Rice-based intercropping systems for rainfed upland conditions of Chotanagpur plateau

C. V. Singh, R. K. Singh, R. K. Tomar, V. S. Chauhan, and M. Variar, Central Rainfed Upland Rice Research Station, Hazaribag 825301, Bihar, India

In the upland area of Chotanagpur region (red lateritic, slopy), upland rice, ragi (minor millet), and pulses are grown in rotation with 1 yr fallow. Intercropping pulses or millets with upland rice could increase the cropping intensity of these areas.

We studied the feasibility of intercropping in red soils (pH 5.4, 0.39% organic C, and CEC 12.3 meg/100 g soil) during 1988 wet season.

Ragi (local), green gram (Sunayana), black gram (T-9), cowpea (Gomati), and red gram (BR65) were sown at 20-, 20-, 45-, 45-, and 75-cm row spacing, respectively, as sole crop and as intercrops. Kalinga III rice was sown in 2:2 row ratio with ragi, 3:1 and 4:1 with red gram, and 2:1 with other crops.

The experiment was laid out in a randomized block design with four replications. N was applied as basal to pulses, at 20 kg N/ha. Rice was fertilized with 60 kg N and ragi with 40 kg N/ha. P and K at 17 kg/ha were applied as basal to all crops.

Rice alone yielded 22 t/ha (see table). In the intercrops, highest rice yield was in rice + red gram. Red gram produced the highest yield among the intercrops. Highest rice equivalent yield was with rice + red gram 4:1 ratio and lowest with rice + cowpea 2:1 ratio. All combinations were efficient, with land equivalency ratios of more than one. Highest return was with rice + red gram. ■

Yield of rice and intercrops in Hazaribag, India, 1988 wet season.

Intercropping system	Yield (t/ha)		Rice equivalent yield (t/ha)	Return ($/ha)	Land equivalency ratio
	Rice	Intercrop			
Rice + green gram (2:1)	1.2	0.2	1.9	312	1.20
Rice + black gram (2:l)	1.3	0.2	1.9	321	1.27
Rice + red gram (3:1)	1.4	0.4	2.5	418	1.32
Rice + red gram (4:l)	1.6	0.4	2.6	438	1.36
Rice + cowpea (2:1)	0.9	0.3	1.7	289	1.12
rice + ragi (2:2)	1.0	1.1	1.7	291	1.02
Rice alone	2.2		2.2	368	1.00
LSD (0.05)			0.2		

Some transplanted rice-based cropping systems

M. S. Sidhu, T. S. Sahota, B. D. Sharma, and B. K. Dhaliwal, Agronomy Department, Punjab Agricultural University, Ludhiana 141004, India

We evaluated some rice-based cropping systems involving cereals other than rice, legumes, oilseeds, and potato during 1987-88. The alluvial soil was calcareous, sandy loam with pH 8.1 and 0.28% organic C. All crops received recommended fertilizer except sunflower following potato.

Rice equivalent yield was highest with rice - potato - transplanted winter maize (27.4 t/ha), followed by rice - potato - sunflower (21.8 t/ha) and rice - Indian rape - transplanted Swede rape - green gram (19 t/ha) (see table). Productivity of rice - wheat, the dominant cropping system in northern India, was lowest (8.8 t/ha).

Maximum gross return was $2,970/ha with rice - potato - transplanted winter maize (more than 3 times the $953/ha return with rice - wheat).

Fertilizer costs were highest ($247/ha) in rice - potato - transplanted winter maize and lowest in rice - peas - green gram ($126/ha). Fertilizer return was highest in rice - potato - sunflower and lowest in rice - wheat.

The difference between returns from fertilizer and total productivity is ascribed to the higher fertilizer requirements of rice - potato - transplanted winter maize than in cropping systems involving legumes and oilseeds. ■

Production and returns from some rice-based cropping systems in Punjab, India, 1987–88.

Cropping system[a]	Total grain yield (t/ha)	Rice equivalent yield (t/ha)	Cost of fertilizer ($/ha)	Gross returns ($)	
				Per ha	Per $ fertilizer
Rice - wheat (4.1) (4.3)	8.4	8.8	163	953	5.85
Rice - winter maize (4.8) (4.7)	9.5	11.4	174	1229	7.06
Rice-peas-green gram (4.9) (1.7) (1.4)	8.0	13.5	126	1462	11.61
Rice - Swede rape - green gram (5.4) (1.4) (1.3)	8.0	14.2	148	1579	10.66
Rice - potato - transplanted winter maize (5.6) (20.5) (6.4)	12.0 +20.5[b]	27.4	247	2970	12.03
Rice - Indian rape - transplanted Swede rape (4.8) (1.8) (0.8) - green gram (1.6)	9.0	19.0	175	2052	11.73
Rice - potato - sunflower (4.9) (21.2) (1.3)	6.2 +21.2[b]	21.8	162	2362	14.58
Rice - Indian rape - sunflower (5.1) (1.9) (1.4)	8.4	15.0	138	1621	11.75

[a] Figures in parentheses are yield (t/ha). In the first three systems, rice PR108 (145 d duration) was used; in the other systems, PRTB (125 d duration) was used. [b] Potato tubers.