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Influence of pre-season crops and nitrogen levels on performance of rice (*Oryza sativa*)–sunflower (*Helianthus annuus*) sequence

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Rice (*Oryza sativa* L.) is grown in the late rainy season under tank-irrigated areas in the eastern dry zone of Karnataka. To find out the feasibility of raising a short-duration crop in the early rainy season, a field experiment was conducted during 1989 and 1990 at the Main Research Station, Bangalore.

The soil of the experimental site was sandy clay-loam, low in organic carbon (0.44%) and available nitrogen (265 kg/ha), high in available P_2O_5 (56 kg/ha) and medium in available K_2O (218 kg/ha). There were 8 treatments, viz. maize (*Zea mays* L.), soybean [*Glycine max* (L.) Merr.], *Sesbania rostrata* and sunhemp [*Crotalaria juncea* L.) as sole crops and maize + soybean, maize + *S. rostrata* and maize + sunhemp in 1 : 1 proportions and a fallow treatment (Table 1). The pre-season crops were raised in randomized complete-block design, replicated thrice. Each of these plots was divided equally for allocating 2 levels of nitrogen (50 and 100 kg N/ha). Rice was raised in split-plot design. The succeeding sunflower (*Helianthus annuus* L.) was grown to ascertain residual effect, without disturbing the plots. Sunflower was fertilized with a basal dose of 75 kg P_2O_5/ha and 50 kg K_2O/ha. The pooled data were analysed.

Table 1. Biomass yield and and NPK composition of pre-season crops (pooled data of 1989 and 1990)

Treatment	Biomass yield (fresh weight) (tonnes/ha)	N (kg/ha)	P (kg/ha)	K (kg/ha)
Pre-season crop				
Maize	10.94	70.53	13.89	63.25
Soybean	4.34	39.93	7.76	18.01
Sesbania rostrata	19.01	177.95	17.87	83.79
Sunhemp	21.82	193.74	19.90	66.89
Maize + sumhemp	11.20 (5.66 + 5.44)	92.33 (36.52 + 55.82)	12.72 (6.82 + 5.90)	52.02 (32.75 + 19.27)
Maize + *S. rostrata*	11.44 (5.00 + 6.44)	101.49 (46.66 + 54.83)	14.09 (8.67 + 5.44)	67.65 (41.84 + 25.81)
Maize + soybean	9.06 (6.26 + 2.80)	61.76 (32.25 + 29.51)	10.88 (6.25 + 4.64)	41.42 (28.92 + 12.50)
Fallow (no pre-season crop)				
CD (P = 0.05)	2.23	17.91	2.21	9.39

Table 1. Influence of pre-season crops and nitrogen levels on performance of rice–sunflower sequence (pooled data of 1989 and 1990)

Treatment	Rainy-season rice			Summer sunflower			Economics of rice–sunflower		
	Panicles/ hill	Filled grains/ panicle	Grain yield (q/ha)	Diameter of the head (cm)	Seed weight/ head (g)	Seed yield (q/ha)	Gross income (Rs)	Net income (Rs)	Benefit : cost ratio
Pre-seasonal crop									
Maize	9.2	51.9	35.5	6.2	4.89	4.31	15,487	4,601	1.42
Soybean	10.5	69.6	41.3	8.6	6.51	6.12	17,364	6,605	1.61
Sesbania rostrata	11.2	76.0	44.7	10.8	8.05	7.83	20,152	9,568	1.90
Sunhemp	11.3	72.1	43.6	10.3	7.44	7.13	19,151	8,567	1.81
Maize + sunhemp	9.8	66.6	39.6	8.6	6.83	6.48	17,998	7,218	1.67
Maize + *S. rostrata*	10.4	66.0	40.4	8.6	6.66	6.39	18,103	7,323	1.68
Maize + soybean	9.6	60.9	37.8	8.2	6.23	5.81	16,941	6,073	1.56
Fallow (no pre-season crop)	10.0	56.9	36.2	6.7	5.26	4.73	14,555	4,956	1.51
CD (P = 0.05)	0.89	3.95	1.51	0.60	0.47	0.51			
N (kg/ha)									
50	9.5	60.3	38.0	8.2	6.23	5.81	61,082	5,636	1.54
100	10.9	69.7	41.8	8.8	6.74	6.40	17,808	7,022	1.65
CD (P = 0.05)	0.24	1.36	0.36	0.15	0.15	0.16			

Sunhemp gave the maximum biomass yield, followed by *S. rostrata* and maize + *S. rostrata*. The findings are in line with those of Beri *et al.* (1989). Sunnhemp had the highest nitrogen and phosphorus contents followed by *S. rostrata,* whereas *S. rostrata* had the highest potassium. The findings are in line with those of Salam *et al.* (1989) and Palaniappan *et al.* (1990). Grain yield of rice was significantly highest with *S. rostrata* green-manure, which was on a par with sunhemp green-manure. Similar results were obtained by Rinaudo and Moudingui (1987) and Singh *et al.* (1988). The significantly higher yield was attributed to more panicles/hill and filled grains/panicle. Maize–rice and fallow–rice sequences gave significantly lower rice yield. Grain yield of rice was the highest with 100 kg N/ha.

The seed yield of sunflower was significantly higher following *S. rostrata*–rice followed by sunhemp–rice. This is attributed to the superior head size and seed weight/head. Pre-season maize–rice and pre-season fallow–rice sequences gave significantly lower seed yield. N @ 100 kg/ha gave 59 kg/ha higher seed yield over 50 kg N/ha.

S. rostrata–rice–sunflower sequence gave the highest gross and net income, followed by sunnhemp–rice–sunflower. The net income was found least with maize–rice–sunflower. The benefit : cost ratio was 1.90 with *S. rostrata*–rice–sunflower, followed by 1.81 with sunhemp–rice–sunflower sequence, while it was the minimum with maize–rice–sunflower. Application of 100 kg N/ha for rice produced maximum gross and net income and benefit : cost ratio (1.65).

Thus *S. rostrata*–rice–sunflower or sunhemp–rice–sunflower crop sequence is profitable to keep the land fallow in the pre-season.

REFERENCES

Beri, V., Meelu, O. P. and Khind, C. S. 1989. Biomass production, N accumulation, symbiotic effectiveness and mineralization of green manures in relation to yield of wetland rice. *Tropical Agriculture,* Trinidad **66** : 11–16.

Palaniappan, Sp., Siddesswaran, K. and Reddy, S. N. 1990. (In) : *International Symposium on Natural Resources Management for a Sustainable Agriculture,* held at New Delhi.

Rinaudo, G. and Moudingui,-A. 1987. (In) *Proceedings of the Symposium on Sustainable Agriculture–Green manure and Rice Farming,* held at International Rice Research Institute, Los Banos, Philippines.

Salam, M. A., Hameed, S. M. S., Sivaprasad, P., Tajuddin, E. and Thomas, Y. 1989. Performance of *Sesbania rostrata* in acid soils. *International Rice Research Institute Newsletter* **14** (4) : 33–34.

Singh, Ranvir, Singh, B. P., Kumar, B. and Chand, D. 1988. *Sesbania rostrata* a promising source of biofertilizer. *Seeds and Farms* **14** (4) : 9–10.