Scouting Technological Vis-a Vis Extension Gaps in Soybean Production in Madhya Pradesh

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ABSTRACT

Soybean, an oilseed crop, is a major kharif crop in Malwa region of Madhya Pradesh, India. In fact, Madhya Pradesh is known as soybean state due to the highest acreage 5.67 million ha (55.69 %) and production 6.28 million tonnes with productivity of 1108 kg/ha, slightly lesser than the national average (1207 kg/ha). Forty six Krishi Vigyan Kendra are functional in the state and striding hard to enhance the productivity and returns from soybean cultivation since long. KVKs are engaged in identifying the reasons for gaps in the productivity at the farmers fields and searching ways for reducing the yield gaps. This study focuses on the technological interventions on soybean crop carried out by three sampled KVKs during the period from 2008-09 to 2010-11. Under frontline demonstrations, technology/ practices viz., use of improve variety (JS-93-05), seed treatment, seed inoculation, spacing 30cm, balance application of fertilizers, weed management and plant protection measure, etc were demonstrated in selected plots. The results showed 16.72 to 34.70 percent yield increase over farmer's practice. The highest yield as 21.42 q ha-1 was recorded in the demonstrated plots, which was 27.0 percent more over the farmer's practice (16.83 q ha-1). The extension gap ranged from 1.85 q ha-1 to 5.05 q ha-1 during the reporting period. The benefit : cost ratio of the demonstration plots and farmers plots ranged as 2.91 to 4.04 and 2.44 to 3.79, respectively.

Keywords: *Soybean; Frontline demonstration; Extension gap; Technology gap;*

Soybean (*Glycine max* L. merril), is recognized as golden or miracle bean due to its high nutritive value and various usage viz., for feed, oil and soy food products. It is rich in protein (38-42%) and contains 18-22 per cent edible oil. Soybean ranked first in the world in oil production (57%) and in the international trade markets (*Meena et al., 2012*). Soybean continues to be number one oilseed crop in India occupying 10.18 million ha with production of 12.28 million tonnes (*GOI, 2012*). As an exceptional crop among oilseeds, soybean attained an unparallel glory of its horizontal expansion in very short span of nearly four decades (*Dupare et al., 2012*). Madhya Pradesh has its major share in area (70%) and production (65%) of soybean in the country and hence also known as soybean state. In Madhya Pradesh, the average yield of soybean is low (10 qha-1) as compared to potential yield (22 qha^{-1}). The adoption of recommended production technology among farmers is not very encouraging. The reason may be that either the promising technologies have not yet reached the farmer's fields or farmers are unable to use improved technology due to various socio-economic reasons. Hence, an efficient technology transfer system is advocated and conducting frontline demonstration on farmer fields have proved as an effective means for creating awareness and acceptance of improved technologies. Keeping this in view, the present study was carried out to find out the effect of technological interventions on soybean productivity and economics in selected KVK- districts of Madhya Pradesh.

METHODOLOGY

This study is based on the technological interventions carried out by the three Krishi Vigyan Kendras located in Malwa Region viz., Dhar, Neemuch and Mandsaur. The demonstrations of improved technology was in an area of 0.4 ha to each farmer. The total area in three years was 40.2 hectare for 100

demonstrations of recommended improve practices of soybean. In the demonstration, one control plot was also demarcated where farmer's practice was carried out. Data were collected with the help of personal interview and observations on yield data was also recorded at the time of separate threshing. The yield of each demonstration was recorded in a systematic manner and the yield of farmer's practices was also recorded at the same time. The sample average method was used to arrive at the overall yield in the district (both under demonstration and farmers' pactice). However, to calculate the overall yield in Malwa region, weighted average method was used by assigning area under demonstration in district as weight. Similarly, the economics of demonstration as well as farmers' practice were also calculated by using weighted average. The formula is given below.

$$Ym = \frac{W_1^* + W_2^* Y_2 + W_3^* Y_3}{W_1 + W_2 + W_3}$$

Where,

'Ym' - overall yield/gross return/gross cost in Malwa region

'W' - the weight i.e. area under demo. in respective district.

'Y' - per ha yield/gross return/gross cost in respective district

The results were compared with full package of practices given *viz*. variety, seed treatment, seed inoculation, spacing, balanced fertilizers, weed control and plant protection measures. The yield data were collected from both the demonstration and farmer's practice and their technology gap and extension gap were worked out (*Samui et al., 2000*) as given below.

$$\text{Tech. gap} = \text{Potential yield} - \text{demo. yield}$$

$$\text{Ext. gap} = \text{Demo. yield} - \text{farmer's yield}$$

$$\text{Tech. index} = \frac{\text{Potential yield} - \text{Demo. yield}}{\text{Potential yield}} \times 100$$

RESULTS AND DISCUSSION

Extent of adoption of recommended technology: The basic motto of the researchers is to evolve a sound technology having ability to solve the problems of the soybean growers through adopting at the larger scale during production, post-production and marketing operations. Frontline demonstrations have been proved as instrumental for enhancing the rate of adoption of the soybean production technology in Madhya Pradesh. In this regard, total 100 frontline demonstrations were conducted at the selected farmer's field of Dhar, Neemuch and Mandsaur by the respective KVKs.

Analyzed data depicted in Table 1 indicated that KVKs had provided the critical inputs after getting the farmers priority during the interactive meetings with farmers before laying out demonstrations. Apropos adoption, full scale adoption was observed in variety, seed treatment, seed inoculation and spacing. This may be due to the fact that soybean growers are more convinced with these techniques and its visible results during the FLD programme or it may be the easiness of

Table 1. Technology-wise extent of adoption of the soybean production technology (N= 100)

Items	Existing `practices	Recommended practices	Extent of adoption	% of farmers	Farmers ioritization for critical input
Variety	JS-335, Samrat, PK-1044	JS-93-05, NRC-7, NRC-37	Full	90	I
Seed rate	100 Kg ha^{-1}	75 Kg ha^{-1}	Partial	80	V
Seed treatment	No use of fungicide	Seed treatment with Thirum 2g+ Carbendazim 1g	Full	85	III
Seed inoculation	No use of culture	Seed inoculation with Rhizobium culture +PSB @ 200 gm per 10 kg of seed	Full	85	IV
Spacing	9" (22.5cm)	12"(30cm)	Full	90	VIII
Fertilizers	50 kg DAP ha^{-1}	20:60:20 Kg N:P:K			
(100 Kg DAP ha^{-1})	Partial	75	II		
Weed control	One hand weeding	One spray of post emergence weedicide + one weeding	Partial	80	VI
Plant Protection	i. Application of insecticide without knowledge ii. Use of incorrect dose	i. Need based insecticide spray ii. Use of correct dose and time of insecticide	Partial	90	VII

the application of the said techniques. However, there was partial gap in adoption of recommended practices over farmer's practices with regard to seed rate, fertilizers, weed control and plant protection measures.

The above findings indicate that emphasis must be given by the KVKs and all extension agencies to identify the reasons and strategy for above listed technology having lesser adoption so that the real benefits of the recent technology could be reaped by the farmers. Also, if needed some extension activities could be organized to further convince the farmers on these aspects of the soybean cultivation.

Yield performance of soybean technology under FLD : Analyzed data during 2008-09 depicted in Table 2 revealed that the highest yield of soybean under demonstration was 18.50 qha^{-1} realized by KVK Neemuch followed by Dhar and Mandsaur 15.04 and 14.32 qha^{-1} respectively over farmers yield of 14.58 q ha-1, while percentage increase over farmers practice was also highest in Neemuch 26.88 per cent. This may be due to better strategy and farmers response at KVK Neemuch compared with other two. During 2009-10, the highest yield 20.34 qha^{-1} was obtained under FLD plots by KVK Neemuch followed by Mandsaur and Dhar 17.02 and 15.62 qha^{-1}, respectively over the farmers yield of 16.80 qha^{-1} at KVK Neemuch. However, during 2010-11, the highest yield 21.77 qha^{-1} was obtained under FLD plots by KVK Mandsaur followed by Neemuch and Dhar 21.42 and 15.72 qha^{-1} respectively over the farmers yield of 16.83 qha^{-1} at KVK Neemuch. The results clearly indicated that the yield of soybean could be increased over the yield obtained under farmer's practices by accelerating the adoption of recommended production technology for the concerned districts as testimonies by three KVKs in Madhya Pradesh. *Dixit and Singh (2003), Patil et al. (2003)* and *Singh (2002)* also found similar findings.

Extension Gap : Extension gap is the difference in the yield of the demonstration and farmers practices. A perusal of analyzed data during 2008-09 revealed that extension gap ranged from 2.16 q ha^{-1} to 3.92 q ha^{-1} and is the highest at KVK Neemuch, while during 2009-10 & 2010-11, it ranged from 1.85 q ha^{-1} to 3.76 q ha^{-1} and 3.98 q ha^{-1} to 5.05 q ha^{-1} the highest at KVK Mandsaur. On overall basis, during three years extension gap ranged from 2.16 to 5.05 q ha^{-1} with mean value of 3.51 qha^{-1}. It shows that these KVKs have to make hard efforts to technologically backing of the extension agency for the speedy transfer of the recommended technology to the farmers fields.

Table 2. Productivity, extension gap, technology gap of soybean under FLD and farmers practices

Year	Area (ha)	No. of demo	Yield q/ha		Productivity increase over FP (%)	Extension gap (q/ha)	Technology gap (q/ha)	Technology Index (%)
			DP	FP				
2008-09								
Dhar	5	12	15.04	12.88	16.77	2.16	6.96	31.64
Neemuch	5	13	18.5	14.58	26.89	3.92	3.5	15.91
Mandsaur	2.5	6	14.32	11.5	24.52	2.82	7.68	34.91
Overall	12.5	31	16.28	13.284	22.55	2.996	5.72	26.00
2009-10								
Dhar	5	12	15.62	13.77	13.44	1.85	6.38	29
Neemuch	5	13	20.34	16.8	21.07	3.54	1.66	7.55
Mandsaur	2.5	6	17.02	13.26	28.36	3.76	4.98	22.64
Overall	12.5	31	17.788	14.88	19.54	2.908	4.212	19.15
2010-11								
Dhar	5.2	12	15.72	11.72	33.9	3.98	6.28	28.55
Neemuch	5	13	21.42	16.83	27.27	4.59	0.58	2.64
Mandaur	5	13	21.77	16.77	30.2	5.05	0.23	1.05
Overall	15.2	38	19.59	15.06	30.03	4.52	2.41	10.98
Overall	40.2	100	18.00	14.45	24.54	3.55	4.00	18.19

(TE 2010-11)

(Potential yield used as 22.0 q/ha)

Further, the above extension gap emphasized the need to educate the farmers through various means for adoption of improved agricultural production technologies to reduce this extension gap. But the extension methods, approach and communication strategy used by these KVKs may also be one of the reasons for encouraging the farmers for taking the advocated technology to their farmers fields at the wider scale. Increasing use of latest production technologies with high yielding varieties will subsequently change the trends of extension gap which in turn would lead to higher productivity, farmers' income and prosperity.

Technology gap: During three years of demonstrations, the technology gap observed ranged from 0.23 qha^{-1} to 7.68 qha^{-1}. The highest technology gap during 2008-09 was observed at KVK Mandsaur, 7.68 qha^{-1} and the lowest was at KVK Neemuch, 3.50 qha^{-1}. While during 2009-10, highest gap was 6.38 qha^{-1} at KVK Dhar and lowest at KVK Neemuch. During 2010-11, highest gap was at KVK Dhar and lowest at KVK Mandsaur. The observed technology gap may attribute to the dissimilarity in the soil fertility status, weather condition and other management practices. Hence variety-wise location specific recommendation with full package of practices and other pre-requisite appears to be necessary to minimize the technology gap for yield level of different situations.

Here home take lesson is that KVKs have to introspect the technology available and its proper application at the farmers fields so that there must be strategic campaign for reducing the technology gap at the farmers fields in the soybean cultivation. Such steps would boost up the production in the region and it would bring more prosperity to the farming community.

Technology Index: The technology index shows the feasibility of the evolved technology at the farmer's fields. Lower the value of technology index more is the feasibility of the technology. During three years, technology index ranged from 34.91 to 1.05 per cent and which is on reducing trend exhibited the feasibility of technology demonstrated. The variation in yield from location to location can be accounted for varying climatic condition, prevailing microclimatic and variation in agricultural practices followed. Similar reasoning was provided by other workers (*Sagar and Chandra, 2004*).

Economic Analysis : Economic indicators depicted in Table 3 showed that the total cost of cultivation (COC)

Table 3. Economics analysis of demonstration and farmers practice (N=100)

Year	Demonstration plots (DP)			Farmer practices (FP)			Additional cost of cultivation	Additional net return	B:C ratio	
	COC* Rs ha^{-1}	GR* Rs ha^{-1}	NR* Rs ha^{-1}	COC* Rs ha^{-1}	GR* Rs ha^{-1}	NR* Rs ha^{-1}	Rs ha^{-1}	Rs ha^{-1}	DP	FP
2008-09										
Dhar	8988	26317	17329	8725	21259	12534	263	4795	2.93	2.44
Neemuch	10163	29600	19437	9363	23328	13965	800	5472	2.91	2.49
Mandsaur	7600	29856	22256	7100	23760	16660	500	5596	3.93	3.35
Overall	9180	28338	19158	8655	22587	13932	525	5751	3.09	2.61
2009-10										
Dhar	8500	34370	25870	8000	30292	22292	500	3578	4.04	3.79
Neemuch	12387	43731	31344	11885	36120	24235	502	7109	3.53	3.04
Mandsaur	11895	47160	35265	10900	34000	23100	995	12165	3.96	3.12
Overall	10734	40672	29939	10134	33365	23231	600	7308	3.79	3.29
2010-11										
Dhar	11400	34582	23182	10500	25773	15273	900	7909	3.03	2.45
Neemuch	13037	42840	29803	10775	33660	22885	2262	6918	3.29	3.12
Mandsaur	12150	43540	31390	11215	33540	22325	935	9065	3.58	2.99
Overall	12185	40245.2	28060	10826	30922	20097	1360	9323	3.30	2.86
TE 2010-11										
Overall	10800	36676	25876	9936	29090	19154	864	7586	3.40	2.93

*COC = Cost of cultivation *GR = Gross returns *NR = Net return

ranged Rs. 7600 to Rs. 13037 per hectare while the cost of farmer practice (FP) Rs. 7100 to 11885 per ha, however, the average COC was Rs. 10680 and 9829 per ha. in demonstration plots and farmers practice. Data in Table 3 also revealed that the net return from demonstration was Rs. 17329 to Rs. 35265 per ha, while net return from farmers practice was Rs. 12534 to 24235 per ha. It means the net return from demonstration was higher than farmer's practices.

The additional cost Rs. 263 to Rs. 2262 gave additional net returns ranging Rs. 3578 to Rs. 12165 per hectare. The benefit : cost ratio was also calculated, it ranged from 2.91 to 4.04 in demonstration plots and 2.44 to 3.79 under farmers practice.

Thus, it was clearly showed that the demonstration of soybean with full package was better to farmer's practices. The results indicated that the frontline demonstration has given a good impact on the farming community of three districts as they were motivated by the new agricultural technology applied in the FLD plots. Similar findings were reported by *Kirar et al. (2006).*

CONCLUSION

Above discussion in the paper shows that the frontline demonstrations play a very important role to disseminate recommended technology in the selected pockets by the KVKs because it shows the potential of technologies resulting in an increase in yield at farmers situation with their resources and major inputs. Many farmer approached the FLD farmers to procure the seed of soybean high yielding variety and now the area under these varieties have increased with further spread in the adjoining area.

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