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Journal of Food Legumes 34(1): 44-47, 2021

Effect of Frontline demonstrations of gram in Sirohi district of South-Western Rajasthan

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Received: January 05, 2021
Accepted: June 03, 2021

Handling Editor: Dr. Uma Sah, ICAR-Indian Institute of Pulses Research, Kanpur

ABSTRACT

Front line demonstrations on gram were carried out at farmers' field in Sirohi district of Rajasthan to evaluate the performance of recent varieties recommended for the zone from *Rabi* 2011-12 to *Rabi* 2014-15. The increase in grain yield with the adoption of improved technology was in the range of 9.7per cent in *Rabi* 2011-12 to 35.7 percent in *Rabi* 2013-14 in different years. Similarly, technology index ranged from 7.5 per cent in *Rabi* 2011-12 to 46.5 percent in *Rabi* 2013-14 as influenced by locality variations in different years. Economics revealed a seven times higher benefit with the adoption of improved packages over traditional cultivation. Demonstration of proven technologies in gram, their scientific management and monitoring helped Include in before income level of the farming community.

***Key words*:** Demonstration, Economics, Grain yields, Gram, Yield gap analysis.

INTRODUCTION

Pulse, the food legume is being grown since millennium and has been a vital ingredient of human diet in India. Pulses are major source of protein to people who avoid eating meat. Chickpea (*Cicerarietinum* L.) is grown in many tropical, sub-tropical and temperate regions of the world. India is the largest chickpea producer as well as consumer in the world.Chickpea is one of the most important pulse crops of India due to its multiple functions in traditional farming system and multiple uses in human diet in the form of green leaves, green seed for vegetables, *sattu*, flour, roasted grain as well as for making local beverage known as *Chhang* (Mir and Mir 2000). Chickpea is annual plant with indeterminate growth habit which grows up to 30-70 cm. In India it is cultivated on 9.44 million ha with a production of 10.13 million tons during 2018-19 (GoI, 2019). Not with standing its distribution throughout the country, six states viz., Madhya Pradesh, Rajasthan, Maharashtra, Uttar Pradesh, Karnataka and Andhra Pradesh together contribute 91% of the production and 90% of the area of the country. Arid region is considered to be the pulse bowls of Rajasthan as it to share about 55% area and 40% of total pulse production of state. The average pulses productivity in the arid region was low (520 kg/ha) against 725 kg/ha as the state average. Total area under chickpea in Sirohi district is 2731hectare and2659 tons in *rabi* season 2017-18 (GoR, 2017).

Appropriate crop management practices increase production potential, ensures stable yields and higher water use efficiency. Main strategies for achieving sustainable production of these crop is the use of improved short duration and high yielding varieties, integrated nutrient management, pest and disease control and suitable agronomic practices (Jain *et al.* 2019). The Front Line Demonstration is an important method of transferring the latest package of practices in totalityto farmers. By which, farmers learn latest technologies under real farming situationat his own field.

To demonstrate the proven technology of scientific cultivation of gram, front line demonstrations were laid out at farmer's field during *rabi* 2011-12 to *rabi* 2014-15 with objectives to assess the performance of technologies demonstrated in frontline demonstrations, their economics and the related yield gaps.

METHODOLOGY

Present study was conducted on FLD in gram in rainfed condition in Sirohi district of Rajasthan state. Sirohi district is situated in the south-west part of Rajasthan between the parallel of 24°20' and 25°17' North Latitude and 72°16' and 73°10' East Longitude. In total 331 frontline demonstrations were conducted on farmers' field in various villages of Sirohidistrict of Rajasthan. Out of these 331 demonstrations 50 demonstrations of GNG 469 variety were conducted

in 2011-12, 156 demonstrations of RSG 888 variety in 2012-13, 63 demonstrations of RSG 888 variety in 2013-14 and 62 demonstration of GNG 1581 variety were conducted in 2014-15 during *rabi* season in arid region of south western Rajasthan.The package of improved technologies like line sowing, nutrient management, seed treatment and whole package were used in the demonstrations. In general, soils of the area under study were sandy loam and medium to low in fertility status. During this period extension activity like field day, farmers training, literature, short message services, diagnostic visits etc. were undertaken to benefit the farmers. Critical inputs supplied by KVK for the present study with respect to FLD and farmers practices have been given in Table 1. The farmers were selected from active participation in group meeting regarding different aspects of cultivation practices. Whole package approach demonstrated to the farmers through FLD trials included critical inputs such as variety, recommended seed rate, seed treatment practices, weed management, fertilizers and plant protection measures.

The thinning and weeding was done invariably 35-40 days after sowing. Seed sowing was done in the first week of November with a seed rate of 80 kg/ha. Under strict supervision of KVK scientists study was conducted from sowing to harvesting. Data with respect to grain yield from FLD plots and from fieldscultivated following local practices adopted by thefarmers of the area were collected and evaluated. Different parameters as suggested by Yadav *et al.* (2004) and Verma *et al.* (2014) were used for calculating gap analysis, costs and returns. The analytical tool used for assessing the performance of the FLD on gram is as follows:

- Technology gap (kg/ha): Potential yield – Demonstration yield
- Extension gap (kg/ha): Demonstration yield – Farmers yield
- Technology index (%): (Technology gap/ Potential yield) X 100
- Additional return (Rs/ha) = Demonstration return - Farmers' practice return
- Effective gain (Rs) = Additional return - Additional cost
- Incremental B: C ratio = Additional return / Additional cost

RESULT AND DISCUSSION

India has led to replacement of chickpea with wheat and mustard in larger areas as the irrigation facility was improved. Results of 331 demonstrations conducted from *rabi* 2011-12 to 2014-15 in 103.86 ha at farmer's field in Sirohi district presented in Table 2 and 3. Results indicated that use of high yielding variety, balanced application of fertilizers and micronutrients and control of insect and disease at economic threshold level gave average significant higher yield of gram as compared to farmer practices.

Grain yield

The increase in grain yield under demonstration over the farmer's local practices was in the range of 9.7 to 35.7 per cent. On the average basis 23.3 per cent yield advantage was recorded under FLD demonstrations as compared to farmers practices (FP) of gram cultivation.

The productivity of gram under improved production technology ranged between 963-1480 kg/ha with mean yields of 1265 kg/ha as against a yield range between 782 to 1189 kg/ha under farmers' practice during study period.In comparison to farmer's practice, there were 24.5, 35.7, 23.2and 9.7% increase in production of gram under improved technologies in 2011-12, 2012-13, 2013-14 and 2014-2015, respectively. The increased grain yield with improved technologies was mainly because of adoption of recommended package of practices in the zone (Jain 2016). Joshi *et al*. (2004) have also observed that improved package of practices along with water management have shown positive effect on yield potentials of different crops. Similar findings have also been supported by Narolia *et al*. (2013) and Narolia*et al*. (2015). Overall, the yield of demonstration plots exceeds that of farmer's plots in all FLD.

Gap analysis

Extension gap is a parameter to know the yield differences between the demonstrated technology and farmers' practice while technology gap is the difference between potential yield and yield obtained under improved technology demonstration. Technology gap is of greater significance than other parameters as it indicates the constraints in implementation and drawbacks in our package of practices, these could be environmental or varietal.An extension gap ranging from 105-375kg per ha was found between FLD and farmers practices during the different time line and on average basis the extension gap was observed to be 238 kg per hectare (Table 2). The extension gap was lowest (105 kg/ha) in rabi 2014-15 and was highest (375 kg/ ha) in year 2012-14. Such gap might be attributed to adoption of improved technology in demonstrations which resulted in higher grain yield than that in the farmers' practices. Wide technology gap were observed during these years and this was lowest (120 kg/ha) during 2011-12 and was highest

Table 1. Comparison between demonstration package (IP) and existing farmers practice (FP) under gram FLDs

Sl. No.	Items	Farmers practice	Recommended practice
1	Use of seed variety	Local seed (Dahod yellow)	Seed of improved variety GNG 469 RSG 888 GNG 1581
2	Seed rate	Higher seed rate (100 kg)	80 kg/ha
3	Seed treatment	-	Seed treatment with Bavistin followed by *Rhizobium* and PSB
4	Fertilizer	No or Lower doses (10 kg N and 25 kg P_2O_5)	N- 20 kg/ha P_2O_5- 40 kg/ha
5	Sowing	Broadcasting Mix cropping	Line sowing
6	Plant protection measures disease insect	Rarely used	Spray of Aciphate 75 SP @ 700 g/ha

Table 2. Performance of gram in crop technology demonstrations (*Rabi* 2011-12 to *Rabi* 2014-15)

Year	Variety	No. of demonstration	Area	Yield (Kg/ha)		% increase over (FP)	Potential yield (kg/ha)	Technology Index	Technology Gap (q/ha)	Extension Gap (q/ha)
				Improved package of practice (IP)	Farmers practice (FP)					
2011-12	GNG-469	50	20	1480	1189	24.47	1600	7.5	120	291
2012-13	RSG-888	156	40	1425	1050	35.71	1800	20.8	375	375
2013-14	RSG-888	63	19.06	963	782	23.15	1800	46.5	837	181
2014-15	GNG- 1581	62	24.8	1190	1085	9.68	1800	33.9	610	105
Average		-	-	1264.5	1026.5	23.2525	1750	27.175	485.5	238

Table 3. Economic analysis in front line demonstrations of gram on farmers field gram (*Rabi* 2011-12 to *Rabi* 2014-15)

Year	Cost of cash input (₹/ha)		Additional cost of demonstration (₹/ha)	Sale price of grain (₹/q)	Total Return		Additional return in demonstration (₹/ha)	Effective grain (₹/ha)	Incremental B:C ratio
	IP	FP			IP	FP			
2011-12	14250	13210	1040	2800	41440	33292	8148	7108	6.83
2012-13	14950	13550	1400	3000	42750	31500	11250	9850	7.04
2013-14	15150	13890	1260	3100	29853	24242	5611	4351	3.45
2014-15	16200	14800	1400	3175	37783	34449	3334	1934	1.38
Average	15137.5	13862.5	1275	3019	37957	30871	7086	5811	4.68

(837 kg/ha) during 2013-14. The difference in technology gap during different years could be due to differential feasibility of recommended technologies during different years. Similarly, the technology index for all the demonstrations during different years were in accordance with technology gap. Higher technology index emphasized the need to educate (insufficient extension services in transfer of technology) the farmer's through various means for the adoption of improved / recommended production technology to decrease the gaps (Jain 2018).

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 additional investment was given in Table 3 under demonstrations. Economic returns as a function of grain yield and minimum support price (MSP) sale price varied during different years. 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 1.38 and 7.04 in 2014-15 and 2012-13, respectively (Table 3) depends on produced grain yield and MSP sale rates.

It is observed that an additional investment of ₹ 1275/- per ha was made under 331 demonstrations. Economic returns was observed to be a function of grain yield and Minimum Support Price (MSP) or sale price which varied along different years. Maximum additional returns of ₹11250/-per hectare wereobtained due to higher grain yield during the year 2012-13.It was attributed due to improved technology, nonmonetary factors, and timely operations of crop cultivation, location specify and scientific monitoring. The lowest and highest incremental benefit: cost ratio (IBCR) were 1.38&7.04 in 2014-15 and 2012-13, respectively (Table 3) which depends on grain yield and MSP. The front line demonstration on gram revealed 23.25 per cent increase in yield over local check. This increase was with an extra expenditure of 1275/- per ha which is very less and even small and marginal farmers could also afford. Thus it is 'not the cost that deters the farmers from adoption of latest

technology but ignorance is the primary reason. The IBCR during different years is sufficiently high to motivate the farmers under aberrant and rainfed conditions to adopt the technology. Therefore, FLD program was effective in changing attitude, skill and knowledge of farmers towards improved/ recommended practices of wheat cultivation. This also led to improvement in the relationship between farmers and scientists and built confidence between them. The FLD demonstration farmers acted as primary source of information about the improved practices of gram cultivation. They also acted as source of good quality pure seeds in their locality and surrounding area for the next crop as it is self-pollinated crop. The concept of FLD's may be applied to all farmer categories including progressive farmers for horizontal dissemination of the recommended practices to other members of the farming community. This will help in the removal of the cross-sectional barriers among farming community. The results are in conformity with the findings of Jain (2017) and Meena *et al*. (2012).

Reactions and constraints: During crop growing period since field preparation to maturity and after harvest, the reaction of farmers about critical input supplied under demonstration was asked and they replied good seed germination, early maturity, high yield and high net benefit with resistance so some diseases. In-spite of best efforts and feedback from respondents, there was some constraints suggested by farmers' for higher adoption and are listed below:

- Pod borer resistance along with shattering tolerance varieties should be developed.
- Timely availability of seeds of HYVs'.
- Unavailability of plant protection chemicals on time.
- Lack of proper post harvest management and value addition
- Lack of centralized facilities for cleaning, grading, processing, packing and storage in the state is prior requirement.
- More number of training programmes should be arranged with demonstration and frequent field visit by the concerned extension experts to enhance the level of adoption.

CONCLUSION

By conducting crop technology demonstration of recommended technologies, yield of gram can be increased to its potential yield. This will substantially increase the income as well as livelihood status of the farming community. There is need to further conduct such demonstration of recommended technology in Sirohi district of Rajasthan.

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