Annals of Arid Zone 57(1&2): 19-22, 2018

Evaluation of Front Line Demonstrations on Gram in Arid Zone

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Received: June 2017

Abstract: The study was carried out during rabi seasons of 2014-15 and 2015-16 in seven villages of Barmer, Jaisalmer and Jodhpur districts of Rajasthan to evaluate the front line demonstrations on gram conducted by ICAR-Central Arid Zone Research Institute, Jodhpur. The data were collected from 45 farmers. The findings of the study results revealed that improved technology recorded a mean yield of 1517 kg ha^{-1} which was 22.4% higher than the yield obtained by farmers' practices (1230 kg ha^{-1}). The higher net returns (Rs. 47223 ha^{-1}) and benefit: cost ratio of 1.52 was obtained with improved technologies in comparison to farmer's practices (Rs. 38354 and 1.33 correspondingly).

Key words: Gram, front line demonstration, extension gap, technology gap, technology index.

Gram is an important rabi pulse crop of Rajasthan which is the second largest producer (14% of total production) of gram in the country. It occupies about 12.56 lakh ha area with total production of 9.11 lakh tones. Gram shares 37.35% of the area and contributes 46.72% of total pulse production of the state. The average productivity of gram is low (725 kg ha^{-1} in 2014-15) as compared to other states. One of the reasons of low productivity is traditional method of cultivation practices by the farmers. There is a considerable scope for increasing the productivity of gram by using improved practices. The Government of India and ICAR are operating various schemes for quick and effective transfer of technology to farmer's field. Among these schemes, Front line demonstrations (FLDs) is one, which emphasizes to increase production by supplying critical inputs along with improved packages of practices tested by scientists of ICAR Institutes and State Agricultural Universities (SAUs) (Choudhary *et al.*, 2013). Disseminating cultivation of improved varieties, getting feedback from farmers about constraints in adoption of recommended improved technologies for further research and to maximize the technology dissemination process among the farmers are some of the important features of this program (Nagarajan *et al.*, 2001). Keeping this in mind, the present study was conducted to assess the impact of front line demonstration on yield and economics of gram production.

Materials and Methods

The study was carried out by Central Arid Zone Research Institute, Jodhpur during 2014-15 to 2015-16 (two consecutive years) at farmers' fields of seven villages namely, Mansagar and Govindpura of Jodhpur, Dhok of Barmer, Sankdia, Deedhu, Damodara and Dedha of Jaisalmer district of Rajasthan. During these two years of the study, an area of 30 ha was covered under front line demonstrations. Before selection of farmers for FLDs, a comprehensive list of all gram growers was prepared out of which, 24 in rabi 2014-15 and 21 in 2015-16 were selected from the 7 adopted villages with the help of random sampling methods. During the selection procedure, repetition of farmers was completely avoided. Thus a total 45 farmers were included in the study. Intensive trainings programs were imparted to the selected farmers regarding different aspects of gram cultivation in both the years. The differences between the demonstration package and existing farmers' practices are mentioned in Table 1. In demonstration plots, use of quality seed of improved varieties (RSG 963, CSJK 6, CSJK 21 and GNG 1581), seed treatment, line sowing, and timely weed control, as well as application of recommended dose of fertilizers (20 kg ha^{-1} nitrogen + 40 kg ha^{-1} phosphorus) were emphasized. In the demonstration, one control plot was also kept where farmers' practices were followed.

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Table 1. Description of technological intervention under FLD on gram

Particulars	Technological interventions (T)	Farmers practice (T)	Gap
Variety	CSJK 6,CSJK 21 and RSG 963, GNG-1581	Local and old	Full gap
Seed rate	75-80 kg ha^{-1}	90-100 kg ha^{-1}	Partial gap
Seed treatment	Seed treatment with mancozeb @ 2 g kg^{-1} seed	Nil	Full gap
Time of sowing	15-30 November	15-30 December	Partial gap
Method of sowing	Line sowing proper crop geometry	Line sowing improper crop geometry	Partial gap
Fertilizer dose	20 kg N ha^{-1} and 40 kg P ha^{-1}	Negligible	Full gap
Plant protection measures	Need based application	Nil	Full gap
Weed management	Pendimethaline 3 litres ha^{-1} as pre-emergence incorporation following by one hand weeding at 30 days after sowing (DAS)	One hand weeding at 30-35 DAS	Partial gap

All demonstrations were conducted under the supervision of CAZRI scientists. All the production and protection technology other than interventions were applied in similar manner in demonstrated plots as well as in the plots of farmers' practices. The data on output were collected from FLD plots as well as control plots and finally the grain yield, cost of cultivation, net returns with the cost-benefit ratio was worked out.

The extension gap, technology gap and technology index was calculated by using following formulas as given by Samui *et al.* (2000).

Technology gap = Pi - Di

Extension gap = Di - Fi

Technology index (%) = [(Pi - Di)/Pi] x 100

where, Pi=Potential yield; Di=Demonstration yield; Fi=Farmers yield.

Results and Discussion

The grain yield data of 2014-15 and 2015-16 indicated that improved varieties CSJK-6, CSJK-21, RSG-963 and GNG-1581 with improved technology of gram in FLDs were superior to local check (Table 2). During the period under study, it was observed that in front line demonstrations, the improved gram varieties CSJK-6, CSJK-21 and RSG-963 recorded higher seed yield 1320, 1225, 1390 and 2135 kg ha^{1} respectively with an average of 1517 kg ha^{-1} as compared to local check (1230 kg ha^{-1}). The yield improvement ranged from 9.4 to 36.9% with an average improvement of 22.4% as compared to local variety. Similar yield enhancement in different crops in front line demonstration has amply been documented by Jeengar *et al.* (2006), Hiremath *et al.* (2007), Dhaka *et al.* (2010) and Patel *et al.* (2013). From these results it is evident that the performance of improved variety was found to be better than the local check under same environmental conditions. Farmers were motivated by results of agro technologies applied in the FLDs and it is expected that they would adopt these technologies in the coming years. Yield of the front line demonstrations and potential yield of the crop was compared to estimate the yield gaps.

The highest extension gap of 475 kg ha^{-1} was recorded in the variety GNG-1582 followed by 240 kg ha^{-1} by RSG-963, 200 kg ha^{-1} by CSJK-6 and lowest 105 kg ha^{-1} by CSJK-21. This emphasized the need to educate the farmers through various means for adoption of improved agricultural production technologies to reverse the trend of wide extension gap. The technology gap showed that the gap in

Table 2. Grain yield, extension gap, technology gap and technology index of different gram variety

Year	Name of variety	No. of demo.	Area (ha)	Seed yield (kg ha^{-1})			% increase in yield over control	Extension gap (kg ha^{-1})	Technology gap (kg ha^{-1})	Technology index
				Potential	IP	FP				
2014-15	CSJK-6	13	6	1800	1320	1120	17.9	200	480	26.7
	CSJK-21	2	1	1800	1225	1120	9.4	105	575	33.8
	RSG-963	9	5	1800	1390	1120	24.0	240	310	18.2
2015-16	GNG-1581	21	18	2500	2135	1560	36.9	475	365	14.6
	Mean	45	30	1950	1517.50	1230	23.4	255	432.50	22.2

Table 3. Gross Expenditure, Gross Return, Net Return and B:C ratio of gram production under FLDs

Year	Name of variety	Gross return (Rs. ha^{-1})		Cost of cultivation (Rs. ha^{-1})		Net return (Rs. ha^{-1})		B:C ratio	
		FP*	IP*	FP	IP	FP	IP	FP	IP
2014-15	CSJK-6	67585	78750	28980	31290	38605	47460	1.33	1.52
	CSJK-21	67585	73420	28980	31290	38605	42130	1.33	1.35
	RSG-963	67585	83170	28980	31290	38605	51880	1.33	1.65
2015-16	GNG-1581	65400	77725	27800	30300	37600	47425	1.35	1.56
	Mean	67039	78266	28685	31043	38354	47223	1.33	1.52

FP*-Farmers practices; IP*-Improved practices.

the demonstration yield and the potential yield was maximum in the year 2014-15 (average 455 kg ha^{-1}) and lowest in the year 2015-16 (365 kg ha^{-1}). However, overall average technology gap in the study was 432.5 kg ha^{-1} (Table 2). The technological gap obtained may be due to dissimilarity in soil fertility status (Kumar, 1985) and weather conditions. These findings are similar to the findings of Patel *et al.* (2013).

The technology index showed the feasibility of improved technology at the farmer's field. The lower the value of the technology index more is the feasibility of technology (Jeengar *et al*. (2006). Data presented in Table 2 revealed that the this value varied between 14.6 to 33.8% with an average of 22.2% during the period of the study. Results of the present study are in consonance with the findings of Singh *et al*. (2007), Hiremath and Nagaraju (2009) and Tomar (2010).

Economics of Front Line Demonstrations

The cost of improved technologies was estimated by the yield economic calculations (Table 3). The improved practices in gram front line demonstration exhibited high value returns. Regarding economics, the gross return of improved technologies was higher in FLD plots than farmers' practices. The average gross returns of demonstrations were Rs. 78266 ha^{-1} as against Rs. 67039 ha^{-1} from farmers' practices. The cost of cultivation was higher in FLD plots (Rs. 31043) as compared to local check (Rs. 28685). The average net returns of demonstration were Rs. 47223 while in local check it was Rs. 38354. Cost-benefit ratio was 1.52 in demonstration while in local practices it was 1.33. Thus, an additional investment of Rs. 2358 ha^{-1} while following improved practices gave additional net returns of Rs. 8869 ha^{-1} suggesting it's higher profitability and economic viability. More or less similar results were also reported by Hiremath *et al*. (2007), Hiremath and Nagraju (2009) and Dhaka *et al.* (2010), Tomar (2010), Gautam *et al.* (2011), Meena and Dudi (2012), Patel *et al*. (2013) and Bhargav *et al*. (2015).

The FLDs produced significant positive results and provided the researcher an opportunity to demonstrate the productivity potential and profitability of the latest technologies under real farming situation, which they have been advocating for long time.

Conclusion

From the above findings it can be concluded that the yield of gram could be increased by 10 to 37% by different technological interventions. The productivity gains under FLDs over the farmers' practices created awareness and motivated the other farmers to adopt scientific crop production and management. The study suggests strengthening of extension approach to educate the farmers for higher production and to increase net return on sustainable basis.

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Printed in June 2018