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Crop technology demonstration: An effective communication approach for dissemination of technology for isabgol production

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ABSTRACT

The front line demonstrations for isabgol (Plantago ovata) were undertaken to assess the efficacy of recommended cultivar RI-1 for augmenting the yield gaps at farmers' fields in Barmer district of Rajasthan during two consecutive seasons. Adoption of improved cultivar and recommended practices increased mean seed yield of isabgol by 41 and 46 percent over farmers practice during first and second year, respectively. Similarly, technology index was declined from 25.5 percent in 2011 to 22.25 percent in second year indicating feasibility of interaction between variety and packages of practices. The extension gap was 2.60 and 2.95 q ha^{-1} during two seasons tested. The economics showed that an approximate four time's higher benefit could be realized with the adoption of improved packages over traditional cultivation practice during this study.

INTRODUCTION

Isabgol (*Plantago ovata* Forsk) grown for its husk and seeds is one of the most important medicinal crops of the country. It gave about 25% husk by weight of the seed and its husk has a purgative as well as laxative action as it contains mucilage, fatty oil, large quantity of albuminous matter, pharmacologically inactive glucoside and plantiose sugar. The colloidal mucilage is widely used in aryuvedic, unani and allopathic systems of medicines for the treatment of constipation and irritation of digestive track etc. India ranks first in global Isabgol production (98%) and is the sole supplier of seeds and husk in the international market. It is the top rank foreign exchange earner among all medicinal crops of India [8]. In India the state of Rajasthan ranks first in area and production in the country. According to one estimate the crop was grown in over 190 thousand ha area in 2012-13 with an annual production of 99.95 thousand MT [3]. Isabgol thrive well in warm temperate region and requires cool and dry weather with less or low quality water. The productivity of crop in the district is low i.e. 380 kg ha^{-1} as compared to state average of 525 kg ha^{-1} and average production of 1519 kg ha^{-1} in the adjoining state of Gujarat [2]. The major causes for its low production are non adoption of recommended package of practices and lack of high yielding improved varieties. Therefore, on the basis of principle of 'seeing is believing', it is essential to demonstrate the latest technologies among farmers for their fast adoption in totality. The present study is an attempt in this direction.

Briefly the Frontline Demonstration (FD) is a new concept of field demonstration that was initially evolved with the inception of ICAR Technology Mission on Oilseed Crops during late-eighties. The

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main objective of FDs is to demonstrate newly released crop production and protection technologies and their management in the farmers' field under different agro-climatic regions [13,14]. The FDs are initially conducted under the close supervision of scientists before being inducted into the extension system of the State Department of Agriculture. During these demonstrations the scientists keep a close watch on factors that either contributes towards higher yields of a given crop or adversely affects productivity in a given geographic niche. Some of the special features of FDs may include: (i) They are conducted with only newly released technologies or those that are likely to be released in near future; (ii) FDs are normally organized in a block of two to four hectares involving all those farmers whose plots fall in the identified demonstration block; (iii) Only critical inputs and training are provided from the scheme budget, remaining inputs are supplied by the farmers themselves; (iv) Training of the farmers associated with FDs is a prerequisite for conducting such demonstrations; (v) The target audience of the FDs are both farmers and the extension officers so that both of them get convinced about the potentialities of a technology package for further wide scale diffusion; (vi) "Seeing is believing" is the basic philosophy of all FDs [1, 4, 5,13].

Field demonstrations are normally aimed to educate farmers about special attributes of a new genetic variety or an agrotechnology in terms of their impact on resistant to disease and pest, water and fertilizer requirements, physical and chemical quality of the field produce, its geometric yields etc. In addition, it also educates the farmers in term of input-output ratio and economic gains in terms of net returns. FDs can either be a single practice demonstration wherein worth of only one practice like effect of balanced fertilizers or yield performance of newly developed or irrigation or harvest schedules etc are studied. A composite FD on the other hand is a combination of field based result demonstrations and a chain of skill oriented methods. Herein, the effect of one practice in harnessing the effect of other practices is also demonstrated and studied. Good conduction of FDs often lead to higher confidence and better adoption of demonstrated practices by the farmers as they themselves are the part of the whole exercise. The scientists involved in FDs plan their work with proper homework because farmers would like to question them to get their doubts clarified on site. A typical FD can advance through following systematic steps:

A. **Planning Phase:** The scientists must develop an understanding with the farmers, their farming systems, resources and establish rapport with them. It is essential to gather information on cropping system, present level of use of inputs and productivity of major crops of the area. There are different ways of knowing these vicinity factors such as beforehand visit and meetings with farmers around target area, collection of information meeting people individually and in groups, exchanging information with local extension workers, consulting office records of population and basic agriculture of the area etc.

B. **Select Technologies:** Select only proven technologies which have higher potentialities in terms of yield, disease resistance, quality, and can fit in the existing farming systems and situations of the area/farmers. Technology should be frontier ones i.e. recently released technologies or such which are at advance stage of release. It should be ensured that the technology selected for demonstration is much superior to the technology being already in use.

C. **Select Demonstration Site:** Demonstration site should be easily accessible to the farmers and extension workers. Isolated farms should be avoided. As far as possible, block of demonstration site should have a good number of farmers of all categories of land holding and status. Attention is also paid to farm size, field layout, soil type and fertility status, irrigation facilities and drainage system.

D. **Select Demonstration Farmers:** Farmers included in FDs are selected by holding a meeting in the village where the purpose of demonstration should be clearly stated.

Suggestions from farmers should also be invited to make FD more effective. All difference of opinions must be sorted out in advance for getting cooperation from all quarters including those farmers who have not been included in the FDs.

E. **Finalize Package of Practices:** The best cultivation packages and varieties of the target crop are included in the FD evaluation as unbiased controls.

F. **Prepare for demonstration:** Critical inputs for the demonstration like seeds, fertilizers, farm equipments are arranged in time. Only critical inputs are supplied by the scientists. Other inputs are arranged by the farmers themselves.

G. **Conducting Phase:** (i) Farmers are guided for laying out the experimental field. Control plot are kept if needed; otherwise all other neighboring/surrounding plots are treated as control plots. In case of block demonstration, one acre plot as a control is adequate; (ii) A publicity board is put on the fringe of the demonstration plot, mention the details of the demonstration on the board; (iii) Presence of scientists is ensured during all crucial farm operations like, seeding, fertilizer application, weeding, irrigation, plant protection measures, harvesting, threshing and weighing of produce. Each operation is used as input of training of farmers; (iv) A field day is arranged to project the new technologies demonstrated in front of a large manageable group of interested farmers. It is an intensive educational activity in which farm experts, extension workers and farmers are involved and learn from each other; (v) Another field day is planned when the crop is fully matured yet green. The FD farmers are asked to explain the story of demonstration to the assembled group of farmers and extension workers. Farmer-scientist-extension workers discussion is an important feature of this field day activity: (vi) Harvesting is carried out in the presence of identified groups of farmers. They are asked to the yield and to find out in what way the demonstrated technologies are superior than the earlier ones. Ask them to provide written feedback on questions like: Are they satisfied with the performance of the technologies? What lessons they have learned from the demonstration? Will they advice other fellow farmers to adopt this practice? Will they exchange the seed materials of new variety with other fellow farmers? What are the expected profits? Will it be more than what they used to get from their own practices? What were the difficulty in following the demonstrated practices? Idea is to ascertain as to what extent farmers are satisfied with the demonstrated technology and what is the possibility of their continued adoption; (vii) Constant follow ups of FDs is necessary because some farmers may revert to old practices in the absence of proper follow-up. These follow-up programs are often linked with the local institutions like Farmers Club, Farmers Cooperative Society, Village Panchayat etc. ; (viii) There are two types of records which one should maintain for each block FD. First is an Information Card that contains basic information about the demonstration site like previous crops and varieties grown, fertility status of the plots, present productivity of crops, size of holdings of each farmers in the demonstration block, extent of use of inputs etc. It also contains detail information of FD like size of block, variety of crop, seed rate, sowing date, inputs applied, irrigation schedule followed, intercultural operation performed, plant protection measures taken, date of maturity, date of harvesting, incidence of disease and pests, average numbers of tillers, yields of crop etc. The card should remain with the demonstration farmers and is filled up by them or by an educated person in their family or by the KVK staff who visit the demonstration site from time to time. The second record is a detailed Technical Report that contains information on soil analysis, variety of crop, germination, plant population, pest and diseases, irrigation, fertilizer application, harvesting, final yield, extension activities undertaken etc. It should also contain information on cost-benefit ratio of the demonstration. This will help to work out the economic returns. A favorable cost-benefit ratio will fully convince the extension officers and the farmers about the profitability of the technologies demonstrated. Timely submission of these technical data sheets to Zonal District Coordinator or other higher decision making platforms in time is as important as concluding a good FD. FD report helps in planning agricultural development and farm research program of an area, state and country. Each Block FD is concluded with a feature story written in simple and easily understandable language for newspapers and as a learning reference material in the relevant KVKs.

MATERIALS AND METHODS

The present study comprised 60 frontline demonstrations on Isabgol at farmer's field in Barmer district to evaluate the economic feasibility of FD's technology and their adoption. The purpose of FD's was to know the yield gaps between demonstrations and farmers practices and to find out the reasons for low productivity. During study period different extension activity including field days, farmer's trainings, diagnostic visits etc were undertaken to benefit the respondents. Each demonstration was in one acre area and recommended package of practices (Improved variety, optimum seed rate, proper seed treatment, integrated weed management and irrigation through sprinkler, fertilizers and plant protection measures) was provided to the farmers through two days on-campus training at KVK. The crop was sown from mid November to last week of November and harvested during first fortnight in April. The demonstrations were regularly monitored from sowing to harvesting by scientists of Krishi Vigyan Kendra, Barmer. The data on seed yield was recorded from per sq. meter, randomly from 3 to 4 places from an acre. Different parameters as suggested by previous workers [6,15] were used for calculating gap analysis, costs and returns. The analytical tools used for assessing the performance of the FDs on isabgol were as follows:

- Extension gap = Demonstration yield - Farmers' practice yield
- Technology gap = Potential yield - Demonstration yield
- Technology index = (Potential yield - Demonstration yield) x 100/ Potential yield
- Additional return = Demonstration return - Farmers' practice return
- Effective gain = Additional return - Additional cost
- Incremental B:C ratio = Additional return / Additional cost

RESULTS AND DISCUSSION

Difference between demonstration package and farmers practices of Isabgol

The differences in demonstration and farmers practices for Isabgol production as per recommended package and practices are presented in Table 1. The recommended HYVs, optimum seed rate @ 05 kg/ha, proper seed treatment with fungicides, insecticides and culture were given to the beneficiaries under demonstration as compared to farmers practice, where they use previous harvest and locally available seed at higher seed rate. These differences in the packages were in line with the findings of previous workers [13,14].

Seed yield

Data of 60 demonstrations revealed that the improved practices gave a significant increase in seed yield over farmers' practices and was in the tune of 41 and 46 percent during two consecutive years respectively (Table 2). The maximum yield of 11.90 and 10.26 q/ha was recorded during first and second year, respectively. Overall, the yield of demonstration plots exceeds that of farmer's plots in all FDs. Similar findings have also been supported by Jain [8] for cumin crop.

Table 1: Difference between demonstration package and farmers practices in isabgol

Parameters	Demonstration package	Farmers practice
Variety	RI 1	Local
Seed rate	05 kg/ha	15 - 20 kg/ha
Seed treatment	Carbendazim @ 3gm/kg seed Cholpyriphos @ 4ml/kg seed PSB+ *Azotobactor* 500gm/ha each	Not applied
Sowing method	Line Sowing	Broadcasting
Fertilizer doses	30: 25: 00 (N : P: K kg/ha)	Imbalance use
Plant protection measures	Need based spray of insecticide and fungicides	No use of insecticide and fungicides

Gap analysis

Technology gap is of great significance than other cultivation parameters as it indicates the constraints in implementation and drawbacks in our package of practices with respect to environmental or varietal changes. An extension gap of 2.60 and 2.95 q ha^{-1} was found between FLD and farmers practices during the different time lines (Table 2). 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 also decreased from 25.5 in first year to 22.25 percent in the second year. This showed the feasibility of interactive influence of variety and recommended practices. The findings of the present study are in line with the findings of previous workers [7,13] in the black gram. The difference in technology gap during different years crops 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 narrow the gaps.

Economic analysis

The net return varies from year to year as it is dependent on 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. The higher additional returns under demonstrations could be due to improved technology, timely operations of crop cultivation and scientific monitoring. The lowest and highest benefit: cost ratio (BCR) were 3.20 and 3.92 in first and second year, respectively (Table 3). The results are in conformity with the findings of Yadav *et al.* [15] in sunflower and Jain [8] in green gram cultivation. A

Table 2: Impact of improved technologies on the productivity potential of Isabgol

No. of FDs	Mean yield (q ha-^{1})		Percent increase over farmers practice	Yield range (q ha-^{1})		Technology Gap (q ha-^{1})	Extension Gap (q ha-^{1})	Technology Index (%)
	Improved practice (IP)	Farmers practice (FP)		IP	FP			
Ist Year (30)	8.94	6.34	41	6.80-11.90	5.01-8.75	3.06	2.60	25.50
2nd Year (30)	9.33	6.38	46	8.34-10.26	4.87-7.93	2.67	2.95	22.25

Potential yield of isabgol-12 q/ha, value in parenthesis shows number of demonstrations; IP-Improved practice; FP- Farmers practice

Table 3: Economic analysis of front line demonstrations of Isabgol on farmers field

Year	Cost of cultivation (Rs ha^{-1})		Additional cost in IP (Rs ha^{-1})	Gross return (Rs ha^{-1})		Net return (Rs ha^{-1})		Additional return in demonstration (Rs ha^{-1})	B:C ratio (BCR)
	IP	FP	IP	IP	FP	IP	FP		
Ist	13174	10393	2781	40234	28550	27060	18157	8903	3.20
IInd	17000	14000	3000	46661	31913	29661	17913	11748	3.92

IP- Improved practice; FP- Farmers practice 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. The value of BCR is sufficiently high to motivate the farmers under aberrant and rainfed conditions to adopt the technology.

Reactions and Constraints:

The improved and treated seed of recent varieties have reported good seed germination along with early maturity. This variety was suited to arid environment. In-spite of best efforts and feedback from respondents, there were some other constraints for higher adoption such as:

More performance for shattering tolerance varieties; need for higher tillering variety; Unavailability of plant protection chemicals on time; Lack of proper post-harvest management package and value addition facility; Lack of centralized facilities for cleaning, grading, processing, packing and storage in the state.

CONCLUSION

The front line demonstration programme is an effective tool for increasing the productivity of crops and changing knowledge, attitude and skill of farmers. This also led to improve the relationship between farmers and scientists and built confidence among them. The significant increase in production level of a crop under FD's over farmers practice (traditional) created greater awareness and motivated the other farmers to adopt improved practice of Isabgol. The beneficiary farmers always play an important role as source of information and dissemination of the HYV of Isabgol for other nearby farmers. 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. Thus, it is concluded that scientific management and monitoring of demonstrations of proven technologies of crop could help in enhancing the income level of the farming community. Extension functionaries may be invited in the program to follow the same procedure in their future demonstration programme to achieve success. Conducting the frontline demonstrations on farmers field also help to identify the constraints and potential of the crop in specific area to ensure the crop security.

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