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Economic analysis of rice (*Oryza sativa*)-based cropping system for Tungabhadra project area

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ABSTRACT

A field experiment was conducted during the wet and dry seasons of 1990 to 1994 at Siruguppa, to find out the suitable crops after the harvest of rice *(Oryza sativa* L.). Among the sequences, rice-rice sequence recorded highest net return (Rs 33,699/ha) followed by rice-sesame (Rs 29,436/ha) and rice-wheat (Rs 26,568/ ha) sequence. Rice-sesame recorded the highest sustainable (0.81), benefit: cost ratio (2.89) and production efficiency (38.13), followed by rice-sunflower sequence. The study indicated that rice-sesame could be recommended as an alternative to rice-rice sequence.

Key words : Rice, Cropping system

In Tungabhadra command area of Karnataka it is a common practice to grow rice after rice crop sequence without any modification. The farmers are facing problem of unsustainable yields particularly during summer due to ill distribution of water between head and the tail end. Therefore, it has been recommended to grow light irrigated crops during summer, but there is urgent need to evaluate suitable remunerative crops equivalent to rice. Mahapatra (1985) reported that in southern states, viz. Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, rice-rice-rice system had indicated highest yield followed by rice-rice-maize and rice-mung-rice. Whereas in eastern part of India the rice-rice rotation was the best in lowlands and rice-wheat rotation was superior under slightly dry hot zone (AICARP, 1986). Hence the present study was undertaken to find out suitable alternate crops for summer.

MATERIALS AND METHODS

The experiment was conducted during the wet and dry seasons of 1990-91 to 1994-95 at Agricultural Research Station, Siruguppa. The soil was deep black with pH 8.0, organic carbon 0.55%, available N, P, and K in the soil was 279.4, 32.9 and 759 kg/ha, respectively. After the harvest of general crop of rice in *kharif* 6 crops, viz. sunflower, sesame, mustard, chickpea, maize and wheat, were grown. All the treatments were replicated 3 times. Recommended varieties

Table 1. Yield of rice and sequence crops (kg/ha) during 1990-1994

Cropping scquence	*Kharif*						*Rabi*/Summer					
	1990	1991	1992	1993	1994	Mean	1990	1991	1992	1993	1994	Mean
Rice-sunflower	6,326	5,899	5,148	4,750	4,536	5,332	712	965	1,369	1,192	935	1,039
Rice-sesame	6,535	6,055	5,395	5,149	4,426	5,512	627	610	1,001	1,080	935	851
Rice-mustard	6,364	5,710	5,148	4,997	4,702	5,388	510	787	1,024	95	605	604
Rice-chickpea	5,699	5,314	4,977	5,600	4,773	5,273	187	1,515	1,247	39	64	610
Rice-maize	6,041	5,353	5,015	5,177	4,393	5,196	1,160	1,507	3,734	3,408	2,199	2,402
Rice-wheat	6,497	5,462	4,996	4,982	4,517	5,291	1,237	2,925	2,343	1,853	1,496	1,971
Rice-rice	6,306	6,070	5,224	4,650	4,274	5,305	2,045	3,110	5,995	6,128	6,174	4,690
CD (P = 0.05)	NS	NS	NS	468	NS	NS						1111

and agronomic practices were followed for all the crops.

RESULTS AND DISCUSSION

Effect of alternate crops on yield of rice

During *kharif* 1990, general crop of rice was grown and data on rice yield were not-significant, indicating uniformity of the experimental site (Table 1). The data indicated that none of the crops after rice had adverse effect on yield of subsequent rice crop. However, during 1993-94, rice yield was significantly higher where chickpea or maize or sesame was grown. Singh *et al.* (1990) reported that the highest yield was obtained with rice-maize followed by rice-wheat sequence. The pooled data indicate that rice-sesame sequence produced highest rice yield (5512 kg/ha). The yields of

Table 2. Rice equivalent yield (kg/ha/year) and economic analysis of rice-based sequences

Crop sequence	Rice eq. yield (kg/ha/year)	Economic analysis				
		Net return (Rs/ha/year)	SVI	BCR	LUE	PE
Rice-sunflower	7,939	25,398	0.67	2.55	63.98	37.27
Rice-sesame	8,575	29,436	0.81	2.89	65.73	38.13
Rice-mustard	7,197	22,953	0.49	2.51	63.72	35.81
Rice-chickpea	6,523	19,564	0.39	2.28	66.94	31.48
Rice-maize	7,333	22,936	0.56	2.35	68.65	30.15
Rice-wheat	8,050	26,568	0.64	2.61	66.38	33.97
Rice-rice	9,995	33,699	0.81	2.66	77.90	35.90
CD (P = 0.05)	1,185	3,800				

SVI : Sustainable value index, BCR : benefit:cost ratio, LUE : land use efficiency, PE : production efficiency

chickpea was not sustainable when grown after rice.

Rice equivalent grain yield

The date revealed that none of the crop sequences outyielded rice-rice sequence (9,995 kg/ha/year). However, this sequence was followed by rice-sesame and rice-wheat sequences in terms of rice equivalent yield of 8,575 and 8,050 and 8,050 kg/ha/year respectively.

Economic analysis

Rice-rice sequence recorded significantly higher net return (Rs 33,699/ha/year) followed by rice-sesame (Rs 29,436/ha/year) and rice-wheat (Rs 26,568/ha/year). The land use efficiency (LUE) was also higher in rice-rice sequence (Table 2). The benefit : cost ratio was however, higher in rice-sesame sequence (2.89). This sequence also recorded higher production efficiency (38.13) and sustainable value index (0.81).

The data revealed that the LUE was lower when legumes or oilseeds or wheat crops were included in the sequence. This is apparent that LUE is based on the time for which the crop remained in the field. Therefore, low LUE indicates that there is scope to take up some green manure crops after the harvest of legume or oilseed crops.

It was concluded though rice-rice sequence recorded higher net return, rice-sesame or rice-wheat could be the best alternatives which resulted in high benefit : cost ratio.

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