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IMPACT OF FRONTLINE DEMONSTRATION ON PRODUCTIVITY AND PROFITABILITY ANALYSIS OF CLUSTER BEAN IN BARMER DISTRICT OF RAJASTHAN

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SUMMARY

Front line demonstrations on cluster bean (Cv. RGC 936) were carried out at Farmers field in Barmer district of Rajasthan to evaluate the performance of variety from *Kharif* 2011 to *Kharif* 2013. The increase in grain yield with the adoption of improved technology was in the range of 37.6 to 44.0 percent in different years. Similarly, technology index was declined from 39 percent in *Kharif* 2011 to 21 percent in *Kharif* 2013 showed feasibility of variety. The economics showed that an approximate five times higher benefit was recorded with the adoption of improved packages over traditional cultivation except during 2012 in view of sudden increase in prices of grain of crop. It was contributed due to scientific management and monitoring of demonstrations of proven technologies of cluster bean and could be help to enhance the income level of the farming community.

Key words : Demonstration, economics, gap analysis, grain yields, cluster bean

Cluster bean [*Cyamopsis tetragonoloba* (L.) Taub] is a drought tolerant typical legume grown in tropical and subtropics. It is locally known as guar and thrives well in semiarid regions. It requires abundant sunshine, flashing rainfalls that are moderately frequent, and well-drained soil for fruitful results. Among the arid legumes, it has an immense importance as industrial crop as the gum powder made after refining the gum from seeds makes an important raw material in industries. Currently, India is the main producers of cluster bean and accounting 80% of global production and lead in exports of guar and it's by-products followed by Pakistan. The production levels of cluster bean is low as its cultivation is confined to marginal lands in areas of low and erratic rainfall coupled with extreme temperatures and low fertility status of soils. Guar is grown in the northwestern parts of country encompassing states of Gujarat, Haryana and Punjab. The state occupied 87 and 82 % of the country's area and production, respectively. But, the productivity of state (530 kg/ha) in comparison to the country (568 kg/ha) and the Barmer district (220 kg/ha) in comparison to state was very low (Anonymous 2012-13, Anonymous 2014 and Anonymous 2013-14). In Rajasthan, the area under cluster bean is quite high due to drought hardy nature and better performance under moisture stress situation compared to traditional legume crops. Therefore, it is of paramount importance to identify and develop agronomical practices that influences the performance of crop. 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. The productivity level of crop in the district is low as it faces harsh climatic and edaphic extremes. Therefore, on the basis of 'seeing is believing' principle, it is very essential to demonstrate the latest technologies at farmers field so that the farmers see the results and adopt the technology in totality. A wide gap exists in cluster bean production with the use of available techniques and its actual application by the farmers which is reflected through poor yield of cluster bean crop on farmer's fields. There is a tremendous opportunity for increasing the productivity of crop by adopting the improved technologies. There are many technologies generated at agricultural universities and research stations but the productivity of cluster bean is still very low due to poor transfer and adoption of technology. To demonstrate the proven technology of scientific cultivation of cluster bean, front line demonstrations were laid out at farmer's field during *Kharif* 2011 to *Kharif* 2013 with following objectives.

- To demonstrate the newly released crop production and protection technologies with complete package of practices and its management in farmers' fields,
- To motivate farmers by adoption of improved package on their fields,
- To assess the performance of FLD fields with local check,
- To analyze the economics of FLDs on cluster bean.
- To generate production data and effective feedback information for research and extension system.

MATERIALS AND METHODS

A study of 70 frontline demonstrations on cluster bean was conducted on farmer's field from *Kharif* 2011-12 to 2013-14 in different blocks of Barmer district under arid region of western Rajasthan to evaluate the economic feasibility of technology transfer and adoption under Front Line Demonstration. The crop was sown with the onset of monsoon (2nd week of July to 4th week of July). During this period extension activity like field days, farmer's trainings, literature, SMS, diagnostic visits etc were undertaken which benefitted the farmers. Material for the present study with respect to FLD's as per package were given while in case of local check plots (FP), existing practices being used by farmers were followed. The soils of the study area are sandy to sandy loam and medium in fertility status. Before conducting FLDs, a list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspects of cultivation etc. were followed to bridge the gap existing between nation, state and district productivity and the whole package approach demonstrated to farmers through FLD trials included component such as variety, seed rate, seed treatment, weed management, fertilizers and plant protection measures. The demonstrations were conducted to reduce the gaps between potential and demonstration field, extension gap and technology index. Data on crop yield was collected by per sq. meter observation randomly from 3 to 4 places from an acre. The grain yield of demonstration crop was recorded & analyzed. 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 cluster bean is as follows:

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

RESULTS AND DISCUSSION

A comparison of productivity level between variety under front line demonstrations and farmers practice has been shown in Table 1 and 2.

Grain Yield

It is evident from the results that under demonstration plot, the yield performance of cluster bean variety RGC 936 was found to be substantially higher than that of local check during the whole study period (2011 to 2013). The yield of crop under demonstration ranged from 732-951 kg/ha as

TABLE 1
Performance of pearl millet in crop technology demonstrations. (*Kharif* 2011 to 2013)

Year	No. of demonstration	Improved package of practices (IP) (kg/ha)	Farmers practices (FP) (kg/ha)	Additional yield over farmers practices (Extension Gap) kg/ha	% increase over farmers practice	Technology index (%)	Technology gap (kg/ha)
Kharif 2011	30	732	515	217	42.0	39	468
Kharif 2012	10	851	591	260	44.0	29	349
Kharif 2013	30	951	691	260	37.6	21	249

Potential yield- 1200 kg/ha.

TABLE 2
Economic analysis of front line demonstrations of cluster bean on farmers field *Kharif* 2011 to 2013

Year	Cost of cultivation (Rs./ha)		Additional cost in demonstration (Rs./ha)	Gross return (Rs./ha)		Net return (Rs./ha)		Additional return in demonstration (Rs./ha)	B : C ratio (BCR)
	IP	FP		IP	FP	IP	FP		
2011	9145	7640	1505	32934	23160	23789	15520	8269	5.49
2012	13735	14490	755	128640	88650	114905	74160	40745	53.96
2013	18300	15750	2550	46080	30800	27780	15050	12730	4.99

compared to farmers practice 515 to 691 kg/ha during the study period (Table 1). The technological intervention thus gave yield enhancement to the tune of 37.6 to 44.0 %, over local check. It was the impact of the use of high yielding improved variety, balanced application of fertilizer and control of insect & disease at economic threshold level. The variety RGC 936 is high yielding and gained popularity it's among the state. Joshi *et al*. (2004) have also observed that improved package of practices have shown positive effect on yield potentials of different crops. Similar findings have also been supported by Jain, (2016) and Narolia *et al*. (2015). Overall, the yield of demonstration plots exceeds that of farmer's plots in all FLD in real farm situation.

Extension gap is a parameter to know the yield differences between the demonstrated technology and farmers practice where as technology gap is a measures difference between potential yield and yield obtained under improved technology demonstration. Technology gap is of great 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 217-260 kg/ha was found between FLD demonstration and farmers' practices during the different time line (Table 1). Such gap might be attributed to adoption of improved technology in demonstrations which resulted in higher grain yield than that in the farmer's practices. The technology index was shown a decreasing trend from 39 to 21 percent from 2011 to 2014 shows the feasibility of variety. The findings of the present study are in line with the findings of Dhaka *et al.* (2015), Jain, (2018) and Singh *et al*. (2014). 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.

Economic Analysis

Grain yield, cost of production and sale prices of produce determine the economic returns and it vary from year to year with the fluctuation in cost of inputs, labour charges and sale price of the produce. Different variables like seed, fertilizers and plant protection chemicals were considered as cash inputs for the FLD demonstrations as well as for farmers practice. Economic returns was observed to be a function of grain yield and market sale price of the commodity which varied along different years. The higher additional returns 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 4.99 & 53.96 in 2013 and 2012, respectively (Table 2). The results are in conformity with the findings of Yadav *et al.* (2004) and Jain, (2016). A significant increase in net return with an affordable extra expenditure for even small and marginal farmers was observed. Thus it is not the cost that deters the farmers from adoption of latest technology but ignorance is the primary reason. It is quite appropriate to call such yield gap as extension gap. The value of BCR 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 cluster bean cultivation. This also led to improvement in the relationship between farmers and scientists and built confidence between them. The FLD beneficiary farmers may act as primary source of information about the improved practices of crop cultivation for speedy and wider dissemination to other members in the

farming community. This will help in the removal of the cross-sectional barriers among farming community. This change in attitude might be attributed to their direct contact with the scientist at all important and critical stages of the crop cultivation along with inclusion in different extension activities. Extension functionaries may be invited in the program to follow the same procedure in their future demonstration programme to achieve success.

REACTIONS AND CONSTRAINTS

The improved seed and adoption of latest technology have reported higher yield and higher returns. The variety was also suited to arid environment. In-spite of best efforts and feedback from respondents, there was some constraints for higher adoption and was listed below :

- Blight and stem rot resistance 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.

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