Indian Journal of Extension Education
Vol. 53, No. 3, 2017 (112-115)

Productivity and Economics of Different Double Cropping Systems at Farmer's Field in Tikamgarh District of Madhya Pradesh

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ABSTRACT

The present study was conducted to assess the productivity and economics of different cropping systems at Farmer's Field in five blocks of Tikamgarh district of Madhya Pradesh. The pooled data revealed that the total productivity in terms of seed yield (45.0 q/ha) as well as wheat equivalent yield (54.1 q/ha) was recorded the highest in soybean-wheat system. Similarly, the production efficiency (19.3 kg/ha/day) and net monetary return (₹ 36882/ha) were also recorded the highest in soybean-wheat system. However, net monetary return per day was recorded the maximum in blackgram-coriander system (₹ 160/ha/day) closely followed by soybean-wheat (₹ 158/ha/day) system. Soybean-wheat system gave an advantage of a net return of ₹ 10467, ₹ 8007 and ₹ 1310 per hectare over sesame-wheat, blackgram-mustard and blackgram-coriander systems respectively. Similarly, increase in net monetary return from blackgram-coriander over sesame-wheat was ₹ 9157/ha and over blackgram-mustard was ₹ 6697/ha. The net return per rupee invested (B:C) was recorded the highest in blackgram-coriander (1.92) and the lowest in sesame-wheat (1.07) system. It was evident from the results that soybean-wheat system exhibited superiority over other cropping systems in Tikamgarh district. Similarly, growing the coriander crop after blackgram was more remunerative than growing mustard crop. Blackgram-coriander system was also profitable over sesame-wheat system.

Keywords: Benefit Cost Ratio, Cropping Systems, Coriander, Net Monetary Return, Soybean, Mustard, Wheat Equivalent Yield.

INTRODUCTION

A suitable cropping system is essential for increased productivity per unit area and per unit time. Cropping systems of a region are decided by a number of soil and climatic parameters which determine overall agro-ecological setting for the nourishment and appropriateness of a crop or a set of crops for cultivation. Nevertheless, at farmers' level, potential productivity and monetary benefits act as guiding principles while opting for a particular crop/cropping system. The production potential and economics vary with cropping systems and availability of resources (Kumar and Singh, 2005). The net return per unit area and per unit time can be further increased in this region by adopting other feasible and profitable cropping systems. A number of cropping systems are adopted by the farmers of Madhya Pradesh and the major cropping sequences followed are soybean-wheat and soybean-chickpea and pigeon pea/corn as intercrops in soybean (Umrani et al., 1993, Yadav and Subba Rao, 2001). However, soybean-wheat is the dominant cropping system in Tikamgarh district of Madhya Pradesh (Tomar *et al.,* 1996). Mustard, coriander and sesame (Til) are also immensely suitable for cultivation in this area. Comparing the suitability of the alternative crops and then raising them in appropriate sequences can lead to the development of such cropping systems which provides the farmers maximum production and net return as well as reasonable high input use efficiency. A study was therefore initiated to assess the productivity and economics of different cropping systems at farmers' field in Tikamgarh district of Madhya Pradesh during the years 2007-08 and 2008-09.

METHODOLOGY

The study was conducted during two consecutive years of 2007-08 and 2008-09 under ECF scheme of AICRP on Cropping System at Farmer's Field in 5 blocks viz., Tikamgarh, Prithvipur, Niwari, Jatara and Baldeogarh of Tikamgarh district of Madhya Pradesh. Tikamgarh district is situated between 24°.26 to 25°.40 latitude and 78°.26 to 79°.56 longitudes with an altitude of 426.7 meters above the mean sea level. About 60 per cent of soil falls under black and the rest 40 per cent is sandy loam to red soil in the district. The climate of the

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district is moderate, generally dry except rainy season. The district receives an average annual rainfall of 1001 mm in 32 rainy days. Average temperature in summer varies from 23 °C to 44 °C and average temperature in winter season varies from 4.5° to 25.4 °C.

In each block, 5 villages were selected and in each village, one farmer was selected for conducting field trials. In this way, field trials were conducted at 25 locations each in kharif and rabi seasons. For statistical analysis, each block was considered as one replica and yield data was analyzed as per randomized block design. The treatments comprised 4 different double cropping sequences *viz.,* T1: soybean-wheat, T2: blackgram-mustard, T3: sesame(til)-wheat and T4: blackgram-coriander. The varieties of crops soybean, blackgram, sesame, coriander, mustard and wheat were JS-9305, PU 35, JS 8, JD-1, Rohini, and GW 273 respectively. Crops during kharif season were raised as rainy crops and rabi crops were given irrigation as per recommendations. As per technical programme of AICRP, all kharif crops were sown with the onset of monsoon as rainfed and rabi crops were sown with pre-sowing irrigations for better germination and optimum plant population of the crops. Fertilizers were applied as per recommendation to respective crops (Table 1). All other agronomic management practices and plant protection measures were followed as per recommendations.

Table 1: Fertilizer management in kharif and rabi crops

Crops	N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)
Soybean	20	80	20
Sesame	40	30	20
Blackgram	20	50	20
Wheat	120	60	40
Mustard	80	40	20
Coriander	60	30	20

Yield data were transformed into economic data by taking into account the prevailing market price during the study period of the crops. The market price (₹/q) during 2007-08 and 2008-09 for soybean 2000 and 2000, for wheat 1200 and 1200, for blackgram 2500 and 2500, for mustard 2000 and 2500, for sesame (Til) 3000 and 3200 and for coriander 4000 and 4000, respectively. To compare productivity of different double cropping systems, wheat grain yield equivalents (WEY, q/ha) was computed by converting the grain yield of other crops into wheat grain yield on the basis of selling prices during the respective years. The net return (₹/ha) and benefit cost ratio (B:C) were calculated on mean basis to judge the best cropping sequence to be adopted by farmers for sustainable crop production. The rainfall data prevailed during two years in 5 blocks is given in Table 2.

Table 2: Rainfall (mm) and rainy days at different blocks of Tikamgarh district

	2007-08		2008-09	
Blocks	Rainfall (mm)	Rainy days	Rainfall (mm)	Rainy days
Tikamgarh	274	25	1401	47
Prithvipur	589	36	1108	58
Niwari	357	30	1219	49
Jatara	413	25	1225	33
Baldeograh	225	20	902	33

RESULTS AND DISCUSSION

Effect of weather condition

A well distributed higher amount of rainfall in all blocks of Tikamgarh district during the year 2008-09 resulted in higher seed yield of all crops except sesame in different cropping sequences than 2007-08 (Table 2). The higher seed yield during 2008-09 also reflected in higher WEY (q/ha) and NMR (₹/ha). However, excess vegetative growth of sesame due to high rainfall during 2008-09 resulted in poor fruit setting and reflected in low seed yield (Table 3).

Table 3: Seed yield and wheat equivalent yield (WEY) of different cropping systems (q/ha)

Treatments	Seed yield (q/ha)							Mean WEY (q/ha)
	2007-08		2008-09		Mean			
	Soybean	Wheat	Soybean	Wheat	Soybean	Wheat	Total	
Soybean-wheat	12.6	27.9	14.5	34.9	13.6	31.4	45.0	54.1
Blackgram-mustard	4.58	15.5	5.27	15.3	4.93	15.4	20.3	39.2
Sesame-wheat	4.50	28.2	4.04	35.1	4.27	31.7	36.0	42.7
Blackgram-coriander	4.55	9.55	5.17	11.4	4.86	10.5	15.4	45.1
S.Em ±	0.11	0.81	0.54	0.97	0.33	0.89	0.85	-
CD (P=0.05)	0.35	2.49	1.67	2.95	1.01	2.72	2.67	-

Productivity of cropping systems

Among the kharif crops, soybean recorded significantly higher grain yield as compared to other crops during both the years of study. Similarly, among rabi crops, wheat exhibited significantly higher grain yield followed by mustard and coriander (Table 3). The pooled data revealed that among different cropping systems, the highest total productivity in terms of seed yield was recorded from soybean-wheat (45.0 q/ha) followed by sesame-wheat (36.0 q/ha), blackgram-mustard (20.3 q/ha) and the lowest was from blackgram-coriander (15.4 q/ha) system (Table 3). Tomar et al. (1996) also reported highest total productivity of soybean-wheat system at Tikamgarh district. Similarly, total productivity in terms of wheat equivalent yield (WEY), soybean-wheat system also recorded the

maximum WEY (54.1 q/ha) followed by blackgram-coriander (45.1 q/ha), sesame-wheat (42.7 q/ha) and was the minimum in blackgram-mustard (39.2 q/ha). The higher WEY of soybean-wheat system was attributed to the fact that these crops have higher yield potential than other crops in different cropping systems. Production efficiency (per day productivity) among different cropping systems was also observed the highest in soybean-wheat (19.3 kg/ha/day) and the lowest in blackgram-coriander (6.91 kg/ha/day) system (Table 4).

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Economics of cropping systems

The net return (₹/ha) of different cropping systems was higher in 2008-09 than 2007-08 probably due to higher grain yield of crops in 2008-09. The higher grain yield of crops in 2008-09 was due to better rainfall amount and its well distribution resulted into vigorous plant growth. The highest net monetary return (NMR) of ` 36882/ha was recorded from soybean-wheat system while a lowest NMR of ₹ 26415/ha was from sesame-wheat system (Table 4). Higher NMR from soybean-wheat system among different cropping systems was also reported by Singh and Lal (1994) at Pantnagar, Uttrakhand. However, NMR per day was recorded the highest in blackgram-coriander (₹ 160/ha/day) system closely followed by soybean-wheat (₹ 58/ha/day), blackgram-mustard (₹ 131/ha/day) and the lowest in sesame-wheat (₹ 114/ha/day) system. Soybean-wheat system gave an advantage in NMR of ₹ 10467/ha over sesame-wheat, ₹ 8007/ha over blackgram-mustard and ₹ 1310/ha over blackgram-coriander system. Similarly, increase in NMR from blackgram-coriander over sesame-wheat was ₹ 9157/ha and over blackgram-mustard was ₹ 6697/ha. Mean net return per rupee invested (B:C) was also recorded the highest in blackgram-coriander (1.92) while the lowest in sesame-wheat (1.07) system (Table 4).

Table 4: Productivity, net monetary return and benefit cost ratio (B:C) from different cropping systems

Treatments	Total duration of system (days)	Production efficiency of system (Kg./ha/day)	Net monetary return (₹/ha)			Net monetary return (₹/ha/day)	Benefit cost ratio (B:C)	Increase in net return over (₹/ha)		
			2007-08	2008-09	Mean			Black gram-mustard	Sesame-wheat	Black gram-coriander
Soybean-wheat	233	19.3	32035	41728	36882	158	1.32	8007	10467	1310
Blackgram-mustard	220	9.23	24561	33189	28875	131	1.60	-	2460	-
Sesame-wheat	231	15.6	22965	29864	26415	114	1.07	-	-	-
Blackgram- coriander	223	6.91	31094	40049	35572	160	1.92	6697	9157	-

CONCLUSION

It could be concluded that soybean-wheat system exhibited superiority over other double cropping systems in Tikamgarh district of Madhya Pradesh. Similarly, growing of coriander crop after blackgram is more remunerative than growing mustard crop. Blackgram-coriander system was also profitable over sesame-wheat system in Tikamgarh district.

Paper received on : March 22, 2017
Accepted on : April 05, 2017

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