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Technological and extension yield gaps in Greengram in Pali district of Rajasthan, India

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ABSTRACT

The technological gap between existing and recommended technologies of greengram crop was studied during 2012, 2013 and 2014. The study in total 40 frontline demonstrations was conducted on farmers' fields in five adopted villages. The findings of the study revealed that improved technology recorded a mean yield of 982 kg/ha which was 35.5% higher than obtained with farmers' practice (755 kg/ha). The study exhibited mean extension gap of 267 kg/ha, technology gap of 368 kg/ha with mean technology index of 27.3%. An additional investment of Rs. 1470 /ha coupled with recommended nutrient, water management, plant protection measures, scientific monitory and non-monetary factors resulted in additional mean returns of Rs.10970/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).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 crop and also the net returns to the farmers.

Key words: Adoption, Frontline demonstration, Greengram, 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. The total production of pulses in the world was 14.76 billion tones from the area of 14.25 billion hectares in the year 2013-14 while in India total pulses production was 19.78 million tons from the area of 23.63 million hectares in the year 2013-14. Whereas in Rajasthan, the total pulses production was 1.55 million tons from the area of 3.78 million hectares. The greengram production among pulses was 3.73 lacs tons from the area of 8.85 hectares in Rajasthan in the year 2014. The major cultivation of greengram is based upon rainfed conditions (GOR, 2013-14). Pali district stands first rank in term of area and production of greengram in the state. In this district, the greengram crop is grown in an area of 2.46 lacs ha with an annual production of over 1.30 tones (GOR, 2013-14).

Greengram (*Vigna radiate* L. Wilczek.) is the third important pulse crop in India. It can be grown both as *kharif* greengram 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 days), there is a big opportunity for successful cultivation of greengram in green gram-wheat rotation without affecting this popular cropping pattern. It ranks third in India after chickpea and pigeonpea. It 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 (Jat *et al.* 2012). However the production and productivity is very low in greengram mainly due to its cultivation in resource poor lands with minimum inputs, non-synchronous maturity and indeterminate growth habit. 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 greengram improvement programmes. Keeping in view the present study was undertaken to analyze the performance and to promote the FLD on greengram production.

MATERIALS AND METHODS

A total of 40 frontline demonstrations were conducted on farmers' field in villages Kishanagar, Bedkallan, Boyal, Kushalpura and Balara Jaitaran block of Pali district of Rajasthan, during *kharif* season 2012, 2013 and 2014 in rainfed condition. 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

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in the demonstrations. The variety of greengram SML 668 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 days after sowing to ensure recommended plant spacing within a row 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 15-20 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, 2013). 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 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 were as under:

Extension gap = Demonstration yield - Farmers' practice yield

Technology gap = Potential yield - Demonstration yield

$$\text{Technology index} = \frac{PotentialYield - DemonstrationYield}{PotentialYield} \times 100$$

Additional cost = demonstration Cost

Effective gain = Additional Returns Additional cost

Additional returns = Demonstration returns Farmers' practice returns

$$\text{Incremental B: C ratio} = \frac{AdditionalReturns}{AdditionalCost}$$

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 2012, 2013 and 2014, respectively. There was an increase of 30.9, 30.6 and 28.0 % 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% more pods per plant under improved technology demonstrations. The findings confirm with the findings of Yadav *et al.* (2007) and Rajni *et al*. (2014).

Yield gaps: Evaluation of findings of the study (Table 3) stated that an extension gap of 284 to 320 kg ha^{-1} was found between demonstrated technology and farmers' practice and on average basis the extension gap was 267 kg ha^{-1}. The extension gap was highest (315 kg ha^{-1}) during 2013 and lowest (135 kg ha^{-1}) during 2012. 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^{-1}) during 2013 and highest (430 kg ha^{-1}) during 2012. The average technology gap of all the years was 368 kg ha^{-1}. The difference in technology gap in different years is due to better performance of recommended varieties with different

Table 1: Demonstration package and farmer practice under FLDs in greengram in Pali district of Rajasthan

Technology component	Demonstration plot	Farmer's practice
Variety	SML-668	Local
Seed rate	15-20 kg/ha	10-12kg/ha
Sowing method	Line sowing with seed drill	Broad casting
Seed treatment	Seed treatment with Bavistin 2gm/kg seed	No seed treatment
Weed management	Weeds control by using herbicide *endimethaline* for 1kg/ha in 500 liter of water as pre-emergence treatment effective control of weeds within two days after sowing.	No weed management with herbicides
Nutrient management	10 tons/ha farm yard manure and 20kg/ha nitrogen	Only FYM and no fertilizers application
Plant protection	Pod borer major insect in green gram to control with Qunolphos 25 EC 1liter/ha	No use of any pesticides for control of pod borer

Table 2: Yield attributing traits of greengram under demonstration plot *vis a vis* farmer's practice

Year	Number of pods/plant			Number of seeds/pods			Seed weight (in 100 pods gm)		
	IT	FP	% increase	IT	FP	% increase	IT	FP	% increase
2012	25.8	19.7	30.9	10.5	6.7	56.7	55.7	39.8	39.9
2013	22.6	17.3	30.6	9.0	5.9	52.5	60.0	42.7	40.5
2014	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

Table 3: Technology gap, extension gap and technology index in green gram in Pali district of Rajasthan

Years	Area (ha)	Number of FLDs	Potential yield (kgha^{-1})	FLD yield (kgha^{-1})	FP yield (kgha^{-1})	% increase	EG (kgha-1)	TG (kgha^{-1})	TI (kgha^{-1})
2012	05.5	10.5	1350	920	785	17.2	135	430	31.9
2013	10.5	15.5	1350	1045	730	43.2	315	305	22.6
2014	10.5	15.5	1350	980	750	30.2	230	370	27.4
Average	**08.8**	**08.8**	**1350**	**982**	**755**	**35.4**	**267**	**368**	**27.3**

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

Table 4: Economic analysis of FLD's in greengram in Pali district of Rajasthan

Years	Cost of cash input (Rs./ha)		Additional cost in demo.	Sale price (MSP) of	Total returns (Rs./ha)		Additional returns in	Effective gain	IBCR
	IP	FP	(Rs./ha)	grain (Rs./qtl.)	IP	FP	demo.(Rs./ha)	(Rs./ha)	
2012	6000	4500	1500	4500	41400	35100	6300	4800	4.2
2013	6300	5000	1300	4620	48510	39726	8784	7484	5.7
2014	7000	5200	1800	5000	49000	41500	7500	5700	3.1
Average	6433	4900	1533	4706	46303	38775	7528	5995	4.3

IT= Improved Technology; FP= Farmers Practices; IBCR= Incremental benefit cost ratio

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% technical index was recorded, which was reduced from 31.9%, 22.6% and 27.4% during 2012, 2013 and 2014, 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 are in the conformity of the results of study carried out by Singh and Chauhan (2010), Chandra (2010), Meena and Singh (2014), Meena *et al.* (2012) and Dayanand *et al*. (2012).

Economic analysis: 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 2013 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 4) depends on produced grain yield and MPS sale rates. Overall average IBCR was found 4.3. 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), Dayanand *et al*. (2012), Meena and Dudi (2012), Poonia *et al*. (2011), Raj *et al*. (2013) and Pal *et al*. (2014).

CONCLUSION

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. 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.

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