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IMPACT OF FRONT LINE DEMONSTRATION ON YIELD AND ECONOMICS OF SOYBEAN IN SHIVPURI DISTRICT OF MADHYA PRADESH

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ABSTRACT Soybean is an important oilseed crop widely cultivated in Madhya Pradesh and particularly in Shivpuri district. It also enriches the soil through biological nitrogen fixation. Madhya Pradesh is the largest soybean producing state with production of 4.91 million tones from 5.91 million ha against India's production of 8.59 million tones of total soybean production is produced in Madhya Pradesh alone. However, the productivity of soybean is low (831kg/ha) as compared to Andhra Pradesh (1000kh/ha) however it is higher than the all India average (737kg/ha). Shivpuri district has considerable area under soybean (1.35 thousand ha) and produces 1.34 thousand tones. However, the average yield is further low in the district. Therefore, the present study was conducted to assess the impact of Front Line Demonstration conducted by Krishi Vigyan Kendra, shivpuri on yield and economics of soybean production. The data were collected from 54 farmers during 2007-08 to 2012-13 and analysed using simple tabular analysis. The results of study showed that the yield under demonstrations was 30.70 per cent higher as compared to farmers' practices, the differences were ranged from 21.12 to 38.00 per cent. The average net returns and B:C Ratio on demonstration plot were 63.70 per cent 24.30 per cent respectively higher as compared to farmers' practices. The technological interventions are expected to increase the production to 1.82 thousand tones. Study suggests for strengthening linkages with line departments and converging the demonstration with Government schemes for large scale adoption on farmers'fields.

KEYWORDS : FLD, soybean, impact analysis, dissemination, net return, B:C ratio

INTRODUCTION

Soybean (*Glycin max* L.) primarily a kharif season crop is an important oilseed crop of India, occupying the third place next to groundnut and rapeseed & mustard in area and production. This crop has a greater potentiality to substitute different oilseeds to overcome the shortage of edible oil and protein rich food. Soybean is one of the oldest cultivated crops of the world. Soybean is known as "Golden bean", "Miracle crop" etc., because of its several uses. Soybean, besides having high yield potential (30-35q/ha), provides cholesterol free oil (20%) and high quality protein (40%). It is a versatile crop with innumerable possibilities of improving agriculture and supporting industry. The soybean protein is rich in lysine (4-6%) and the oil extracted is edible one (Subhash Katare et al. 2013). In India large portion of the population are vegetarians, under this situation crop like soybean with high protein content and high yield potential became an important crop. Soybean protein is receiving more attention than any other source of protein today. Besides, it contains several vitamins, calcium, phosphorous and iron. They are ideally suited for human beings. Food uses of soybean include beverages; fermented products like soya sauce and cheese. Small quantities of soybean flour are already being used in baked goods, primarily biscuits and in snacks.

In Shivpuri district during Kharif season, it is the major crop covering almost 40-50 per cent area of under rainfed cultivation. Soybean is the important source of edible oil and in protein and other nutrients. The area, production and productivity of the soybean in the country is 10.91 million hectare, 10.37 million tones and 951kg/ha, respectively (GOI, 2016). Madhya Pradesh is the highest soybean producing state of country and nearly 61.26 per cent of country's total soybean is produced here. It also enriches the soil through biological nitrogen fixation. Madhya Pradesh is the largest soybean producing state with production of 4.91 million tones from 5.91 million ha and country's 8.59 million tones of total soybean production is produced in Madhya Pradesh anole (GOI, 2016). Shivpuri district has considerable area under soybean (135.7 thousand ha) and produces 134.8 thousand tones. However, the average yield is further low in the district. Therefore, the present study was conducted to assess the impact of Front Line Demonstration on yield and economics of soybean production.

RESEARCH METHODOLOGY

The study is based on both primary and secondary data. Primary data were collected from the Front Line Demonstration on soybean conducted at farmers fields by Krishi Vigyan Kendra, Shivpuri, M.P. during the period from 2007-08 to 2012-13 in eight villages viz. Bada gaon, Ratore, Piparsama, Tanpur, Lalgarh, Karmachkala, Lohadevi and Nohrikala of Shivpuri block of district Shivpuri. Total 54 farmers were associated under this programme. The component demonstration of front line technology in Gram were improved variety JS 9560, balanced dose of fertilizer (20 kg Nitrogen+60 kg P2O5+ 20kg Potash +20 S /ha) and use of Trichoderma @ 5 gm/kg of seed as seed treatment were taken in an area of 0.40 ha of each farmers. The total area covered in 5 years was 22.5 hectares for demonstration of recommended improved practices of Soybean. In the demonstration, one control plot was also kept where farmers practices was carried out. All the production and protection technologies other than interventions were applied in similar manner in demonstrated as well as in farmer's practices. The yield data was collected from the selected FLD farmers by random crop cutting method. The secondary data were collected from various published sources to estimate the ex-ante impact of technology in district. The collected data were analyzed using simple tabular analysis like percentage etc.

Table 1: Productivity of soybean crop under demonstration and farmers practices

Year	Under FLD program		Average yield (q/ha)		Percent Increase in yield over farmer practice
	Total farmers	Total area (ha)	Demo plot (FLD)	Farmers practice	
2007-08	12	5.0	12.50	9.00	38.00
2008-09	06	2.5	12.50	10.32	21.12
2009-10	12	5.0	13.28	9.81	35.37
2011-12	12	5.0	23.60	18.50	27.57
2012-13	12	5.0	18.40	14.00	31.42
Total /Average	**54**	**22.5**	**16.10**	**12.30**	**30.70**

RESULTS AND DISCUSSION

The productivity results of improved practices under demonstration vis-à-vis farmers practice are given in Table. The perusal of table reveals that the overall productivity of demonstration plots was 30.70 per cent higher (16.10q/ha) as compared to the local farmers practices (12.30q/ha). The productivity was ranged from 12.50q/ha during 2007-08 to 23.60q/ha during 2011-12. It indicates that due to knowledge and adoption of appropriate varieties i.e. JS 9560, use of balanced dose of fertilizer (20 kg Nitrogen+60 kg P2O5+ 20kg Potash +20 S /ha) and seed treatment with Trichoderma @ 5 g/kg. of seed, the yield of Soybean increased from 21.12 per cent to 38.00 percent over the yield obtained under farmers practices (i.e. use of the non-descriptive local variety, no use of the balanced dose of fertilizers). The similar results were also observed by Singh *et al.* (2002) and Ishwar Singh (2013). As we know that HYV proved the vital role in production and productivity of crops, it is one of the important intervention for disease management also. Root rot and color rot occuring in early stage of crop growth causing drastic yield loss in soybean. JS 9560 variety of soybean released by JNKVV, Jabalpur specially for enhancing production potential is resistant /tolerant against major pests and diseases including YVM virus disease. Bio-fungicides i.e. Trichoderma recommended as a seed treatment @ 5 gm/ kg of seed to control/management of soil borne diseases. In case we could not use this bio-fungicide (Trichoderma sps.) as a seed treatment, we can apply this bio-fungicide by using mixture of well decomposed FYM, compost in standing crop as broad casting. But the dose of Trichoderma (bio-fungicides) is to be 5.00 kg per ha with 80-100 kg F.Y.M./compost. It is generalized that farmers are treating the pulse/oilseed crops as secondary. Nutrient requirements for soybean crop is established under DSR and RVSKVV on hte basis of the soil testing results. In soybean crop, 20 kg Nitrogen+60 kg P2O5+ 20 kg Potash +20 S /ha has been recommended as basad dressing (entire dose of the fertilizer should be applied at the time of sowing/last ploughing). As soybean is protein rich, it requires more nitrogen for the protein synthesis. Naturally, biological nitrogen fixation occurs in the soybean crop. Root nodules of soybean having symbiotic bacteria *Bradyrhizobium japonicum, rhizobium fredii and Bradyrhizobium elkanii*. These bacteria are able to convert the atmospheric nitrogen into the soil through fixation processes. About 78.8 percent gaseous nitrogen found in the atmosphere. About 20 kg N/ha is to be required as a starter dose for the growth and development of the crop during early stages of crop establishment. Phosphorus is one of major nutrient requires for the root establishment, nodulation and root development of soybean crop. For the better nodulation and root development, 60kg P2O5/ha has been advised as a basal application.

ECONOMIC ANALYSIS

The economic analysis of demonstration and farmers' practices are presented in table 2. Table reveals that the overall net return on frontline demonstration and farmers practices were Rs. 19860/- and Rs. 12131/- respectively, i.e. more than 60 per cent higher on demonstration as compared to farmers practice. However, the cost of cultivation was also increased on the demonstration and as a result B:C Ratio on demonstration plots was only 24.3 per cent higher than farmer's plots.

Table 2: Economic analysis of soybean on demonstration plot and farmers practice

Year	Demonstration plot (Rs./ha)				Farmers practice (Rs./ha)			
	Gross cost	Gross return	Net return	B:C Ratio	Gross cost	Gross return	Net return	B:C Ratio
2007-08	12500	25000	12500.0	2.0	11500	16200	4700.0	1.4
2008-09	13500	25000	11500.0	1.9	12000	20640	8640.0	1.7
2009-10	14200	33200	19000.0	2.3	13650	24525	10875.0	1.8
2011-12	18400	39700	21300.0	2.2	17300	30740	13440.0	1.8
2012-13	20200	55200	35000.0	2.7	19000	42000	23000.0	2.2
Average	15760.0	35620.0	19860.0	2.2	14690.0	26821.0	12131.0	1.8
Average % improvement over FP	**7.3**	**32.8**	**63.7**	**24.3**				

The FLD produces significant positive results after smaller increase (here average 7.3%) in cost of cultivatin in the form of interventins. These results provided the researcher an opportunity to demonstrate the productivity potential and profitability of the latest technology (Intervention) under real farming situation, which they have been advocating for long time.

CONCLUSION

There is wide yield gap between scientific practices and traditional practice of farmers in soybean. The Front Line Demonstration programme was effective in changing attitude, skill and knowledge of recent technology for high yielding varieties, balanced dose of the fertilizer and biological disease management of soybean including their adoption. This also improved the relationship between farmers and scientist and built confidence between them. The selected farmers of the demonstration acted as a source of information and pure seeds of wider dissemination of HYV of soybean for the other farmers. This study revealed that by using improved variety of soybean and scientific recommendation yield and net return may be increased upto 30-35% and 60-70% respectively by incresing cost of cultivation 5-10% only in the form of interventions. The productivity gain under FLD over conventional practices of soybean cultivation created greater awareness and motivated the other farmers to adopt appropriate recent production and protection technologies of soybean in the district. The selection of critical input and participatory approach in planning and conducting the demonstration definitely help in the transfer of technology to the farmers. Study suggests for strengthening linkages with line department and converging the demonstration with Government schemes for large scale adoption on farmer's fields.

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