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ECONOMICS AND GAP ANALYSIS IN ISABGOL CULTIVATION THROUGH FRONTLINE DEMONSTRATIONS IN WESTERN RAJASTHAN

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A B S T R A C T

A study was conducted during Rabi 2009-10 and 2010-11 to increase the productivity of isabgol (*Plantago ovata*), an important cash crop in western Rajasthan during Rabi season. A high yielding isabgol variety RI 89 was evaluated at farmer's field under Front line demonstration programme (FLD's). Fifty demonstrations (Twenty in 2009-10 and thirty in 2010-11) were conducted at farmer's field against traditional or farmers practice in Barmer district of Rajasthan. Grain yield of Isabgol variety RI 89 under improved practices was 8.25 q/ha and 8.32q/ha and increased significantly by 27 and 25 per cent over farmers practice during 2009-10 and 2010-11, respectively. The farmers gains an additional return of Rs 6713/- and 6050/- against an additional investment of Rs 1500/- and 2300/- during 2009-10 and 2010-11, respectively. During this period extension activity like field days, farmer's trainings, distribution of literature, short messages services, diagnostic visits etc. were taken to provide instance benefit to the farmers. During extension activities particularly field days, another study was conducted to find out the gaps in adoption of improved practices for further improvement and refinement in the technology, objectives of FLD's. Most of farmers welcomed the technology but availability of inputs like improved seeds, plant protection particularly seed treatment chemicals, non-shedding variety, high cost of inputs were found major constraints behind lower cost of produce just after harvest.

Keywords: Economic analysis, gap analysis, demonstration, isabgol

INTRODUCTION:

Isabgol is one of the most important medicinal crops grown for its husk. Mucilage yield amounts to approximately 25% or more (by weight) of the total seed yield. Isabgol seed mucilage is often referred to as husk or psyllium husk. The milled seed mucilage is a white fibrous material that is hydrophilic (water-loving). India ranks first in isabgol production (98%) and the sole supplier of seeds and husk in the international market. Among medicinal plant, isabgol is the first ranking foreign exchange earner for the country (Rs. 30 million annually). Isabgol contains a significant amount of proteins and husk yields colloidal mucilage which are valued for medicinal application and used in aryuvedic, unani and allopathic systems of medicines. It is an annual herb and cultivated in Rajasthan, Gujarat, Madhya Pradesh & Haryana. Rajasthan is one of the main isabgol producing states of India. The state ranks first in terms of area and production in the country. The mucilage has medicinal properties and used against constipation, irritation of digestive track etc. The left over material of seed after husk removal is used as animal feed. Isabgol thrive well in warm temperate region and requires cool and dry weather during its crop season hence generally it is sown during winter months. It can be grown well in saline soils with poor quality water in western Rajasthan as *Rabi* crop. The water requirement is low as compared to traditional crop makes it suitable for such areas.

It matures in about 120 days (November to March-April). The spikes are harvested when they turn red. The average yield comes to 800-1000 kg/ha. Isabgol products available in the market are used as laxative that is particularly beneficial in constipation, chronic ailments and dysentery. Seed prices are not governed

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by any regulations and are solely dependent upon the farmers.

The average price of the seed is around Rs. 35 to Rs. 55 per kg. The crop covers 214188 hectares with the production of 113344 ton and average productivity of 529 kg/ha (Vital Agriculture Statistics, 2011-12) in the state. However, isabgol cultivation under arid condition with sandy loam soil is a profitable venture, which is gaining popularity among the farmers of western Rajasthan.

Table 1. Area, production and productivity of Isabgol in Rajasthan Rabi 2010-11

Districts	Area(ha)	Production (ones)	Productivity (kg/ha)
Barmer	60829	19621	323
Jalore	36922	21963	595
Jodhpur	34474	30011	871
Nagaur	40283	23791	591
Jaisalmer	26243	9791	373
Rajasthan	214188	113344	529

Source: Vital Agriculture Statistics 2011-12.

METHODOLOGY

A study of 50 frontline demonstrations on isabgol was conducted on farmer's field during 2009-10 and 2010-11 in arid parts of western Rajasthan to evaluate the recommended package of practices against traditional one, economic feasibility and adoption through FLD's. These demonstrations were conducted at farmer's field in different blocks in Barmer district of western Rajasthan. The crop was sown from 2nd week of November to 4th week of November and harvested as per maturity in month of March. The farmers selection was made as per guidelines provided by Zonal Project Directorate to bridge the gap existing between state productivity and district productivity (Table 1). The whole package approach demonstrated to farmers through FLD trials included component such as improved variety, recommended seed rate, seed treatment, weed and water management, fertilizers and plant protection measures (Table 2). Under strict supervision of KVK scientists, the study was conducted from sowing to harvesting. Data on crop yield was recorded by per sq. meter observation method randomly from 3 to 4 places from an acre. The state average is 529 qha^{-1} which is very lower than the realizable yields in this season to the tune of 12 q ha^{-1}. Frontline demonstrations (FLD) were conducted under real farm situations to assess the yield gaps and technology gaps to achieve the highest production potential and to suggest possible refinement in technologies to bridge the gaps. The experiment was also conduct to popularize and fulfill the demand of non-shattering resistant varieties as evident from earlier feedback so the demonstration under frontlines was conducted from 2009-10 and 2010-11 to fulfill the above requirement with RI 89.

In improved package of practices, input supplied to farmers were improved seed, seed treatment chemicals and bio fertilizers particularly phosphate solubilizing bacteria. During crop period and after harvest, the reaction about critical input supplied was asked. During this period extension activity like field days, farmer's trainings, literature distribution, SMS, diagnostic visits etc. were undertaken which benefitted the farmers (Feder, 2002).

The data generated was utilized for calculating the technology index, technology and extension gaps using the following formula:

(i) Technology gap: Improved yield – Farmers yield.

(ii) Extension gap: Potential yield - Improved yield.

(iii) Technology index: (Technology gap/ Potential yield) X 100.

The differences in adoption of improved and recommended package and rejection of local practices of isabgol production and its horizontal expansion to increase the production sustainable basis is prime aim of front line demonstrations (FLD's) by farmers. The difference among production techniques (gaps) and reasons associated in terms of constraints back to researchers for further refinement is another aim of FLD's. Table 2 shows that under FLDs only recommended HYVs, seed rate @ 05 kg/ha, Carbendazim @ 3 g/kg PSB+ *Azotobactor* 500gm/ha each seed with fungicide, insecticide for seed treatment given to the farmers for demonstration. Whereas, under farmers practice they generally used local self-produced earlier crop seed at high seed rate without

treatment. These differences in the packages were in line with the findings of Singh and Varshney (2010), Verma *et al.* (2010), Khan and Chauhan (2005) and Veerasamy *et al.* (2003).

A set of personnel interview, filled questionnaire and filled farm inventory to collect data on basic information and problems for adoption were filled from these farmers. The variables were scored according to scale already developed and used the extension research studies. The data were analyzed and interpreted in terms of percentage and score value to find out the gaps in adoption of improved technologies.

Table 2: Difference between demonstration package and farmers practices for Isabgol cultivation

Sr. No.	Particular	Demonstration package Practice	Farmers practices
1.	Variety	RI 89	Local
2.	Seed rate	05 kg/ha	15 - 20 kg/ha
3.	Seed treatment	Carbendazim @ 3g/kg. PSB + *Azotobactor* 500 g/ha each	Not applied
4.	Sowing method	Line Sowing	Broadcasting
5.	Fertilizer doses	30: 25: 00 (N : P: K kg/ha)	Imbalance use
6.	Plant protection measures	Need based spray of pesticides	No use of pesticides

RESULTS AND DISCUSSIONS

Yield: The study revealed that improved technology (IT) registered overall 26.2 per cent increase in seed yield over the farmers practice (FP). The increase was 26.9 and 25.1 percent during 2009-10 and 2010-11, respectively over farmers practice (6.50 and 6.65 q/ha, respectively). The yield ranges from 7.5 to 9.5 q/ha during 2009-10 and 4.85 to 10.44 q/ha during 2010-11 under improved practice under FLD's (Table 3). A record of 10.44 and 9.50 qha^{-1} in FLD and lowest was 5.30 and 4.05 q/ha from farmers practice during 2009-10 and 2010-11, respectively. It was evident from the yield levels recorded in demonstrations that the improved package of practices can boost the yield significantly. These results confirm those obtained by conducting in FLD trials on various pulse crops (Das and Willey, 1991). Overall, the yield of demonstration plots exceeds that of farmer's plots in all FLD. This was attributed to the quality seed used, adequate seed rate, management practices and judicious use of fertilizers. The data revealed that the extension gap existing between the potential and demonstrable yields was not substantial (3.68 and 3.75 q/ha, respectively). Thus indicating that it was possible to replicate the results obtained in research experiments in real farm situation too. Results also indicate technological gap between the improved technology and farmers practice in tune of 1.75 and 1.67 qha^{-1} during 2009-10 and 2010-11, respectively in yield was there in isabgol which could be overcome by adopting improved varieties and efficient management practices. Technology index 14.6 and 13.9 % during 2009-10 and 2010-11, respectively gave evidence that there was a scope for further improvement in the productivity of isabgol (Choudhary and Pagaria, 2012). However, to further bridge up the gap between technology developed and technology transferred, there is a need to strengthen the extension network besides emphasis on specific local recommendations.

The technology index indicates the feasibility of evolved technology at the farmer's field. Lower the values of technology index more is the feasibility of the technology demonstrated (Chauchan, N.M., 2011).

Economics: The data on economics of the improved technology indicated that, the cost of production in FLD was higher than that of the local practices (Table 4). However, the farmers could fetch additional returns of Rs 6382/- by investing Rs 1900/- over mean basis and gave a B: C ratio of 3.36 % more with adopting the improved technology. The percent increase in net returns over mean basis was 30.1%.The results also reveal that farmers in arid part of western Rajasthan where water is scare, quality is poor, poor soil structure etc. favors to grow isabgol. In these situation where growing crops successfully is very tedious job. The farmers get a B:C ratio of 2.12 and 2.25 during 2009-2010 and 2010-11, respectively. The benefit is more in real sense because they do not include the cost of labour. The marginal difference between benefit-cost ratio of improved practice and farmer's practice proves of adoption of improved technologies by the farmers.

Table 3. Impact of improved technologies on the productivity potential of rainfed isabgol.

No. of FLD's	Variety	Mean yield (q/ha-1)		Range yield index (q/ha-1)		Technology Gap (q/ha)	Extension Gap (q/ha-1)	Technology Index (%)
		Improved practice	Farmers practice	Improved practice	Farmers practice			
2009-10 (20)	RI-89	8.25	6.50	7.50-9.50	5.30-7.80	1.75	3.75	14.6
2010-11 (30)	RI-89	8.32	6.65	4.85-10.4	4.05-8.28	1.67	3.68	13.9
Mean		8.28	6.56	-	-	1.72	3.72	14.3

Potential yield of isabgol -12 q/ha; TG=IP-FP and EG= PY-IP; TI=TG/PI*100

Gap analysis: The data were collected with help of structural interview schedule and presented in Table 5 revealed the farmers perspective to bridge the extension and technology gaps described earlier for adoption of improved package of practice for better livelihood. A study of 50 beneficiaries under FLD's was asked to explain the reasons for such behavioral differences. The constraints in present study may be personnel, failure of extension communication systems or policy matters. It was revealed that since the isabgol is an irrigated and cash crop and farmers need improved and shattering resistance varieties, non-declaration of minimum support prizes and lack of processing units were treated as major constraints and ranked I, II and V rank, respectively. Also the government polices like lack of subsidies on inputs to purchase costly inputs like seed and plant protection chemicals (X), loaning for inputs (XI), unavailability of storage structure (VII) and adequate insurance for damage (VIII) prevent the farmer to invest more and more in production. The lack of custom hiring centers to follow mechanization (VI rank) because high cost of machines suitable for field preparation to harvesting particularly line sowing in light soils to make better contact of seed and moisture increased the cost of cultivation and uneven plant population ultimately reflect the poor adoption. The increased rate of wage and engaged in MNREGA reduced the labour availability for timely operations (XII rank).

Table 4: Impact of improved technology on the economics of isabgol cultivation (Rs/ ha)

Sr. No.	Particulars	Year		Mean
		2009-10	2010-11	
1.	Production cost			
	Improved practice (IP)	12000	12820	12410
	Farmers practice (FP)	10500	10520	10510
2	Additional cost over FP	1500	2300	1900
3	Gross return			
	IP	37463	41600	39532
	FP	29250	33250	31250
4	Net return			
	IP	25463	28780	27122
	FP	18750	22730	20740
5	B:C ratio			
	IP	2.12	2.25	2.19
	FP	1.78	2.16	1.97
6	Additional return	6713	6050	6382
7	Increase in net return (%)	35.8	26.6	30.1
8	B:C on additional input in demonstration	4.47	2.63	3.36

IP- Improved practice; FP- Farmers practice.

Data depicted in Table-5 further showed that winter rains coincides with maturity in western Rajasthan resulted in crop damaged initially by shattering and secondly farmers not get adequate insurance or relief from government against natural calamities in proportion to area cultivated and crop conditions.

Farmers generally grow using previous crop seed due to timely unavailability. In Indian condition government declare minimum support prices for major crop well in advance but this crop is not included resulted in farmers sold their produce just after harvesting to local vendors to pay the wages, fulfill daily requirement and loans by cooperatives. Similar finding were reported by Jain and Pagaria, 2011 and Singh et al, 2011.

CONCLUSION

From above study it may be concluded that adoption of improved technologies is easy but constrains for its adoption are as hurdle race where one constrain solved give birth another constrains. As it is clear that sowing time do not wait and farmers either use uncertified seed or untreated seed results in incidence of diseases and insect and cause a considerable damage. Also it maturity coincides with winter rains, cause considerable shattering resulted in zero yield some times and delayed sowing reflects decrease in yield significantly. If inputs make available on time the average productivity of crop in Rajasthan may be increased up to significant level. The heartfelt efforts made by extension workers would always be resulted in good impact and feedback. It is suggested that there is a need to strengthen effective communication methods like SMS services, newspapers, radio talk etc.

The training programmes will be imparted on different need based aspects related to improved crop production practices time to time with motivation.

This study suggest for conducting intensive trainings, FLD's and effective use of all means of extension education to educate the isabgol growers for higher production of crop and to get higher net return on sustainable basis.

Table 5: Reasons for non-adoption of improved practices in cultivation of isabgol

Practices	Farmers response		
	Numbers	Percent	Rank
Timely unavailability of certified and improved HVY seed	36	72	III
Seed of varieties resistant to shattering	41	82	I
Timely availability of seed treatment chemicals and biofertilizers	17	34	IX
High cost of fertilizers and other inputs	12	24	X
Unavailability of labour on time and at fair prices	9	18	XII
Custom hiring center for mechanization	25	50	VI
Suitable prices at the time of harvest (Minimum support prices)	40	80	II
Adequate availability of power for irrigation	35	70	IV
Processing units	30	60	V
Loaning facility	10	20	XI
Adequate insurance	20	40	VIII
Storage structures	21	42	VII

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