Soil and Crop Management

Mollisol productivity under two management levels

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We studied the productivity of a Mollisol occupying the lowest position on a 0-1% slope and developed on fine silty calcareous alluvial parent material. The profile was poorly drained. Surface and subsurface texture was clay loam, subsoil texture varied from silt loam to silty clay loam (Table 1). The soil was classified as fine silty, mixed, hyperthermic Typic Haplaquoll. It belongs to the Phoolbagh series.

A crop management experiment was conducted on this soil during the 1983 rainy season. High and moderate management levels were applied in a randomized block design with four replications.

High management approximated the practices followed by affluent and progressive farmers of the area. It included summer plowing, harrowing, and leveling; optimum transplanting (around 15 Jul), maintaining 3-5 cm water level in the field: 120 kg N and 40 kg P/ha; and weeding at 20, 40, and 60 d after transplanting.

Moderate management was a combination of practices followed by a farmer with moderate resources and know-how. It included summer plowing, harrowing, and leveling; late transplanting around 21 Jul, maintaining field moisture at saturation; 60 kg N and 20 kg P/ha; and weeding at 20 and 40 d after transplanting.

N was applied as urea in three split doses and P as single superphosphate as a basal dose. Diseases and pests were controlled as needed.

Number of tillers and grain yield were significantly higher under high level of management (Table 2). The significant increase in grain yield was due to more effective tillers per unit area.

But net income was somewhat lower under high management level because of increased costs of production. ☐

Table 1. Physical and chemical properties of soil at Pantnagar, India, 1983.

Horizon	Depth (cm)	Sand (%)	Silt (%)	Clay (%)	pH	Organic matter (%)	$CaCO_3$ equivalent (%)	Cation exchange capacity (meq/100 g)	Base saturation (%)
Ap	0-11	44	24	32	7.8	3.2	0.4	25.2	91
A_1	11-31	43	21	36	7.9	2.6	0.7	24.6	91
A_3	31-48	45	31	24	8.0	2.0	0.7	19.1	100
B_2	48-10	42	37	21	8.0	1.5	2.1	17.6	95
IIB_3	70-90	25	36	39	8.1	1.4	2.5	13.5	100
IIC	90-96+	24	41	35	8.1	1.2	2.6	13.2	98

Table 2. Yield components and yield, and net income[a] under 2 management levels. Pantnagar, India, 1983.

Management level	Tillers/ meter (no.)	Grain yield (t/ha)	Straw yield (t/ha)	Harvest index	Gross income ($)	Production cost ($)	Net income ($)
High	64	5.9	7.9	43	786.83	315.31	411.52
Moderate	53[b]	5.0[b]	6.3	44	664.87	229.95	434.92

[a]US$l = Indian rupees 10.50 (Nov 1983). [b]Significant difference at 5% level.

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Effect of nitrogen source and insect control on growth of a ratoon crop

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We studied N source and insecticide treatment on a ratoon crop (Sona Mahsuri) in 1985-86. The area has endemic brown planthopper *Nilaparvata lugens* that could survive in the stubble of a ratoon crop. There were 4 fertilizer treatments: 0 N/ha, 50 kg N/ha, azolla applied 34 times at 2.5 t/ha, and azolla + 25 kg N/ha. The insecticides were monocrotophos at 0.5 kg ai/ha and chlorpyrifos at 0.3 kg ai/ ha. Treatments were laid out in a randomized complete block design with three replications.

Azolla (fresh weight) was applied on the soil surface 3-4 times, up to 12 t/ha. But the azolla could not be uniformly maintained in the field. Growth and multiplication were retarded by fluctuating water level, snail damage, and high temperature. Soil salinity also could have affected azolla growth. Soils were black deep Vertisols with pH 8.5. N content of the azolla was about 6%.

Regenerated tillers were counted at 15

Effect of N source and insecticide treatment on ratoon crop. Siruguppa, India, 1985-86.

Treatment [a]	Regenerated tillers (no.)	Plant height (cm)	Tillers/ plant	Panicles/ plant	Sterility (%)	Yield (t/ha)	Harvest index
No N (control)	11	43.9	13	10	2.15	0.9	0.44
No N + monocrotophos	9	47.7	11	8	4.72	0.9	0.49
No N + chlorpyrifos	13	49.0	15	12	2.71	1.2	0.49
50 kg N/ha	22	63.9	20	21	2.11	2.2	0.44
50 kg N/ha + monocrotophos	22	64.3	26	20	1.25	1.9	0.41
50 kg N/ha + chlorpyrifos	18	60.0	24	17	0.93	1.9	0.44
Azolla	14	50.4	17	13	2.7	1.7	0.50
Azolla + monocrotophos	13	48.8	14	11	1.3	1.2	0.41
Azolla + chlorpyrifos	15	48.3	13	11	1.5	0.7	0.40
Azolla + 25 kg N/ha	18	56.6	21	17	1.3	2.0	0.52
Azolla + 25 kg N/ha + monocrotophos	21	53.3	24	14	1.8	1.5	0.45
Azolla + 25 kg N/ha + chlorpyrifos	23	56.8	20	18	1.2	1.4	0.45
CD (0.05)	4.26	7.80	0.98	9.4	0.52	0.74	0.09

[a] Monocrotophos at 0.5 kg ai/ha, chlorpyrifos at 0.3 kg ai/ha, and azolla at 2.5 t/ha.

d after ratooning; plant height, tillers per plant, panicles per plant, sterility percentage, yield, and harvest index were noted at harvest (see table). Number of regenerated tillers, panicles/ plant, and yield vaned considerably. In most treatments, some tillers regenerated after 15 d.

The interaction between N source and insecticide application had no significant effect on ratoon growth and development because there was no pest pressure on either the main or the ratoon crops. Fertilizer at 50 kg N/ ha gave the highest mean ratoon yield. Applying azolla immediately after ratooning may not benefit the ratoon crop because azolla N is not available to the plant until the azolla decomposes. □

Effect of sesbania straw in a flooded soil on soil pH, redox potential, and water-soluble nutrients

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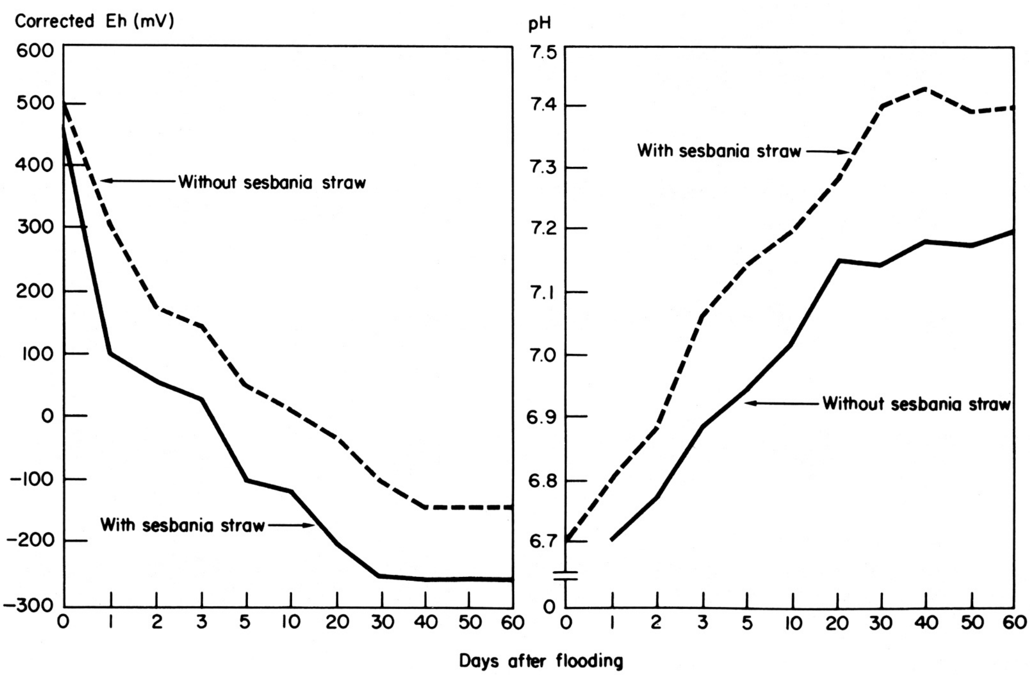
Information on release of nutrients other than N by green manures is scarce. We studied the effect of Sesbania straw on Eh-pH kinetics and the release of water-soluble nutrients in a flooded rice soil in the laboratory.

The Crowley silt 1oam (Typic Albaqualf) collected from the Rice Experimental Station at Crowley, Louisiana, had pH 6.7,0.81% organic C, and CEC 14.8 meq/ 100 g.

To monitor changes in Eh and pH, duplicate 60-g samples of air-dry soil, without or with 0.2% by weight sesbania straw (2.5% N) were transferred into redox tubes. The tubes were constructed by sealing 12.5 mm of 18-gauge platinum wire on both sides of 40 × 138 mm pyrex test tubes, 25 mm from the bottom. The soil samples were submerged with an excess of deionized distilled water and incubated at 30 °C. pH and Eh measurements were made at intervals for 60 d.

To monitor release of water-soluble nutrients, duplicate 10-g portions of air-



1. Effect of sesbania straw on kinetics of pH and Eh in a flooded Crowley silt loam soil in the laboratory. Louisiana State University, 1987.