2. Effect of Preceding Upland Crop on the Growth and Yield of Rice

1) Effect of Different Upland Crops (1975)

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This experiment was carried out succeeding to the Experiment IV-1 in order to examine the effect of upland crops on the succeeding rice crop.

Materials and method

1. Preceding upland crops.
   See the design of the Experiment mentioned above or the table below.
2. Cultivation of rice
   1) Variety: RD 7
   2) Transplanting time: 1 September, 1975
   3) Number of days from harvesting of the preceding upland crops to transplanting of rice:

Planting time of preceding crops / Preceding crops	T_1 (early)	T_2 (medium)	T_3 (late)
S_1 (maize)	154	98	57
S_2 (sorghum)	154	112	49
S_3 (rice)	—	63	19
S_4 (soybean)	147	91	42
S_5 (peanut)	126	98	74
S_6 (mungbean)	147	112	74
S_7 (cotton)	112	42	19
S_8 (sunflower)	147	112	74
S_9 (sesbania)	112	56	21

   4) Fertilizer application:

Basal dressing: (Sept. 8)	N	20 Kg/ha	(ammophos)
	P_2O_5	25 Kg/ha	
	K_2O	12.5 Kg/ha	(potassium chloride)
Top dressing: (Oct. 16)	N	17.5 Kg/ha	(ammonium sulphate)

   5) Spacing: 25 cm × 25 cm, 3 plants per hill.
   6) Harvesting: 8 December, 1975

Results

1. Leaf color of rice plants was obviously dark in all Sesbania plots* and Soybean T_3 plot* comparing with other plots at one week after transplanting. As shown in Table 2-1 and Fig. 2-1, rice growth in terms of plant height, tiller number, leaf area index (LAI) and dry weight was superior in Sesbania plots as compared with the plots where other crops were grown. In case of soybean plots, rice growth in T_3 plot was nearly as well as in sesbania plots, while such a trend was not prominent in T_1 and T_2 plots where soybean was seeded earlier.
2. Relative growth rate (RGR) and net assimilation rate (NAR) of rice did not show any clear difference among the plots. However, when RGR was compared among the plots with reference to dry weight of plants as shown in Fig. 2-2, RGR in Sesbania plots were evidently high. (Compare the RGR value of each plot along a certain vertical line.)
3. The yield of rice was shown in Fig. 2-3 and Table 2-2. Sesbania plots produced highest yields such as 5.2 to 5.4 ton/ha of full grains. Soybean T_3 plot yielded 5.06 ton/ha, while T_1 and T_2 plots yielded 4.5 and 4.6 ton/ha respectively. In case of Mungbean plots, T_3 plot had a higher yield than T_1 and T_2 plots similarly as in Soybean plots.
4. Different rates of fertilizer application to preceding upland crops did not induce any difference in growth and yield of rice.

Discussion

It can be said that rice plants grow well in the field where leguminous crops such as susbania, soybean and mungbean have been grown as preceding crops. In cases of soybean and mungbean, rice should be transplanted in a short period after harvesting those crops.

Further experiments are required to clarify the effect of leguminous crops on enriching soil fertility with special reference to the period from harvesting leguminous crops to transplanting rice as well as the fertilization management of rice culture.

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* Sesbania plot means the plot where sesbania was grown in the last dry season as a preceding crop of rice. Soybean T_3 plot means the plot where soybean was seeded latest in the last dry season as a preceding crop of rice. The similar applied to other plots.

Table 2-1. Dry weight, LAI, RGR and NAR of rice plant as affected by preceding upland crops

Preceding crop & its planting time		Sept. 25		Oct. 15		Nov. 12		Sept.25—Oct.15		Oct.15—Nov.12	
		DW	LAI	DW	LAI	DW	LAI	RGR	NAR	RGR	NAR
S_1	T_1	62.5	0.84	231.8	2.06	692.3	2.54	6.55	6.22	3.90	7.20
	T_2	51.3	0.64	241.9	2.15	652.2	2.45	7.80	7.73	3.60	6.38
	T_3	56.0	0.72	264.5	2.29	652.9	2.39	7.71	7.65	3.27	6.01
S_2	T_1	54.6	0.72	233.6	2.16	737.8	2.75	7.28	6.84	4.09	7.30
	T_2	51.7	0.64	234.0	2.11	655.1	2.40	7.58	7.42	3.68	6.69
	T_3	46.2	0.57	225.1	1.98	653.1	2.32	7.96	7.98	3.78	7.09
S_3	T_1	61.8	0.81	255.7	2.45	739.4	2.69	7.13	6.59	3.81	6.83
	T_2	48.8	0.64	211.2	1.91	611.0	2.26	7.33	7.00	3.77	6.84
	T_3	47.7	0.64	230.9	2.15	663.5	2.54	7.88	7.34	3.78	6.64
S_4	T_1	54.2	0.72	239.9	2.10	660.7	2.50	7.45	7.37	3.62	6.57
	T_2	51.0	0.68	258.7	2.25	593.6	2.16	8.13	7.93	2.96	5.42
	T_3	88.4	1.12	357.0	3.36	785.5	3.22	7.02	6.57	2.81	4.67
S_5	T_1	59.0	0.76	252.1	2.32	682.0	2.49	7.46	6.97	3.58	6.45
	T_2	45.5	0.63	214.2	1.89	629.2	2.22	7.74	7.35	3.84	7.20
	T_3	64.4	0.82	239.7	2.19	561.0	2.37	6.61	6.35	3.04	5.14
S_6	T_1	60.0	0.76	266.1	2.55	725.5	2.78	7.47	7.00	3.58	6.17
	T_2	47.3	0.63	220.8	2.12	643.2	2.37	7.70	7.05	3.81	6.70
	T_3	59.5	0.83	252.6	2.28	660.9	2.43	7.24	6.76	3.48	6.29
S_7	T_1	60.7	0.87	275.2	2.48	702.5	2.86	7.59	7.00	3.34	5.71
	T_2	53.1	0.72	248.4	2.34	664.4	2.29	7.76	1.17	3.52	6.45
	T_3	61.0	0.79	246.3	2.12	633.4	2.23	7.03	6.93	3.38	6.38
S_8	T_1	53.5	0.73	232.8	2.10	753.6	2.69	7.36	6.91	4.19	7.80
	T_2	48.7	0.65	231.3	2.06	625.3	2.23	7.80	7.50	3.56	6.60
	T_3	56.7	0.76	247.0	2.24	656.4	2.31	7.37	6.95	3.50	6.43
S_9	T_1	89.6	1.19	362.6	3.63	881.0	3.61	7.00	6.24	3.17	5.12
	T_2	80.3	1.12	383.1	3.57	842.2	3.51	7.80	7.15	2.82	4.65
	T_3	86.5	1.17	415.7	3.92	877.4	3.20	7.88	7.26	2.66	4.65

Remarks: DW: dry weight (g/m^2), LAI: leaf area index,
RGR: relative growth rate (%/day),
NAR: net assimilation rate (g/m^2.day).

Table 2-2. Yield and yield components of rice as affeted by preceding upland crops

Preceding crop & its planting time		Weight of full grains	No. of panicles /hill	/m²	No. of spikelets	ripening percent	Weight of 1,000 grains
		t/ha			/panicle	%	g
S_1	T_1	4.69	12.5	200.0	95.3	87.0	28.3
	T_2	4.40	12.4	197.9	93.7	85.0	28.0
	T_3	4.59	11.7	186.7	104.5	82.3	28.6
S_2	T_1	4.48	12.0	192.0	92.6	86.7	29.1
	T_2	4.52	11.8	188.8	97.7	85.0	28.9
	T_3	4.35	12.0	192.5	97.3	82.5	28.1
S_3	T_1	4.71	12.6	202.1	94.7	86.4	28.4
	T_2	4.39	11.4	182.9	102.6	82.5	28.4
	T_3	4.44	11.8	188.3	101.6	82.0	28.3
S_4	T_1	4.49	11.9	190.9	96.6	86.2	28.3
	T_2	4.59	11.4	182.4	105.1	84.5	28.2
	T_3	5.06	12.0	192.5	106.3	85.6	29.1
S_5	T_1	4.56	11.7	186.7	101.5	85.0	28.4
	T_2	4.30	11.6	185.1	101.4	81.6	28.1
	T_3	4.67	11.8	188.8	101.7	84.3	28.8
S_6	T_1	4.71	12.5	198.9	95.9	86.2	28.7
	T_2	4.68	11.5	183.5	107.1	84.0	28.4
	T_3	4.90	11.8	188.8	105.4	85.2	29.0
S_7	T_1	4.77	12.1	194.1	98.0	87.7	28.7
	T_2	4.35	11.9	189.9	94.6	85.5	28.3
	T_3	4.37	11.3	180.6	99.2	85.2	28.7
S_8	T_1	4.59	12.5	200.0	94.0	85.2	28.6
	T_2	4.35	11.8	189.3	96.1	84.0	28.4
	T_3	4.57	11.7	187.7	101.2	83.7	28.8
S_9	T_1	5.40	13.0	208.0	105.7	85.8	28.6
	T_2	5.21	12.9	205.9	102.3	85.6	29.0
	T_3	5.35	12.9	206.4	106.8	84.7	28.8

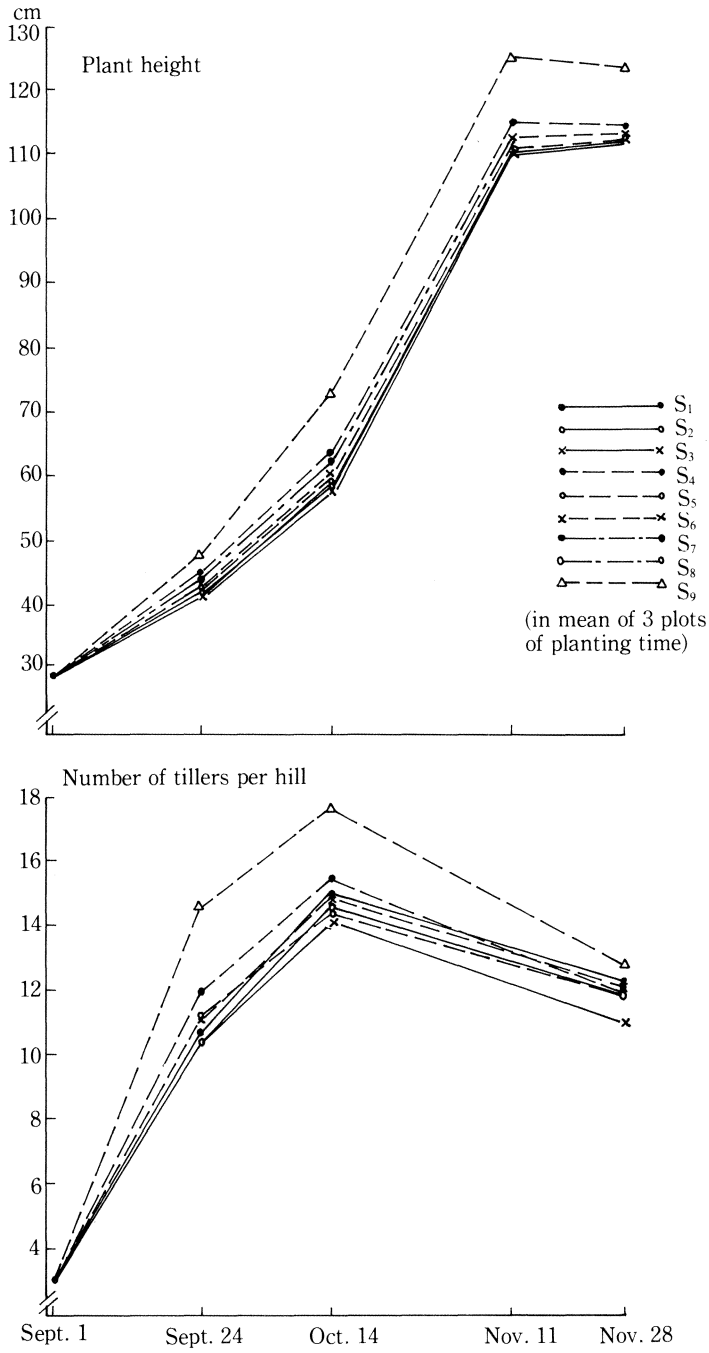
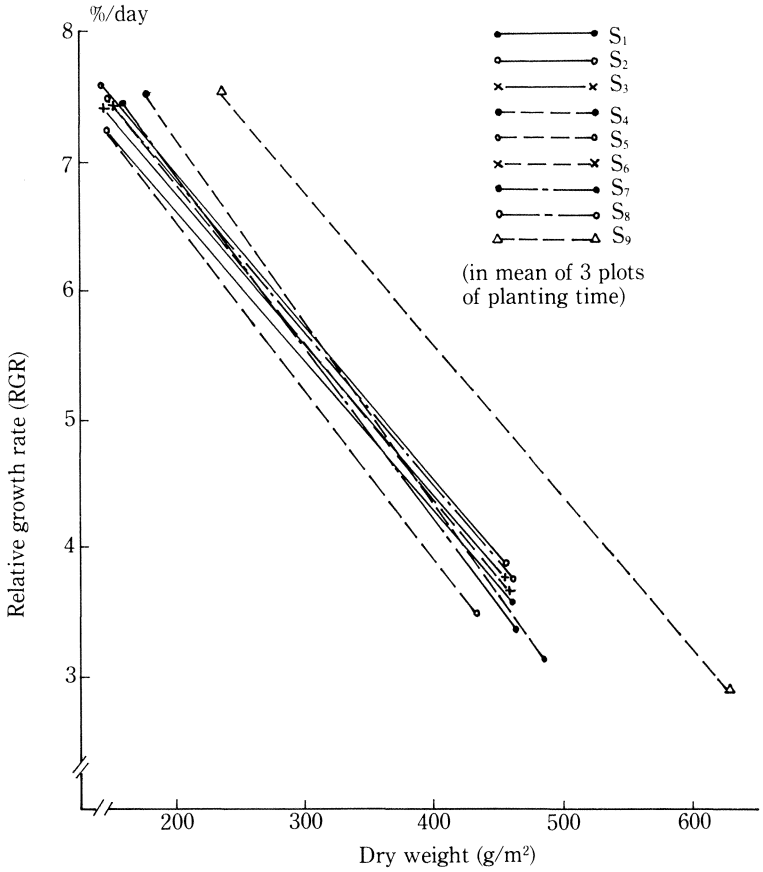


Fig. 2-1. Growth of rice plant as affected by preceding upland crops



Remarks: The means of dry weight at Sept. 25 & Oct. 15 and those of Oct. 15 & Nov. 12 for each crop were plotted on the horizontal axis, respectively.

Fig. 2-2. Relation between relative growth rate and dry weihgt of rice as affected by preceding upland crops

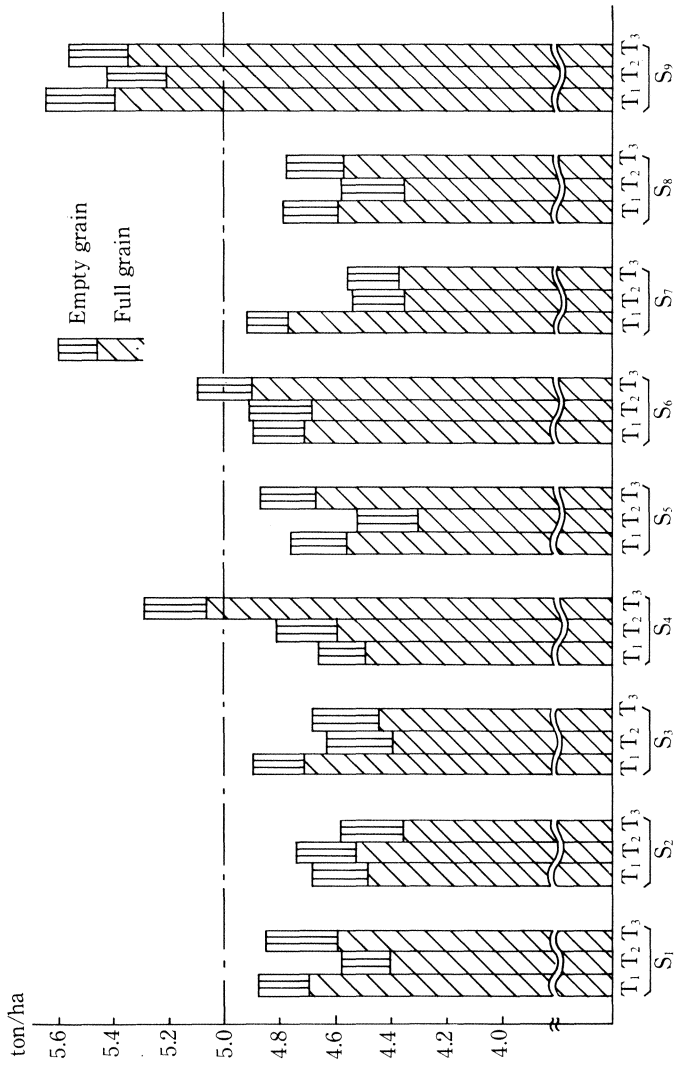


Fig. 2-3. Yield of rice as affected by preceding upland crops