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Popularization of Improved Maize Production Technology through Frontline Demonstrations in South-eastern Rajasthan

B. L. Dhaka, B. S. Meena and R. L. Suwalka

Maharana Pratap University of Agriculture and Technology, Krishi Vigyan Kendra
Post Box No. 4, Bundi 323 001, Rajasthan, India

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ABSTRACT Maize has emerged as one of the most suitable alternative to soybean and rice in soybean – wheat and rice – wheat cropping system in Bundi district Rajasthan. However, the productivity of maize in the district is very low. The productivity of maize per unit area and time could be increased by adopting feasible scientific and sustainable management practices with a suitable variety. Taking into account the above consideration, frontline demonstrations were carried out in a systematic manner on farmers' field to show the worth of a new variety and convincing farmers about potentialities of improved production management practices of maize for further adoption.

INTRODUCTION

Maize is the most important cereal crop and known as queen of cereal due to unparallel productivity among cereal crops. In India, maize occupies third position both in area and production after rice and wheat. In Rajasthan it is grown on 1 m ha area with production 1.1 m ton and productivity of 1,100 kg/ha. During recent years, Bundi district of Rajastan has emerged as the leading one in maize production in the state. Farmers of area are preferring maize as a suitable alternative to soybean and rice in soybean – wheat and rice – wheat cropping system. However, the productivity of maize in the district is very low as compared to average national productivity (2435 kg/ha). Lack of suitable high yielding variety as well as poor knowledge about production practices are ascribed as main reasons for low productivity of maize in the district. The productivity of maize per unit area could be increased by adopting recommended scientific and sustainable management practices using a suitable high yielding variety. Taking into account the above considerations, frontline demonstrations were carried out in a systematic manner on farmers' field to show the worth of a new variety and convincing farmers to adopt improved production management practices of maize for enhancing productivity of maize.

METHODOLOGY

The study was conducted in Bundi district in of Rajasthan. To popularize the improved maize production practices, constrains in maize production were identified though participatory approach. Preferential ranking technique was utilized to identify the constraints faced by the respondent farmers in maize production. Farmers were also asked to rank the constraints they perceive as limiting maize protection in order of preference. The quantification of data was done by first ranking the constraints and then calculating the Rank Based Quotient (RBQ) as given by Sabarathnam (1988), which is as follows:

$$R.B.Q. = \frac{\Sigma fi(n+1-i)}{N \times n} X\ 100$$

Wherein,
fi = Number of farmers reporting a particular problem under i^{th} rank
N = number of farmers
n = number of problems identified

Based on top rank farmers problems identified, front line demonstrations were planned and conducted at the farmers' field under Integrated Scheme of Oilseeds, Pulses, Oilpalm and Maize (ISOPAM). In all, 250 full package frontline demonstrations were conducted to convince them about potentialities of improved variety of maize 'PEHM -2', during 2006 and 2007. All the participating farmers were trained on all aspects of maize production management. To study the impact of front line demonstrations, out of 250 participating farmers, a total of 75 farmers were selected as respondent through proportionate sampling. Production and economic data for FLDs and local practices were collected and analyzed. The technology gap and technology index were calculated using the following formulas as given by Samui et al. (2000):

Technology gap = Potential yield – Demonstration yield

Technology index = Potential yield – Demonstration yield/Potential yield ×100

Knowledge level of the farmers about improved production practices of maize before frontline demonstration implementation and after implementation was measured and compared by applying dependent 't' test. Further, the satisfaction level of respondent farmers about extension services provided was also measured based on various dimensions like training of participating farmers, timeliness of services, supply of inputs, solving field problems and advisory services, fairness of scientists, performance of variety demonstrated and over all impact of FLDs. The selected respondents were interviewed personally with the help of a pre-tested and well-structured interview schedule. Client Satisfaction Index was calculated as developed by Kumaran and Vijayaragavan (2005).

$$\text{Client Satisfaction Index} = \frac{\text{The individual obtained score}}{\text{Maximum score possible}}$$

The data thus collected were tabulated and statistically analyzed to interpret the results.

RESULT AND DISCUSSION

Constraints in Maize Production

Farmers' maize production problems were documented in this study. Preferential ranking technique was utilized to identify the constraints faced by the respondent farmers in maize production. The ranking given by the different farmers are given in table 1. A perusal of table indicates that lack of suitable HYV was given the top most rank by 23 respondent farmers. Based on the ranks given by the respondent farmers for the different constraints listed out in table 1, the rank based quotients were calculated and presented in table 2.

The analysis of data presented in the table 2 revealed that lack of suitable HYV, low technical knowledge, grass hopper infestation are the major constraints to maize production and followed by wild animals. Other constraints such low or erratic rainfall, stem borer infestation, stem rot and weed infestation were found to reduce maize production. Among all the constraints, low soil fertility got least concerns. Other studies (Hassan et al. 1998; Ouma et al. 2002; Joshi et al. 2005) have reported similar problems in maize production.

Table 2: Frequency distribution of RBQ values given by farmers (n=75)

S. No.	*Problems*	*R.B.Q*	*Overall rank*
1	Lack of suitable HYV	79.70	I
2	Stem rot	41.19	VII
3	Stem borer infestation	42.52	VI
4	Low soil fertility	31.11	IX
5	Low technical knowledge	77.33	II
6	Wild animals	66.52	IV
7	Low or erratic rainfall	53.04	V
8	Weed infestation	39.85	VIII
9	Grass hopper infestation	69.33	III

Performance of FLD

A comparison of productivity levels between demonstrated variety and local checks is shown in table 3. During the period under study it was observed that in front line demonstrations, the improved maize variety PHEM - 2 recorded the higher grain yield (3820 kg ha^{-1}) compared to local check (3015 kg ha^{-1}). The percentage increase in the yield over local check was 26.7. Similar yield enhancement in different crops in front line demonstration has amply been documented by Haque (2000), Tiwari and Saxena

Table 1: Ranks given by farmers for different constraints (n=75)

S. No.	*Constraints*	*Ranks*								
		I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*
1.	Lack of suitable HYV	23	12	12	14	11	3	0	0	0
2.	Stem rot	2	0	3	10	8	17	15	6	14
3.	Stem borer infestation	5	5	0	7	7	11	14	13	13
4.	Low soil fertility	0	0	5	0	9	9	11	20	21
5.	Low technical knowledge	11	17	18	16	13	0	0	0	0
6.	Wild animals	6	11	18	16	9	6	3	1	5
7.	Low or erratic rainfall	7	12	7	3	11	7	8	5	15
8.	Weed infestation	4	7	0	0	0	17	21	20	6
9.	Grass hopper infestation	17	11	12	9	8	5	3	10	0

(2001), Tiwari et al. (2003), Hiremath et al. (2007), Mishra et al. (2009), Kumar et al. (2010). From these results it is evident that the performance of improved variety was found better than the local check under local conditions. Farmers were motivated by results of agro technologies applied in the FLDs trials and it is expected that they would adopt these technologies in the coming years.

Yield of the front demonstration trials and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology index. The technology gap shows the gap in the demonstration yield over potential yield and it was 427 kg ha^{-1}. The observed technology gap may be attributed to dissimilarities in soil fertility, salinity and erratic rainfall and other vagaries of weather conditions in the area. Hence, to narrow down the gap between the yields of different varieties, location specific recommendation appears to be necessary. Technology index shows the feasibility of the variety at the farmer's field. The lower the value of technology index more is the feasibility. Table 3 revealed that the technology index values was 10.05. The finding of the present study are in line with the findings of Sawardekar et al. (2003), Hiremath and Nagaraju (2009).

Table 3: Yield, technology gap and technology index of demonstration

Variables	*Yield (kg ha^{-1})*	*% increase over local check*	*Technology gap (kg ha^{-1})*	*Technology index (%)*
Local check	3015	-	-	-
Demonstration (PEHM -2)	3820	26.7	427	10.05

The economics of maize production under front line demonstrations were estimated and the results have been presented in table 4. Economic analysis of the yield performance revealed that front line demonstrations recorded higher gross returns (Rs. 28704 ha^{-1}) and net return (Rs. 14188 ha^{-1}) with higher benefit ratio (1.97) compared to local checks. These results are in line with the findings of Gurumukhi and Mishra (2003), Sawardekar et al. (2003), Sharma (2003), Hiremath et al.(2007), Hiremath and Nagaraju (2009). Further, additional cost of Rs.1426 per hectare in demonstration has yielded additional net returns Rs. 4370 per hectare with incremental benefit cost ratio 4.06 suggesting its higher profitability and economic viability of the demonstration. Similar results were also reported by Hiremath and Nagaraju (2009).

Table 4: Economics of frontline demonstrations

Variables	*Cost of cultivation (Rs ha^{-1})*	*Gross return (Rs ha^{-1})*	*Net return(Rs ha^{-1})*	*Benefit – cost ratio*
Local check	13090	22908	9818	1.75
Demonstration	14516	28704	14188	1.97
Additional in demonstration	1426	5796	4370	4.06*

***** Incremental benefit cost ratio

Increase in Knowledge

Knowledge level of respondent farmers on various aspects of improved maize production technologies before conducting the frontline demonstration and after implementation was measured and compared by applying dependent 't' test.

It could be seen from the table 5 that farmers mean knowledge score had increased by 23.75 after implementation of frontline demonstrations. The increase in mean knowledge score of farmers was observed significantly higher. As the computed value of 't' (8.94) was statistically significant at 5 % probability level. The results are at par with Narayanaswamy and Eshwarappa (1998), Singh and Sharma (2004), Singh et al. (2007). It means there was significant increase in knowledge level of the farmers due to frontline demonstration. This shows positive impact of frontline demonstration on knowledge of the farmers that have resulted in higher adoption of improved farm practices. The results so arrived might be due to the concentrated educational efforts made by the scientists.

Table 5: Comparison between knowledge levels of the respondent farmers about Improved Farming Practices of maize (n=75)

Mean score			*Calculated 't' value*
Before FLD implementation	*After FLD implementation*	*Mean difference*	
39.42	63.17	23.75	8.94*

* Significant at 5% probability level.

Farmers' Satisfaction

The extent of satisfaction level of respondent

farmers over extension services and performance of demonstrated variety was measured by Client Satisfaction Index (CSI) and results presented in table 6.

Table 6: Extent of farmers satisfaction of extension services rendered (n=75)

Satisfaction level	*Number*	*Per cent*
Low	17	22.67
Medium	33	44.00
High	25	33.33

It is observed from table 6 that majority of the respondent farmers expressed medium (44.0 %) to the high (33.33 %) level of satisfaction for extension services and performance of technology under demonstrations. Whereas, very few (22.67) percent of respondents expressed lower level of satisfaction. The results are in conformity with the results of Narayanaswamy and Eshwarappa (1998), Kumaran and Vijayaragavan (2005). The medium to higher level of satisfaction with respect to services rendered, linkage with farmers, and technologies demonstrated etc. indicate stronger conviction, physical and mental involvement in the frontline demonstration which in turn would lead to higher adoption. This shows the relevance of frontline demonstration.

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