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Research Paper

Transfer of Improved Technology of Soybean Production through Frontline Demonstrations in Vertisols of Central India.

Agriculture

KEYWORDS :

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ABSTRACT

Front line demonstrations (FLDs) were conducted in different ecological regions in the in Ujjain district of Malwa agro climatic zone of central India having predominantly vertisols with soybean-wheat /gram cropping sequence to transfer the most viable technologies on improved technologies to the soybean growers. With in a span of 5 years (2004-05 to 2008-09) a total of 64 demonstrations were laid to educate the farmers through live field demonstrations. The results indicated that, on an average the highest yield achieved by adopting improved technologies was 2712 kg ha-1 whereas the corresponding yield range under farmers practice was 861 kg ha-1 to 1725 kg ha-1 . Adoption of improved technologies also resulted in better utilization of the natural resource as reflected in terms of WUE and the applied nutrients in terms of factor productivity and correspondingly on the profitability on per rupee invested.

INTRODUCTION.

The oilseed scenario in the country has undergone a dramatic change in recent years due to various incentives and institutional support given by the government particularly by launching the TMO (Technology mission on oilseed, in 1986). However, the productively growth in the total oilseed had declined in Post-TMO period as compared to the Pre-TMO period (Sadeesh et al., 2007). Soybean is the premier oilseed crop in India, having only three and half decade's of commercial cultivation history but has exhibited phenomenal growth and provided resilience to oilseed and edible oil production. Madhya Pradesh, before the introduction of soybean in kharif has been largely following traditional fallow-chickpea / wheat cropping pattern. The increasing adoption of soybean in the past has given a sustainable cropping system in the region. As on today soybean covers nearly 4.8 million hectares area out of 7.8 m ha in the country, thus contributing more than 60% to the national acreage. The national as well as state average productivity hovers around 1 tonne per hectare for the last one decade, mainly in view of deficit and erratic distribution of rainfall and uncertainty in onset of monsoon being experienced on account of global climatic change, although the varieties evolved during the last few years have high genetic yield potentials (Sharma et al., 1996 and Tiwari, 2001). The documentations in the past also bring out that for the lower productivity of soybean in India and particularly in Madhya Pradesh, the unbalanced and under nutrition is one of the major reasons. The pulses and oilseeds, which conserve the energy most, are unfortunately grown under most energy deficient management.

Many technologies for soybean cultivation have been evolved for increasing productivity but farmers have hardly adopted a few of them and those too in a non holistic manner. The aim of frontline demonstrations is to identify the production constraints / gaps in cultivation through various extension methods including the Participatory Rural Appraisal (PRA) technologies in its adopted villages in particular and the district in general to boost the production and productivity through transfer of technology (Narasimha Rao et al., 2007). This influences the farmers as well as the extension functionaries to a very great extent owing to high yield levels attained from the demonstrations. Highest yield potentials of several crops have shown that the new agricultural technologies can produce economic viability by persuasion of farmers by means of demonstration. In view of the above the present study was designed to identify the impulse resulting from the front line demonstrations for spreading of improved soybean production technology in the vertisols region of Malwa agro climatic zone.

MATERIAL AND METHODS

The present study was conducted by the Krishi Vigyan Kendra, Ujjain, with the financial assistance from ICAR under the aegis of RVS Krishi Vishwa Vidyalaya. Based on "seeing is believing" concept, the aim of the FLDs was to demonstrate the impact of research emanated production technologies that of improved varieties most suitable the agro climatic conditions and befitting to the existing cropping sequence

The speedy adoption of improved technologies and innovations are the most important tools for enhancing the agricultural production at faster rate and hence it is a crucial aspect under innovation diffusion process. The main objective was to demonstrate the productivity potential and profitability of the latest improved production technology in real farm situation under different and aberrant weather situations to address the following problems identified in PRA.

1. Use of high seed rate with improper method & planting geometry.
2. Lack of concept of crop rotation.
3. Heavy reliability on traditional varieties coupled with inappropriate sowing time.
4. Low use of organic matter and bio-fertilizers.
5. Imbalance use of fertilizers in oilseeds.
6. Lack of application of secondary nutrients and rare use of micro nutrients.
7. Faulty method & improper time of fertilizer application.
8. Heavy infestation of weeds in soybean.
9. Lack of intercultural operations by cultivators adopting chemical weed control.

The FLDs conducted from 2004-05 to 2008-09 in 64 locations of Ujjain district of malwa plateau which falls under the X^{th} agro-climatic zone during kharif season on totally rain fed conditions. The whole package approach demonstrated to the farmers through FLD trials included the components like improved variety, seed rate, spacing INM and IPM. The data generated, in full package technology was utilized for calculating the technological index, technology and extension gaps using the formulae given by Kadian et al, 1997.

(i). Technological Gap = (Potential yield-Demonstration yield)
(ii) Extension gap= (Demonstration yield-Farmers yield)
(iii) Technology index = P-D / P *100.
(iv) Adoption index = A / R *100.

Where A= adoption score obtained by the farmers,

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R= possible maximum score of crop.

Z test is utilized to test whether the demonstrated technology is really promoted the yield level over farmer's practice as per the method described in Chandel,1999.

RESULT AND DISCUSSION

Soybean being the most economic crop of *Malwa* Plateau zone during kharif season has changed the economic scenario of the farmers over the last 10 years, but previous gains have not sustained today, because of increasing cost of production and yield stagnation whereas the genetic potential of varieties is more than 2.5 t/ha. Due to continuous soybean wheat cropping sequence and injudicious use of fertilizer the soil health deteriorated .On the basis of Soil Testing data the area has been categorized under severe deficiency zone *i.e.* 70 % for zinc and sulphur.

Crop performance and yield: The performance of soybean crop owing to the adoption of improved technologies assessed over a period of five years and presented in table 1 and 2 reveal that, being a rain fed crop, the effect of genotype to drought and other biotic stresses, total rainfall and its distribution over the critical phonological stages earmarks the stability and sustainability of soybean production in the vertisol region of central India. The data in table 1, revealed that the variety JS 93-05 of 95 days maturity yielded 17 to 35 % higher yield over farmers practice with the highest yield level of 1855 kg ha^{-1}. This may be attributed to sufficient and more than average rainfall distributed fairly during the pod setting to physiological maturity stage, better utilization of applied nutrients (18.6 kg grain per kg of NPK and 92.8 kg grain / kg of applied sulphur). However, the trend for WUE of crop was reverse and it exhibited more efficiency in 2005-06 (286 kg seed cm^{-1} of rainfall) which was a year of low rainfall. A change in genotype with shorter duration (JS 95-60 of 82-85 days maturity) resulted I still higher seed yield of 2712 kg ha^{-1} even at less rains, thus giving a high WUE, factor productivity and sulphur use efficiency of 329.9 kg grain cm^{-1} of rainfall, 27.1 kg grain $^{-1}$kg NPK and 135.6 kg grain $^{-1}$kg of sulphur, respectively. Overall, across the genotypes the factor productivity of 18.8 kg grain $^{-1}$kg NPK was higher than the national average for any crop i.e., 6.2 kg grain $^{-1}$kg NPK. This fact has earlier been reported by Tiwari (2001), Joshi et al. (2004), Billore et al. (2009) stating that the improved package of practice followed have led to realization of higher yield potentials.

Here, we observed that the value of z (the normal deviate) is 2.46, which is greater than 1.96, the value of z at 5% level of the significance, and is thus proved to be significant. Hence, it is concluded that the refined practice had really promoted the yield of farmer's field.

Economics of cultivation: Data in table.4 reveal that the additional cost involved in the adoption of improved technology in soybean based on maturity group varied and was more profitable in case of short duration varieties. Additional cost involved ranged between Rs. 625 to Rs 1200 for medium maturity group while it was Rs 2000 for short duration variety and the mean over five years was Rs 1623. The mean additional B: C ratio was 4.3 and 6.2 for the respective maturity groups but on an average for every additional rupee invested the benefit was Rs. 5.29. This indicates the sustainability of the production system under improved production technology. This is in agreement with the findings of Billore et.al 2009.

Table1: Impact of improved technologies on realization of productivity potential and WUE of rain fed Soybean under real farm situation

Year	No. of demon-strations	Name of variety	Yield kgha^{-1}			Increase in yield	WUE in Demo plot (kg /cm)	WUE under FP (kg /cm)
			Potential yield	Demonstra-tion Yield	Farmers Practice			
2004-05	5	JS-93-05	2500	1175	861	314	144.17	105.64
2005-06	12	JS-93-05	2500	1540	1315	225	286.25	244.42
2006-07	12	JS-93-05	2500	1855	1525	330	92.98	76.44
2007-08	15	JS-95-60	3500	2115	1596	519	151.72	114.49
2008-09	20	JS-95-60	3500	2712	1725	987	329.93	209.85
Total	64	Mean	2900.00	1879.40	1404.40	475	201.01	150.17
SD of mean(X1-X2)= 305.6; SE of(mean of X1- mean of X2)=193.3; Z(cal)=2.457; Z(tab)=1.96								

Table2: Use efficiency of applied nutrients as influenced by rainfall distribution at critical growth stages of soybean.

Year	Total Rainfall (mm)	No. of rainy days	Rainfall Distribution			Factor productivity (kg grain/kg of NPK)	Sulphur use efficiency (kg grain/kg S)
			Vegetative	Flowering to pod set	Seed setting to Maturity		
2004-05	815	36	232	524	59	11.8	58.8
2005-06	538	35	238	280	20	15.4	77.0
2006-07	1995	63	1356	606	38	18.6	92.8
2007-08	1394	47	615	779	0	21.2	105.8
2008-09	822	21	327	460	35	27.1	135.6
						18.8	94.0

Table3: Technological index and adoption index of the respondents

Year	Variety	Technological Gap (Py-Dy)	Extension Gap (Dy-Fy)	Technological Index (P-D/9*100)	Adoption Index
2004-05	JS-93-05	1325	1639	53.0	35.8
2005-06	JS-93-05	960	1185	38.4	44.3
2006-07	JS-93-05	645	975	25.8	47.1
2007-08	JS-95-60	1385	1904	39.6	47.3
2008-09	JS-95-60	788	1775	22.5	52.5

Table4: Impact of improved technologies on economics of Soybean under real farm situation

Year	Maturity Duration of variety (DAS)	Demo. Cost (Rs)	Gross return (Rs)	Net return (Rs)	Additional cost (Rs)	Additional return (Rs)	Additional B:C ratio
2004-05	Medium 93-97	3200	18800	15600	625	4553	7.3
2005-06		5011	26180	21169	1910	3263	1.7
2006-07		4550	31535	26985	1200	4785	4
Mean		4254	25505	21251	1245	4200	4.3
2007-08	Short 82-85	12500	46742	34241	2000	7526	4.3
2008-09		10975	51528	40533	2000	18260	10.1
Mean		11738	49135	37387	2000	12893	6.2
Over all mean		7996	37320	29319	1623	8547	5.29

REFERENCE

Billore, S.D, Vyas, A.K and Joshi, O.P .2009. Assessment of improved production technologies on soybean on production and economic potential in India. J.of Food legumes. 22(1):49-52 | Joshi, O.P, Billore, S.D, and Vyas, A.K.2004. Production and economic sustainability of improved soybean production technologies under real farm conditions. Paper presented in VII WSRC held at Foz dop Iguassu, PR, Brazil on 29 Feb to 5 March 2004 Pp.283-284 | Kadian, K.S., Sharma, R and Sharma, A.K.1997. Evaluation of frontline demonstration trials on oilseeds in kangra valley of Himachal Pradesh .Annals of Agriculture Research, 18 (1):40-43 | Narasimha Rao, S., Satish, P. and Samuel, G.2007. Productivity improvement in soybean, Glycine max L.Merrill through technological interventions.J.Oilseeds Res., 24(2):271-273 | Sadeesh, J., Pouchepparadjou, A. and Thimmapa, K.2007. Growth trends in major oilseeds- A state wise analysis.J.Oilseeds Res., 24(1):164-169 | Sasidharan, N., Patel, B.R., Saiyad, M.R and Patel, K.K.2007. Transfer of improved technology through frontline demonstrations in groundnut, Arachis hypogaea L.J.Oilseeds Res., 24(1):231-232 | Tiwari S.P, .2001. Shattering the production constraints in soybean based cropping systems. JNKVV Research Journal, 35(1/2):1-7 |