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Impact of production technology on productivity and profitability of soybean under Kymore Plateau and Satpura hills Agro Climatic zone of Madhya Pradesh

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Abstract
The Front line Demonstration undertaking the basic principle of extension education "Learning by doing and seeing is believing" are back bone of the transfer to technology. The present study was undertaken in Kymore plateau and satpura hills of Madhya Pradesh under Krishi vigyan Kendra Chhindwara, Betul and Panna districts. Eight villages were selected from identified districts. The study was carried out to know the yield gaps between improved package and practices (IP) and framers practice (FP) of soybean crop. The yield of soybean in IP under different conditions ranges from 15.85 to 20.58 q/ha, whereas, in FP ranges from 11.2 to 16.55 q/ha. The 22 to 67.85 percent increase in yield with IP over FP was recorded. The extension gap ranging between 3.7 – 7.6 q/ha during the period of study. The trend to technology gap reflected the farmer's cooperation in carrying out such demonstrations with encouraging results in subsequent years. The cost benefit ratio was 1.31 to 3.69 under demonstration, while it was 0.78 to 2.80 under control plots.

Keywords: Front line demonstration; Soybean, Technology gap Extension gap

Introduction
The Indian council of Agricultural research introduced the concept of First Line Demonstration under Oil seed technology mission during 1990-91. Later on this concept was rearranged and termed as front line demonstrations (FLD). Demonstrations were carried out under the close supervisions of agricultural scientists belonging to ICAR Institutions, national research centers, project Directorate Krishi vigyan Kendras and State agricultural universities in order to transfer the particular technology and get feedback from the farmers with respect to its feasibility acceptability profitability adoptability etc. The feedback will help the scientists to reorient their research programmes as well as refinement of the technology as per the need of the farmers. Field demonstrations are an effective way to disseminate the latest technology among the farming community. Gautam *et al*. (2007) [1].

Soybeen (Glysine max L. merril) belongs to oilseed group and occupied third place among oilseed crop in Madhya Pradesh. That's why state is known as Soya state occupied an area of 4.4 million ha with the production of 3.89 million tones. The sufficient efforts have been made by stake holders for enhancing the production and productivity. However, the productivity is very low in real farm conditions. The scientist and farmers are concern with the low productivity of Soyabean under present agro situations. The major constraints responsible for its low productivity are lack of awareness about the improved cultivation practices inherent problem of seed longevity and unavailability of quality seed apart from the abrupt change in the climatic conditions which increases the incidence of pest and diseases. In order to overcome these problems it is needed to educate and bring out the facts of the cultivation practices in the notice of the farmers through demonstration of improved production technology at their field so that they may augment technology based on seeing is believing it will develop the faith among the growers. Thus, keeping the above views in mind and realizing the importance of FLD in dissemination of technology the study was carried out to know the effect of demonstration conducted at different locations on the production and profitability of the farmers.

Methodology
Field demonstration in soybean with respect to different production and protection aspects

Have been conducted for five years from 2007 to 2011 under the close supervisions of Krishi Vigyan Kendras belonging to Chhindwara, Betul and Panna in order to assess the production and profitability of demonstrated technologies over traditional cultivation practices of soybeen. Data recorded pertaining to output and outcome of the technology demonstrated under front line demonstrations. A total of 190 demonstrations covering an area of 76 ha. Belong ing to eighteen adopted villages of Chhindwara, Betul, and Panna districts. The area under each demonstration was 0.4 ha (one acre). Before conducting demonstration, farmers were selected and prepared a list and group meeting organized for the purpose. A skill oriented training programme was organized for the selected farmers and made aware with the various aspects of soybean cultivations including improved latest cultivars. The details of demonstrations with respect to practices / operations intervention as well as existing farmer practices are given in Table 1.

Table 1: Improved practices demonstrated over existing farmers practice under rainfed conditions.

S. No.	Component of technology	Farmer Practice	Improved Practices
1.	Seed / Variety used	Seeds of old variety 335, grain used as seed	HYV JS – 9305, JS – 9752 certified seed
2.	Seed rate	100 kg/ha	75 kg/ha
3.	Sowing time	June 3rd week to July 2nd week	3rd week of June
4.	Seed treatment	Not follow the seed treatment	Carboxin + Thiram 37.5 : 37.5@ 2g/kg seed
5.	Seed inoculation	Not used	seed inoculation with Rhizobium + PSB @ 05 g/kg seed each
6.	Sowing method	Broad casting	Line sowing, using ridge & furrow/ Raised bed planter
7.	Fertilizers application	DAP 1 bag/acre, least attentions towards the use of micro nutrients especially the Zn & S	RDF based on soil test value (NPK + ZnSo4, 30 80, 40 + 25 kg /ha
8.	Pest Control	Girdle beetle attack, not follow the particular treatment	Spray of methyl parathion 50 EC @ 10 – 12 ml / 15 litter of water (one tank) at 30 – 35 DAS and 20 days after 1st spray.
9.	Weed control	No use of herbicide, only one weeding at 30 – 35 DAS	One hand weeding + spray of weedicide Imezathapyr 250 ml /ha at 20 – 25 DAS

The recommended practice includes the use of balance fertilizers (30:80:40:25 kg NPK, ZnSo4 / ha) fungicide carboxin 37.5% + Thiram 37.5 @ 2 g/kg seed used as seed treatment subsequently the seed inoculation with PSB and Rhizobium culture. For the control of girdle beetle methyl parathinon 50 Ec @ 01 ml / litter of water at 30 – 35 days after sowing and subsequently 20 days after first spray in a 500 litter of water / ha was used under demonstration which are suggested in package of practices for the Kaymore plateau and Satpura hills. In order to control of broad leaved and grasses imazathapyr @ 100 g/ha at 20 days after sowing was applied. Farmers and extension functionaries were invited at the demonstration plot to show the performance of technology. Yield gap and extension gap was calculated with the use of formula as suggested by Singh (2007a) [5].

Technology gap = Potential yield – Yield under demonstration

Extension gap = Demonstration yield – Farmers yield

Result and Discussion

Result of 241 front line demonstrations carried out during 2007 – 2011 on 960 ha area of land at farmer fields. Recorded data indicated that cultivation technologies consisted of improved variety (JS – 9305, JS – 9560 and JS – 9752) sowing method (Line sowing with the use of ridge & furrow / Raised bed planter), balance fertilizer application based on soil test value (RDF 30:80:40+25 kg NPK + ZnSo4 /ha) along with seed rate and time of sowing (75 kg/ha. 3rd week of June).

Table 2: Performance of soybean production technology under demonstration over farmers practices.

Year	Crop	Variety	Area (ha)	Demo. Av. yield (q/ha)	FP. Av. yield (q/ha)	% increase	Technology Gap (q/ha)	Extension Gap (q/ha)
2007	Soybean	JS – 9305	10	15.85	11.7	35.47	6.15	4.15
		JS – 9560	10	18.8	11.2	67.85	3.2	7.6
2008	Soybean	JS – 9305	15.2	17.55	13.105	33.90	4.45	4.445
2009	Soybean	JS – 9305	15.2	16.62	12.10	37.35	5.38	4.52
		JS – 9752	5.2	20.9	16.38	27.59	1.1	4.52
2010	Soybean	JS – 9560	15.2	16.2	12.50	29.60	5.8	3.7
		JS – 9752	5.2	19.2	13.87	38	2.8	5.33
2011	Soybean	JS – 9560	15.2	19.86	13.6	38.10	2.14	6.26
		JS – 9752	5.2	20.58	16.55	22	1.42	4.03
Total			96.4					

The improved technologies out yielded 37.67 per cent as compared to farmers practice (13.35 q/ha) further, it was observed that the yield of Soybean increased over the year in demonstration plots these results showed that there is a positive response of intervention with respect to enhancement in the crop productivity over the farmers practice, Similar results of yield enhancement in soybeen crop under front line demonstration have been reported by Singh *et al*. (2007) [5] in Sehore District of Madhya Pradesh. Data presented in Table 2 with respect to technological gap and it ranging from 1.1 to 6.15 q/ha. This variation in technology gap might be attributed to the variations in the soil fertility constituents as well as change in weather conditions. This indicate that the location specific recommendations, for variety and other interventions needs to be made in order to minimize the technology gap for yield under different situations of agro ecology. These findings are in the agreement with the findings of Singh *et al*. (2007b) [6].

The highest extension gaps ranging farm 3.7 to 7.6 /ha recorded during the period of study. It emphasized that there

is a need to educate farmers through various means for adoption of improved agricultural production technologies in order to inverse this trend of wide extension gap.

Table 3: Economics of demonstration over farmer practices

Year	Crop	Variety	Area (ha)	Cost of cultivation (Rs/ha)		Net return (Rs/ha)		B:C ratio	
				Demo.	FP	Demo.	FP	Demo.	FP
2007	Soybean	JS – 9305	10	11000	9710	14360	8960	1.31	0.92
		JS – 9560	10	10500	9750	16900	8850	1.61	0.91
2008	Soybean	JS – 9305	15.2	10875	9725	25361	19466	2.33	2.00
2009	Soybean	JS – 9305	15.2	11500	8500	17500	9600	1.52	1.13
		JS – 9752	5.2	15500	14000	26300	18700	1.67	1.34
2010	Soybean	JS - 9560	15.2	7600	7200	28040	20300	3.69	2.82
		JS – 9752	5.2	16200	15200	21240	11846	1.31	0.78
2011	Soybean	JS – 9560	15.2	11250	9000	18400	12800	1.64	1.42
		JS – 9752	5.2	15817	14908	51970	41726	3.29	2.80
Total			96.4						

Data with respect to economics work out for demonstration are presented in Table – 3 reveal that the net return under demonstration plot was highest (Rs. 51970/-) in the year 2011 – 12 and lowest return of Rs. 14360/ ha was noted during 2017 – 08. Similarity, the highest net income of Rs. 41726/ha under farmers practice was observed during 2011 – 12. Further it was noted the net return under demonstration plot increased to the tune of 30 to 52 percent over farmers practice. Similar findings were also reported by Kirar *et al*. (2005) [3]. The benefit cost ratio of front line demonstration clearly revealed that recommended practice gave higher return per rupee investment over the year of demonstration. The incremental benefit cost ratio was also noted ranging from 1.31 to 3.69 under demonstration, while it was 0.78 to 2.80 under farmers practice. Thus, higher B: C ratio proved the economic viability of the intervention made under demonstration and convinced the farmers with respect to realize the utility of intervention. The result of frontline demonstration convincingly brought out that the yield of soybean could be increased by 22 to 67.85% with the intervention in relation to balanced fertilization coupled with the seed of improved variety, disease and pest management in the Satpura region. The variety of soybean viz. JS – 9560 and JS – 9752 have a very good yield potential in comparison to local check. These varieties may be popularized in this area by the extension agencies to bridge the extension gap.

Conclusion

From the above findings it is concluded that the use of scientific method of soybean cultivation reduced the technology gap to a considerable extent. Moreover, extension agencies in the district need to provide proper technical support to the farmers through different educational and extension methods to reduce the extension gap for better oilseed production in the region. Favorable benefit cost ratio itself explanatory of economic viability of the demonstration and convinced the farmers for adoption of demonstration.

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