



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(2): 408-410
Received: 18-01-2019
Accepted: 22-02-2019

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Effect of varietal intervention on the yield of soybean crop across agro-climatic zones in Madhya Pradesh: A cluster approach

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Abstract

Cluster frontline demonstration is a unique approach to enhance the production and productivity of oilseeds crops. Oilseed plays an important role in agriculture economy in many regions of the world. Cluster frontline demonstration is educational activity conducted in a systematic manner at farmers' fields to show the worth of a new practice/technology. Farmers in India are still producing crops based on the knowledge transmitted to them by their forefathers leading to a grossly unscientific agronomic, nutrient management and pest management practices. As a result of this, they often fail to harvest the potential yields of various crops. In India soybean area is 11.32 mha, production 13.79 mt. and productivity 12.19 q/ha. While in Madhya Pradesh area is 5.40 mha, production 7.08 mt. and productivity 13.10 q/ha during 2016-17. Therefore, the present study was conducted total 31 KVKs under ten agro-climatic zones of Madhya Pradesh. In ten zones 2530 demonstration conducted in 1047 ha area. Whereas use of demonstrated variety JS 93-05, JS 95-60, JS 97-52, JS 20-34, JS 20-29, RVS 2001-4, NRC-7 etc. during 2017-18. The average of demonstration plots was obtained yield 13.95 q/ha, net return 25159 Rs/ha with benefit cost ratio 2.03. The results clearly indicate the positive effects of demonstration practices over the local practices also benefit cost ratio was recorded to be higher under demonstrations against local control treatments during year.

Keywords: Soybean, cluster front line demonstration, variety, agro-climatic zone, yield, economic performance, B:C ratio

Introduction

The soybean is a crop of global importance and it is one of the most frequently cultivated crops worldwide. Since, this is the most important oilseed crop in central region of the country. In Madhya Pradesh soybean is generally referred to as golden as well as wonder bean because seeds are rich in oil (20%) and proteins (40-44%), amino acids, lysine (5%), which is deficient in most of the cereals. Keeping these points in view and desirable impact being created by front line demonstrations. Soybean is the important part of human diet as they are rich sources of proteins. The area under soybean cultivation in Madhya Pradesh during 2016-17 was 54.00 lakh ha with total production of 44.50 lakh tonnes and average productivity of soybean in Madhya Pradesh was recorded 1310 kg/ha during 2016-17. In soybean mitigate the problem of low yield, soil test value based nutrient application and bio-fertilizer (PSB and Rhizobium) as seed treatment were followed as technical intervention. Cluster front line demonstration were conducted under the supervision of scientist to disseminate the appropriate technology among the farmer and to get their feedback about the technology. Under cluster front line demonstration introduction of improved technologies/package practices is the one of the mandate of KVKs.

Methodology

This paper is based on the cluster frontline demonstrations conducted by the KVKs under ten agro-climatic zones in Madhya Pradesh. 2530 Cluster front line demonstrations were carried out in 1047 ha area by KVKs during 2017-18. The demonstrations were conducted in 31 districts (Shahdol, Tikamgarh, Shivpuri, Sheopur Ashoknagar, Rewa, Jabalpur, Panna, Satna, Jhabua, Dhar, Indore, Dewas Neemuch, Ujjain Mandsaure, Ratlam, Shajapur, Rajgarh, Khandwa, Khargone, Chhindwara, Betul, Sagar, Raisen, Bhopal, Sehore, Damoh, Narsinghpur, Harda, betul) in 2017-18 of Madhya Pradesh. Demonstration base line survey were carried out for find out the problem under soybean cultivation with help of survey it was observed that lower yield was due to use of poor quality of seed, method of sowing, indiscriminate use of inorganic fertilizer and no use of bio-fertilizers. In this finding, results in terms of productivity and profitability per unit area realized by the farmers are given.

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Performance data has been reported by the demonstrating KVKs has been compiled and compared for interpretation and inference. The yield and economic performance of both CFLDs as well as farmers practice were analyzed under rainfed and irrigated both conditions.

Results and Discussion

Technological intervention on cluster basis

KVKs and farmers made efforts in collaborative manner for making difference in higher production and productivity of soybean. The recommended packages of practices were followed to conduct the Cluster Front Line Demonstrations (CFLDs) at the farmer's field. The recommended practices for soybean were followed. Improved soybean variety *viz.*, variety JS 93-05, JS 95-60, JS 97-52, JS 20-34, JS 20-29, RVS 2001-4 and NRC-7 were demonstrated at farmers' fields. In demonstration plots, use of seed treatment, soil treatment,

use of bio-fertilizer for legumes, different sowing method *viz.* line sowing, Ridge and furrow, BBF and Raised bed planting, timely weeding, need based of pesticides, use of balanced nitrogenous fertilization as NPK 0:18:18 also using micronutrient for oils and control of aphid by methyl parathion 2% dust was used in demonstrated plots given in package and practices for the Madhya Pradesh were emphasized and comparison has been made with the existing practices.

The difference between the demonstration package and farmers practices has been given in Table 1. As technical interventions, use of improved varieties, seed treatment, line sowing, ridge and furrow, raised bed planting, and timely sowing, use of balanced fertilizer, integrated pest management as suggested by Chattopadhyay *et al.* (2003) was used.

Table 1: Difference between Farmers practice and demonstrated practices for use of intervention.

Intervention	Farmer's Practices	Demonstrated practices
Farming situation	Irrigated/Rainfed	Irrigated/Rainfed
Soil Treatment	No soil treatment	Trichodarma viridi 5 kg/ha with 20 kg Cow dung
Variety	Local	Improved variety JS 93-05, JS 95-60, JS 97-52, JS 20-34, JS 20-29, RVS 2001-4, NRC-7
Seed treatment	Seed Treatment Not done	Seed treatment by FIR with fungicide and KVK provides Carbendazim 2 g/kg seed, trichodarma viridi 5g/kg Seed
Method of sowing	Broadcasting	Line sowing, Ridge and furrow, BBF, Raised bed planting
Fertilizer Doses	Use of unbalance fertilizer	Balance dose of fertilizer,
Boi-fertilizer	Bio fertilizer not done	Rizobium culture 5 g/kg seed for enhance legumes in soybean

In North Hills of Chhattisgarh, under JS 9305 variety of soybean which covered 30 area by involving 50 farmers respectively and result showed that their yield significantly higher yield (11.06 q/ha) as compared to local check (8.00 q/ha) increasing percentage 38.25. followed Bundelkhand region Js 95-60 variety covered 30 ha area by involving 75 farmer with 14.00 q/ha as compared to local check 6 q/ha, also increase percentage 124.16, Gird Zone under JS 9560 variety covered 90 ha area and 225 farmer also they result showed 16.08/ha as compared to local check 20.20 q/ha with increasing percentage 57.64, followed by JS 9305 variety covered 45 ha area and 113 farmer also they result showed 14.20 /ha as compared to local check 12.33 q/ha with increasing percentage 15.17, Kymore Plateau & Satpura Hills JS 9560 variety covered 30 ha area and 75 farmer also they result showed 10.66 /ha as compared to local check 4 q/ha with increasing percentage 166.50, JS 9752 variety covered 30 ha area and 68 farmer also they result showed 16.55 /ha as compared to local check 11.55 q/ha with increasing percentage 43.29, JS 9305 under variety covered 30 ha area and 75 farmer also they result showed 13.95/ha as compared to local check 11.70 q/ha with increasing percentage 19.23, RVS 2001-4 under variety covered 30 ha area and 54 farmer also they result showed 13.94 /ha as compared to local check 12.37 q/ha with increasing percentage 12.69. Jhabua Hills RVS 2001-04 under variety covered 30 ha area and 75 farmer also they result showed 14.96 /ha as compared to local check 10.37 q/ha with increasing percentage 44.68. Malwa Plateau JS 9560 under variety covered 292 ha area and 724 farmer also they result showed 16.95/ha as compared to local check

11.68 q/ha with increasing percentage 25.75 followed by RVS 2001-04 under variety covered 30 ha area and 75 farmer also they result showed 18.00 /ha as compared to local check 11.20 q/ha with increasing percentage 60.71. Nimar Valley RVS 2001-04 under variety covered 30 ha area and 75 farmer also they result showed 14.83 /ha as compared to local check 11.56 q/ha with increasing percentage 28.29 and JS 9560 under variety covered 30 ha area and 75 farmer also they result showed 17.47/ha as compared to local check 11q/ha with increasing percentage 58.82. Satpura Plateau JS 9752 under variety covered 50 ha area and 105 farmer also they result showed 4.26 /ha as compared to local 4.78 q/ha with increasing percentage 72.80. JS 9560 under variety covered 50 ha area and 125 farmer also they result showed 14.40/ha as compared to local check 8.00 q/ha with increasing percentage 80.00. Vindhya Plateau JS 9560 under variety covered 90 ha area and 195 farmer also they result showed 10.73 /ha as compared to local check 10.7 q/ha with increasing percentage 33.13. followed by JS 2029 under variety covered 50 ha area and 125 farmer also they result showed 15.97/ha as compared to local check 11.30 q/ha with increasing percentage 41.33 and JS 2029 under variety covered 20 ha area and 50 farmer also they result showed 13.39/ha as compared to local check 4.68 q/ha with increasing percentage 186.1. Central Narmada Valley RVS 2001-04 under variety covered 30 ha area and 75 farmer also they result showed 5.7 /ha as compared to local 3.19 q/ha with increasing percentage 78.68. JS 9560 under variety covered 40 ha area and 96 farmer also they result showed 18.45/ha as compared to local check 10.27 q/ha with increasing percentage 79.65.

Table 2: Performance of mustard crops

Agro-climatic Zones	Variety	Area (in ha)	No of Demo	Yield performance (q/ha)		Yield gap (q/ha)	% (+/-)
				DY	FY		
North Hills of Chhattisgarh	JS 93-05	20	50	11.06	8	3.06	38.25
Bundelkhand Region	JS 95-60	30	75	13.45	6	7.45	124.16

Gird Zone	JS 95-60	90	225	16.08	10.20	5.58	57.64
	JS 93-05	45	113	14.2	12.33	1.87	15.17
Kymore Plateau & Satpura Hills	JS 95-60	30	75	10.66	4	6.66	166.5
	JS 97-52	30	68	16.55	11.55	5	43.29
	JS 93-05	30	75	13.95	11.7	2.25	19.23
	RVS 2001-4,	30	54	13.94	12.37	1.57	12.69
Jhabua Hills	RVS 2001-04	30	75	14.96	10.34	4.62	44.68
Malwa Plateau	JS 95-60	292	724	16.95	11.68	5.27	25.75
	RVS 2001-04	30	75	18	11.20	6.8	60.71
Nimar Valley	RVS 2001-04	30	75	14.83	11.56	3.27	28.29
	JS 95-60	30	75	17.47	11	6.47	58.82
Satpura Plateau	JS 97-52	50	105	8.26	4.78	3.48	72.80
	JS 95-60	50	125	14.4	8	6.4	80.00
Vindhya Plateau	JS 95-60	90	195	10.73	8.06	2.67	33.13
	JS 20-34	50	125	15.97	11.3	4.67	41.33
	JS 20-29	20	50	13.39	4.68	8.71	186.1
Central Narmada Valley	RVS -2001-4	30	75	5.7	3.19	2.51	78.68
	JS 95-60	40	96	18.45	10.27	8.18	79.65
Total		1047	2530	13.95	9.11	4.69	63.34

Economic performance of Mustard

Economic performance of soybean in different agro-climatic zone brought out that overall average net returns were 25159 per ha with B:C ration of 2.03. As the cost of cultivation differed zone to zone the net return ranged from Rs. 11232 (Satpura Plateau) to Rs. 76460 (Bundelkhand region),

whereas B: C ratio from 1.50 (Satpura Plateau) and 2.11 (Bundelkhand region) indicated that Bundelkhand region is best suited for profitable cultivation of soybean on following improved technology. Other zone which support profitable crop of soybean are North hills of CG, Nimar Valley, Bundelkhand Region, Gird Zone, Malwa Plateau.

Table 3: Economic performance of soybean

Agro climatic region	Farmer's Plot				Demonstration Plot			
	Gross Cost (Rs/ha)	Gross Return (Rs/ha.)	Net Return (Rs /ha.)	B:C Ratio	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha.)	B:C Ratio
North Hills of CH	17633	20260	2626.	1.15	20346	33180	12833	1.63
Bundelkhand region	64000	111510	47510	1.74	68800	145260	76460	2.11
Grid Zone	19538	34585	15046	1.77	20496	45653	24946	2.23
Kymore Plateau & satpura Hills	18126	30226	12100	1.69	20431	40076	19645	2.11
Jhabua Hills	20700	33549	12849	1.62	22350	48503	26153	2.17
Malwa Plateau	22479	36830	14351	1.69	23519	47806	24286	2.1
Nimar Valley	15333	33978	18644	2.31	16989	45407	28417	2.78
Satpura Plateau	18568	32125	13557	0.84	22083	33316	11232	0.94
Vindhya Plateau	14186	25686	11499	1.8	16736	38456	21840	2.38
Central Narmada Valley	16757	20327	3570	1.13	18442	36691	18248	1.84
							25159	2.03

Conclusion

Frontline demonstrations were carried out with soybean variety at different locations in Madhya Pradesh in 2017-18. Full package of practices was followed by the participating farmers. KVKs facilitated the farmers to conduct effective demonstrations. On an average 13.95 q/ha was realized by the farmers which was 63.34 % higher over local check. Average net return of Rs 25159/ha was obtained by the participating farmers. The varieties JS 95-60, JS 93-05 performed better in varied conditions. For realizing higher productivity and profitability per unit area by cultivating soybean crop, suitable varieties, sowing method, integrated nutrient management, and integrated pest management play a greater role to the farmers. District specific technology modules again can make a difference for enhancing productivity.

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