rotation.

Green gram belonging to family leguminosae, is a tropical and sub-tropical grain legume, adapted to different types of soil conditions and environments (*kharif, spring and summer*). It ranks third in India after chickpea and pigeonpea. It has strong root system and capacity to fix the atmospheric nitrogen in to the soil and improves soil health and contributes significantly to enhancing the yield of subsequent crops (Tomar *et al.*, 2012). Greengram yield is also affected by insects-pests and diseases, especially by greengram yellow mosaic virus (GYMV) and *Cercospora* leaf spot (CLS). There is a strong need to develop the lines/ varieties which give outstanding and consistent performance in *kharif* season over diverse environment. Development of varieties with high yield and stable performance is a prime target of all

green gram improvement programs. The total production of pulses in India was 22.95 million tonnes from the area of 29.28 million hectares in the year 2015-16. Whereas in Rajasthan, the total *kharif* pulses production was 1.8 million tonnes from the area of 4.23 million hectares in 2017-18. The green gram production among *kharif* pulses was 0.97 million tons from the area of 2.24 million hectares in Rajasthan in the year 2017-18. Jodhpur district stands second rank in terms of area and production of green gram in the state. In this district, the green gram crop is grown in an area of 3.18 lacs ha with an annual production of over 1.92 lacs tons (GOR, 2017-18). The front line demonstration is an important method of transferring the latest package of practices in totality to farmers. By which, farmers learn latest technologies of oilseeds and pulses production under real farming situation at his own field. 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 Front Line Demonstration 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. While demonstrating the technologies at the farmer's field, the scientists are required to study, the factors contributing to higher crop production, field constraints of production and thereby generating production factor and feed-back information. Front Line Demonstrations are conducted in a block of ten 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 done to analyze the performance and to promote the Front Line

Demonstration (FLD) on green gram production.

### **Materials and Methods**

Present study was conducted on FLD green gram in rainfed condition in Jodhpur district of Rajasthan. Total 100 frontline demonstrations were conducted at farmers' field in villages of Palli-phanta, Bendo ka bera, Padasla and Kali-mali of Jodhpur district of Rajasthan, during *kharif* season 2018 and 2019. Each demonstration was conducted on an area of 0.4 ha, 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 green gram 'GAM-5' 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 loamy fine to coarse 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 35-40 days after sowing to ensure recommended plant spacing (10 cm) within a row (30 cm) because excess population adversely affects growth and yield of crop. Seed sowing was done in the first week of July, with a seed rate of 20 kg/ha. Other management practices were applied as per the package of practices for *kharif* crops by Department of Agriculture, Agro-climatic Zone Ia - Arid Western Plains Zone (DOA, 2018). 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 gm/plant under recommended package of practices with 30 × 10 cm crop geometry (Chandra, 2010). Different parameters as suggested by Yadav *et al.*, (2004) was used for gap analysis, technology index and calculating the economics parameters of green gram. 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 = Potential yield - demonstration yield/potential yield x 100

Additional cost (Rs.) = Demonstration cost (Rs.) - farmers' Practice Cost (Rs.)

Effective gain = Additional returns (Rs.) - additional cost (Rs.)

Additional returns = Demonstration returns (Rs.) - farmers' practice returns (Rs.)

B: C ratio = Gross returns/ gross Cost

### **Results and Discussion**

#### **Yield attributing traits**

The numbers of productive pods per plant under improved technology were 28.2 and 29.9 as against local check (farmers' practices), 22.7 and 23.2 pods per plants (Table 2) during the year 2018 and 2019, respectively. There was an increase of 24.22 and 28.87 % 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 29.05 and as compared 22.9 under farmers' practice (local check), thus

there were 26.5% more pods per plant under improved technology demonstrations. The numbers of seeds per pods under improved technology were 9.7 and 10.8 as against local check (farmers' practices), 6.1 and 6.9 seeds per pods (Table 2) during the year 2018 and 2019, respectively. The findings confirm with the findings of Yadav *et al.*, (2007) and Meena *et al.*, (2011) and Meena and Singh (2017) who found more yield in pulses under FLD plots.

### **Seed yield (kg/ha)**

The productivity of green gram under improved production technology ranged between 900-910 kg/ha with mean yields of 905 kg/ha and overall production 1810 kg/ha in two years (Table 3). The productivity under improved technology was 900 and 910 kg/ha during 2018 and 2019, respectively as against a yield range between 540 to 570 kg/ha under farmers' practice. In comparison to farmer's practice, there was low than FLD plots of 66.67 and 59.64 % in productivity of green gram under improved technologies in 2018 and 2019, respectively. The increased grain yield with improved technologies was mainly because of line sowing use of nutrient management and weed management. The present findings confirm the findings of Singh and Meena (2011), Poonia and Pithia (2011), Meena *et al.*, (2012). Math *et al.*, (2012), Raj *et al.* (2013) and Meena and Singh (2017). They found more gain yield of FLD plots than the existing practices.

### **Gap analysis**

Evaluation of findings of the study (Table 4) stated that an extension gap of 340 to 360 kg/ha was found between demonstrated technology and farmers' practice and on average basis the extension gap was 350 kg/ha. The extension gap was highest (360 kg/ha) during 2018 and lowest (340 kg/ha)

during 2019. Such gap might be attributed to adoption of improved technology especially high yielding variety (GAM- 5) 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 (890 kg/ha) during 2019 and highest (900 kg/ha) during 2018. The average technology gap of both the years was 895 kg/ha. The difference in technology gap in different years is 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 two years study, overall 49.7% technical index was recorded, which was lowest (49.4 %) during 2019 and highest (50 %) during 2018. 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 are in the conformity of the results of study carried out by Chandra (2010), Meena and Singh (2016), Meena and Singh (2017), Singh and Chauhan (2010), Dayanand *et al.*, (2012), Meena *et al.*, (2012) and Rajni *et al.*, (2014).

### **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. 2155 per ha was made under demonstrations. Economic returns as a

function of gain yield and Minimum Support Price (MSP) sale price varied during different years. The maximum returns (Rs. 42160) during the year 2019 were obtained due to high grain yield and higher 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. The lowest and highest benefit

cost ratio (BCR) were 2.9 and 2.7 in 2019 and 2018, respectively (Table 5) depends on produced grain yield and MSP sale rates. Overall average BCR was found 2.8. The results confirm with the findings of front line demonstrations on pulses by Yadav *et al.*, (2004), Gauttam *et al.*, (2011), Lothwal (2010), Chaudhary (2011), Dayananda *et al.*, (2012), Meena and Dudi (2012) and Meena and Singh (2017).

**Table.1** Package of practices followed by farmers under front–line demonstrations

Particulars	Technology interventions	Farmer's practices
Variety	GAM–5	Local cultivar
Seed rate	20 kg/ha	16 kg/ha
Soil treatment	Trichoderma @ 2.5 kg/ha cultured with 100 kg FYM	No use
Seed treatment	Carbendazim 50 WP @ 2.0 g/kg Seed	No seed treatment
Time of sowing	First week of July	Second week of July
Method of sowing	Line sowing, 30 cm ×10–15 cm	Broadcasting
Fertilizer management	15:40:0 (NPK kg/ha)	Use of urea 50 kg/ha and DAP 150 kg/ha
Weed management	Early post emergence application of imazethapyr 10 SL 500 ml/ha followed by manual weeding at 35–40 DAS	No use
Water management	Light irrigation at flowering and pod formation stage	No use
Plant protection	Sucking pests–dimethoate 30 EC @ 1 lit./ha, imidacloprid 200 SL @ 150 ml/ha Pod borer–quinalphos 25 EC	Products suggested by local pesticide dealers

**Table.2** Yield attributing traits of green gram under front–line demonstrations

Years	Number of pods/plant			Number of seeds/pod		
	FLD's	Local check	% increase over check	FLD's	Local check	% increase over check
2018–19	28.2	22.7	24.2	9.7	6.1	59.0
2019–20	29.9	23.2	28.8	10.8	6.9	56.5
Average	29.1	22.9	26.5	10.3	6.5	57.8

**Table.3** Technological impact of green gram variety 'GAM 5' under front–line demonstrations

Years	Area (ha)	No. of demonstration	Potential yield (q/ha)	Yield under demonstration (kg/ha)			Yield under local check (kg/ha)	Increase in yield (%)
				Highest	Lowest	Average		
<b>2018–19</b>	30	75	18	1180	620	900	540	66.67
<b>2019–20</b>	10	25	18	1190	630	910	570	59.64
<b>Average</b>	20	50	18	1185	630	905	555	63.05

**Table.4** Yield gap green gram variety 'GAM 5' under front–line demonstrations

Years	Variety	Technology gap	Extension gap	Technology index (%)
		(kg/ha)	(kg/ha)	
<b>2018–19</b>	'GAM–5'	900	360	50.0
<b>2019–20</b>	'GAM–5'	890	340	49.4
<b>Average</b>	–	895	350	49.7

**Table.5** Economic impact assessment of green gram variety 'GAM 5' under front–line demonstrations

Year	Av.cultivation cost (Rs/ha)		Add. cost in FLD's (Rs/ha)	Av.gross returns (Rs/ha)		Av.net returns (Rs/ha)		Add. returns in FLD's (Rs/ha)	BCR	
	FLD's	Local check		FLD's	Local check	FLD's	Local check		FLD's	Local check
<b>2018–19</b>	14515	12450	2065	5625 0	3375 0	4173 5	2130 0	20435	3.87	2.71
<b>2019–20</b>	14715	12470	2245	5687 5	3562 5	4216 0	2315 5	19005	3.86	2.85
<b>Average</b>	14615	12460	2155	5656 3	3468 7	4194 7	2222 7	19720	3.86	2.78

It is concluded that front line demonstrations was an effective tools for increasing the productivity of green gram. The frontline demonstrations conducted on green gram 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. So, there is a need to disseminate the

improved technologies among the farmers with effective extension methods like training. Kisanghoshies, field days, exposure visits and demonstrations. The farmers' should be encouraged to adopt the recommended package of practices realizing for higher returns. This created greater curiosity and motivation among other farmers who do not adopt improved practices of green

gram cultivation. These demonstrations also built the relationship and confidence between farmers and scientists of KVK. It was also concluded that beside other practices of weed management, insect-past management and water stress to be given due to attention to enhance green gram production in the area. This will subsequently increase the income as well as the livelihood of the farming community of the district.

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