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Soybean production sustainability in south eastern Rajasthan

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Abstract

The frontline demonstrations (105) were conducted during 2005-06 to 2010-11 on farmer's field in the zone V to evaluate the performance of improved soybean technology. The results revealed that the improved technology was more meaningful and remunerative as compared to farmer's practices. With the adoption of improved technology, the productivity of soybean increased by 20.56% over farmers practice. In term of net return increase of 23.32% was observed over farmers practice. Similarly mproved technologies exhibited higher value of SYI and SVI in most of the years, indicate that adoption improved technology will boost up the productivity of the crop which sustainable for farmers income. The yield gap can be narrowing by popularization of improved technology at farmers field.

Key words: Soybean, improved technology, farmer's practices, frontline demonstration, sustainability yield index, sustainability value index

Introduction

Soybean (Glycine max (L.) Merrill) belongs to the legume family, is recognized as golden or miracle bean due to its high nutritive value and various uses viz., for feed, oil and soy food products. It is rich in oil (18-22%) and protein (38-42%). Soybean ranked first in the world in oil production (57%) in the international trade markets among the major oilseed crop viz., cotton seed, peanut, sunflower seed, rapeseed, coconut etc. Soybean continues to be number one oilseed crop in India, currently occupying 9.21 million ha with an estimated production of 9.81 million tonnes (*Kharif* 2010-11). Rajasthan ranked third in area (7.10 lakh ha) with annual production (6.0 lakh tonnes) after Madhya Pradesh and Maharashtra (Anonymous 2010).

The crop also plays an important role in the oil economy and foreign earnings as among nine major oilseed crops, during 2009-10; it contributes 40 and 23 % to the total oilseeds and edible oil production of the country and earns valuable foreign earnings (Rs. 4258 corers) by exporting soya meal. During 2009-10, the export of soybean meal was reduced as compared to previous year (Rs. 7485 corers) on account of several reasons.

The possible reasons for this were wide fluctuation in the rates of DOC in the international market, higher prices of Indian DOC, holding by farmers (about 40 % of produce) for the want of higher prices and no tariff on the import of soybean.

Soya oil contains 85% unsaturated fatty acids that include high content of essential fatty acids such as linolic acid and linolenic acid. Although, the soybean research and development system in the country has generated viable production technology to raise the productivity to more than 80 per cent from the present level of around 1 t per hectare, it appears that there are impediments in reaching to end users creating a technological gap (Bhatnagar, 2009). Productivity of Soybean in Rajasthan is very low, about one tone per hectare. Therefore concerted affords are required to enhance its productivity. Improved agricultural technologies are the products of modern science which lead to ultimate sustainable production. In spite of availability of improved crop production technologies; the adoption of recommended production technologies among farmers is not very encouraging. The average productivity of soybean in the state is very low as compared to potential yield. The reason may be that most of the technologies have not yet reached to the farmer's field. Hence, to percolate the scientific know how amongst soybean growers and to have direct interaction with farmers, ICAR proposed to undertake a project on frontline demonstration. The main objective of frontline demonstration is to demonstrate the productivity potentials and profitability of the latest and improved soybean production technologies under real farm conditions. Humid South east Rajasthan (Zone-V) receive precipitation between 500-700 mm. between last week of June to September. Early withdrawn of monsoon adversely affect the seed yield. Soils are heavy black with "N" medium 'P' high and 'K' medium. Keeping this in view the front line demonstrations were carried out under AICRP on soybean to find out the impact of improved technologies on soybean productivity and income generation in south east Rajasthan.

Materials and Methods

105 frontline demonstrations were carried out

during the period last six year (2005-06 to 2010-11). Every demonstration was laid out in an area of 0.4 ha with improved package of practices viz., high yielding varieties (Pratap soya- 1, NRC- 37, JS- 335, JS- 95-60 ,JS 93-05 and RKS- 24), seed treatment (Thirum + Bavistin, Rhizobium and PSB culture), recommended dose of fertilizers (20:40:40:30 N:P:K:S kg./ha), weed management (hand weeding, Imazeythpyr 0.750kg/ha, chlorimuron ethyl 9.37 g /ha) plant protection management (one spray of monocrotophos followed by one spray quinalphos), crop geometry (30 x 10 cm), seed rate (60-80 kg /ha) etc. were demonstrated through frontline demonstration on farmers field . The results of six years (2005-06 to 2010-11) frontline demonstrations were recorded. As regard farmers practice, farmers were allowed to follow up their own technology i.e. tradition practices. (use their own seed of traditional variety, no seed treatments, no fertilizers, hand weeding only, chemical plant protection spray after the appearance of insect pest, crop geometry (22.5 x 5 cm), and seed rate (100 kg./ha).

Data recorded on seed yield and net returns were statistically analyzed for calculation of parameter like standard deviation, coefficient of variation as per standard procedure (Panse and sukhatme 1961). Sustainability indices (sustainability yield index, sustainability value index) were worked out using formula:

$$SYI / SVI = y\text{-}o / Y \max.$$

Where

Y/V is estimated average yield/net return of practice over year (study period), 0 is standard deviation and Y max is observed maximum yield/maximum net return during the study period (Singh *et al*., 1990).

Results and Discussion

Average yield obtained in demonstration field by using all the improved technologies of soybean cultivation was 1637 kg/ha, where as it was 1360 kg/ ha from farmers practice (Table 1). This reveals that the adoption of improved production technologies of soybean cultivation is enhance the productivity by 20.56% over farmer's practice. Bhatnagar (2001) reported that the research emanated production technologies were capable of increasing the productivity as soybean by 32.26% through frontline demonstration. Similar result was also observed by Raghuwanshi *et. al*. 2009. They observed 34.33% enhance the productivity over farmer's practices. Similar yield enhancement in different crops in frontline demonstrations has amply been documented by Dhaka *et al*. (2010).

In an economic evaluation, the per hectare net return of Rs 14148 was obtained in demonstration plots, while Rs. 11483 were obtained in farmer's practice. The data clearly indicated that additional net return of Rs 4241 over farmer's practice was obtained in demonstrations. The cost of cultivation was more (Rs 1279) in demonstration, moreover, the demonstration plots increased the net return to the tune of 23.32% over farmer's practices. The per rupee return obtained through improved production technologies was 1.38 which was 7.81% higher than the farmers practice. The integration of different components of Soybean production technology in improved practice though increase the cost of cultivation by 14.29% (Table 2) but due to this, addition increase over net return of Rs 2665 /ha was also obtained. Similarly Raghuwanshi *et al*.

Table 1: Performance of improved technologies of soybean production through frontline demonstrations.

Year	No. of demonstrations	Yield through improved technology		Averageyield through farmers practices (kg/ha)	Additional yield over FP(kg/ha)	% increase over FP(kg/ha)
		Highest yield(kg/ha)	Average yield(kg/ha)			
2005	15	1782	1592	1259	333	26.45
2006	26	2125	1815	1538	277	18.25
2007	24	2440	2060	1655	405	24.49
2008	20	1540	1168	0978	190	19.56
2009	10	1425	1312	1096	216	19.74
2010	10	2010	1873	1631	242	14.87
Mean		1637	1259			

Table 2: Economic evaluation of improved technologies in soybean production.

Particulars	Improved practices	Farmers practices	Increase over FP	Per cent over FP
Average yield (kg/ha)	1637	1359	278	20.46
Net return (Rs./ha)	14148	11483	2665	23.21
Per rupee return	1.38	1.28	0.10	7.81
Cost of cultivation(Rs./ha)	10229	8950	1279	14.29

Table 3: Variability in seed yield and net return in soybean front line demonstration

Particulars	Kharif 2005		Kharif 2006		Kharif 2007		Kharif 2008		Kharif 2009		Kharif 2010		Mean	
	IT	FP	IT	FP	IT	FP	IT	FP	IT	FP	IT	FP	IT	FP
Seed Yield Range (kg/ha)														
	1277-1782	1000-1495	1250-2125	1125-1850	1780-2440	1420-1980	1025-1540	1000-1250	1180-1425	1000-1200	1710-2010	1530-1750	1025-2440	1000-1980
Mean	1592	1259	1815	1538	2060	1655	1168	0978	1312	1096	1873	1631	1637	1359
Standard Deviation	178.3	162.7	251.5	223.6	196.4	162.5	112.0	91.3	93.4	77.4	106.3	82.7	344.7	289.1
CV %	11.20	12.92	13.85	14.54	9.53	9.81	9.59	9.34	7.12	7.60	5.67	5.07	21.05	21.28
Net Return Range(Rs per ha)														
	6091-11529	4395-9410	5693-17068	5125-14650	8500-15520	6136-12184	1402-8509	811-6500	10672-15572	8850-12650	24045-35818	20165-31765	1402-35818	811-31765
Mean	9490	7166	14401	11204	12374	9541	4151	3160	12882	10400	31670	27429	14148	11483
SD	1874.5	1644.8	3170.1	2736.0	2482.4	2110.2	1775.1	1491.4	1868.7	1510.6	4284.8	4644.9	9285.1	8333.1
CV %	19.79	22.95	23.31	24.42	20.06	22.12	42.76	47.20	14.05	14.25	14.77	18.44	65.62	72.57
SYI	0.793	0.733	0.736	0.710	0.763	0.753	0.709	0.685	0.855	0.848	0.884	0.878	0.540	0.529
SVI	0.660	0.586	0.658	0.578	0.637	0.609	0.279	0.256	0.707	0.702	0.764	0.717	0.136	0.099

(2010) also observed 20.01 % higher net return our farmers practice in soybean front line demonstrations.

Further improved technologies exhibited higher value of sustainability indices (SYI and SVI) for all the years except 2008 where it was observed heavy infestation of the crop with yellow mosaic virus followed by charcoal rot which ultimately results in low production potential and low SYI and SVI. However overall mean of 6 years study period for sustainability parameter was also of higher magnitude with improved technologies as compared to farmer's practice because of higher standard deviation values varied due to variation in crop conditions and response to inputs and also depended upon varying situation of cultivation. Similar observation was also observed by Kumar and Ali (2002) in linseed front line demonstrations.

Thus, it is concluded that cultivation of soybean with improved technology adopted in frontline demonstrations at farmer field was more profitable compared to farmer's practices. Sustainability parameter like SYI and SVI were also higher in improved technologies during the study period.

Thus, the study proved that improved technology of soybean cultivation offered higher yields and profit as compared to farmers practice. The sustainability parameters like SYI and SVI were higher with improved methods during majority of the years under study. Soybean productivity can be enhancing by adopting of improved technology as compared to farmers practices, technology should be popularized at farmer's field by the extension functionaries to narrowing the yield gap.

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