and 27° C constant temperature. Length of coleoptile, first leaf, and primary root were measured after 1 week incubation.

Oxygen concentration had little effect on coleoptile emergence, but low O_2 levels enhanced coleoptile elongation. Maximum coleoptile length (20 mm) occurred at 0% O_2. It appears that the rice seed germinated at very low O_2 levels. Root and leaf growth were inhibited at 0% O_2, evidence that low O_2 levels can restrict rice stand establishment.

The critical O_2 concentration for maximum shoot elongation appeared to be about 5%. The critical O_2 concentration for root elongation was less evident. Roots of Labelle and Bellemont seedlings reached maximum length at as low as 5% O_2. Roots of Calrose 76 and M 101 seedlings continued to increase in length at 10.5% and 21% O_2.

Length of rice leaf, root, and coleoptile after 1 week incubation in water saturated with 10.5% and 1% O_2 at Beaumont, Texas.

Cultivar	Difference (%) in length		
	Leaf	Root	Coleoptile
CB744	–81[a]	–63	122
IR8	–61[a]	–60	52
IR24	–78	–77	47[a]
Labelle	–82	–47	135[a]
Mars	–68	–78	93
Peta	–64	–63	62
Bellemont	–82	–35[a]	108
Saturn	–70	–79	74
Starbonnet	–75	–90[a]	93
TN1	–62	–40	67

[a]Extremes for character.

To help identify cultivars most tolerant of low O_2 concentrations, growth was measured for 10 cultivars in 10.5 and 1% O_2 (see table). When O_2 decreased from 10.5% to 1%, leaf length differences ranged from –61% (IR8) to –81% (CB744). Root length differences ranged from –35% (Bellemont) to –90% (Starbonnet). Coleoptile length differences ranged from 47% (IR24) to 135% (Labelle). Rice cultivars exhibited tolerance for low O_2 levels in one character, but not in the two others.

Late planting effects on long-duration semidwarf rices in wetland fields

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Seedling age and time of planting influence rice productivity to a great extent, particularly in short-duration, photoperiod-insensitive cultivars during the rainy season. This experiment examined the effect of late planting on growth duration and yield performance of long-duration semidwarf rice cultivars in wetland fields (20- to 50-cm water depth) during the 1977 rainy season. Materials were 15 long-duration, semidwarf rice cultivars of diverse genetical backgrounds in 2 seedling age groups, 35 days and 60 days old. The experimental design was randomized complete block with four replications. Plots (net) were 4.8 × 2.6 m with plant spacings of 20 × 15 cm and fertilizer applications of 80-40-40 kg NPK/ha.

Grain yields in both normal and late plantings did not differ significantly (see table). However, grain yields of IR32, IR34, CR1006, and IET3257 increased in the late planting. Growth duration increased in all late planted cultivars. Although growth duration increases appreciably, grain yields of normal and late plantings are comparable in long-duration semidwarf rice cultivars.

Grain yield and growth duration of long-duration[a] semidwarf rice cultivars at normal and late planting dates during 1977 rainy season at Chinsurah, West Bengal, India.

Cultivar	Grain yield (t/ha)		Growth duration (days)	
	Normal	Late	Normal	Late
IR32	3.4	3.8	149	171
IR34	3.0	3.5	140	163
CR1006	4.0	4.3	158	180
CR1009	4.1	4.0	153	172
IET3257	3.0	3.4	149	160
IET3235	3.3	3.0	140	160
IET4087	3.1	2.7	142	157
IET2991	3.2	2.8	149	153
Pankaj (m) 107	3.8	3.4	147	161
Pankaj (m) 91	3.5	3.0	152	163
HTA448	2.8	2.6	140	167
HTA108	3.5	3.1	149	167
CNBP153-58-2	2.8	2.6	147	159
CNPB134-34-1-1	2.2	2.0	143	161
Pankaj (control)	4.4	4.3	146	164
LSD (0.05) = 0.4 t/ha	0.5	0.6		

[a]Maturity of 140 days or more. Normal = 35-day-old seedlings, late = 60-day-old seedlings.

Sesbania rostrata green manure and rice

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To study the effect of *Sesbania rostrata*, a tropical legume that colonizes waterlogged soils in the Senegal Valley, as green manure on rice yield, an experiment was set up in microplots (1 m^2 each) during the rainy season. Three treatments were used:

Sesbania rostrata green manure. Plots were sown with *S. rostrata* and kept waterlogged for 45 days (stems inoculated by spraying with a culture of *Rhizobium* strain ORS 551). Irrigation was stopped for 7 days, and the stems of *Sesbania* were cut and plowed in. Nineteen days later, plots were fertilized with PK (17.44 g K_2HPO_4/m^2), planted with 2-week-old seedlings of rice cultivar Moroberekan, and waterlogged again.

Mineral nitrogen fertilization. Plots were kept in fallow with the same water management, fertilized with PK and N (23.32 g $SO_4\ (NH_4)_2/m^2$), planted, and waterlogged.

Control. Plots were kept in fallow with the same water management, only fertilized with PK, planted, and waterlogged.

Rice was harvested when plants were 135 days old.

In the microplots ...

Sesbania green manure, yield in dry matter (grain or straw) increased over control (see table). Application of mineral nitrogen was significantly less effective. Nitrogen content of grain and straw was significantly higher in green-manured plots than in plots without green manure.

If extrapolation of the data to the field is valid, we can conclude that the use of *S. rostrata* as green manure permits yields as high as 6 t/ha in a soil with lower than average fertility, such as the one used in this experiment.

Effect of *Sesbania rostrata* green manure on the yield and nitrogen content of rice.

Treatment[b]	Av dry yield (g/m^2)		Nitrogen content (%)		Av nitrogen yield ($g N/m^2$) in grain + straw
	Grain	Straw	Grain	Straw	
PK + green manure	596 a	772 a	1.80 a	0.94 a	18.17 a
PK + N (60 kg/ha)	381 b	484 b	1.27 b	0.49 b	7.21 b
PK (control)	212 c	276 c	1.14 b	0.58 b	4.02 c

[a]Figures followed by same letter do not significantly differ at 1% level. [b]Six microplots per treatment.

Rice crop productivity in alkali soil reclaimed by gypsum or pyrites — a case of eastern Uttar Pradesh

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Alkaline soils constitute a permanent constraint to rice production in eastern Uttar Pradesh. A series of experiments were initiated in alkali soil (pH 10.4) during the 1976 rainy season and repeated in 1977 and 1978. Plots measured 5 × 4 in a randomized block design with 3 replications. Gypsum was applied at 0, 3, 6, 9, and 12 t/ha. Pyrites were applied at 0, 1.5, 3, 4.5, and 6 t/ha. Pyrites applied were half that of gypsum because the sulfur content (30%) of pyrites is double that of gypsum. In addition, the cost of one ton of pyrites is almost double that of gypsum. Rice husk and sawdust at a maximum dose of 7.5 t/ha also were used.

Medium-duration variety IR24 was grown during the first year and Jaya was grown during the second and third years. Transplanting of 5- to 6-week-old seedlings in early to mid-July was at 15-cm plant spacing with 4 to 5 seedlings/hill. Fertilizer was applied at 120 kg N, 50-60 kg P_2O_5, and 32-40 kg K_2O/ha. Zinc sulfate was applied at 35 to 40 kg/ha.

Rice husk and sawdust had no effect. Grain yield dramatically increased with increasing doses of gypsum and pyrites (see table). Yield increased from a minimum of 1.0 t/ha in original alkali soil to a maximum of 6.0 t/ha in pyrite-treated and 6.8 t/ha in gypsum-treated plots. Gypsum consistently proved superior to pyrites in enhancing rice yields from alkali soil. Yields in nontreated original alkali soil plots also went up from 1.0 t/ha to 2.0 t/ha suggesting some spontaneous improvement in soil even without any chemical amendments. This might be possible because continued application of fertilizers and zinc sulfate and proper water management aided natural leaching of salts. Yield levels after chemical amelioration suggest that alkali soils are inherently productive and that good rice yields can be obtained with proper soil-water-crop management practices.

Effect of gypsum and pyrites on rice yield from alkali soils of Kumarganj (Faizabad), India.

Application rates[a] (t/ha)		Yield (t/ha)								
		1976			1977			1978		
Gypsum	Pyrites	Gypsum	Pyrites	Difference	Gypsum	Pyrites	Difference	Gypsum	Pyrites	Difference
0	0	1.0	1.1	-0.1	1.6	1.6	0	2.0	2.0	0
3	1.5	1.9	1.7	0.2	2.9	2.8	0.1	3.4	3.1	0.3
6	3.0	3.5	2.7	0.8	4.6	4.0	0.6	4.7	4.3	0.4
9	4.5	4.8	4.2	0.6	6.0	5.2	0.8	6.2	5.6	0.6
12	6.0	5.3	4.6	0.7	6.4	5.9	0.5	6.8	6.0	0.8
LSD (0.05)		0.4	0.4		0.4	0.3		0.3	0.3	

[a]The soil amendments were applied only once, in 1976.

Influence of presowing soil water and seed iron-coating on iron in soil and yield of dryland rice

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An experiment on a calcareous Vertisol (pH 8.7, organic carbon 0.61%, Olsen-P 8.74 ppm, DTPA extractable Fe 1.38 ppm, Mn 2.64 ppm, and $CaCO_3$ equivalent 8.2%) at Rahuri during the 1980 rainy season examined the influence of water treatment (control and one irrigation daily to about soil saturation) 15 days before sowing and seed coating with an iron compound (control and 2% Fe coating through $FeSO_4 \cdot 7H_2O$ and Fe EDTA) on the availability of soil Fe and yield of dryland rice cultivar Karjat 184. Field moisture capacity of 27-35% was maintained from sowing to maturity.

Soil saturation before sowing significantly increased DTPA extractable Fe at 15 days and at sowing, tillering, panicle initiation, and flowering stages of rice growth (see table). This could have been caused by the moderately reduced soil conditions that resulted from soil saturation 15 days before sowing (Eh reduced from +502 to +390 mV and pH from 8.70 to 8.15). Coating seed with Fe compounds had no influence on the release of Fe in the soil.

Grain and straw yields were signifi-

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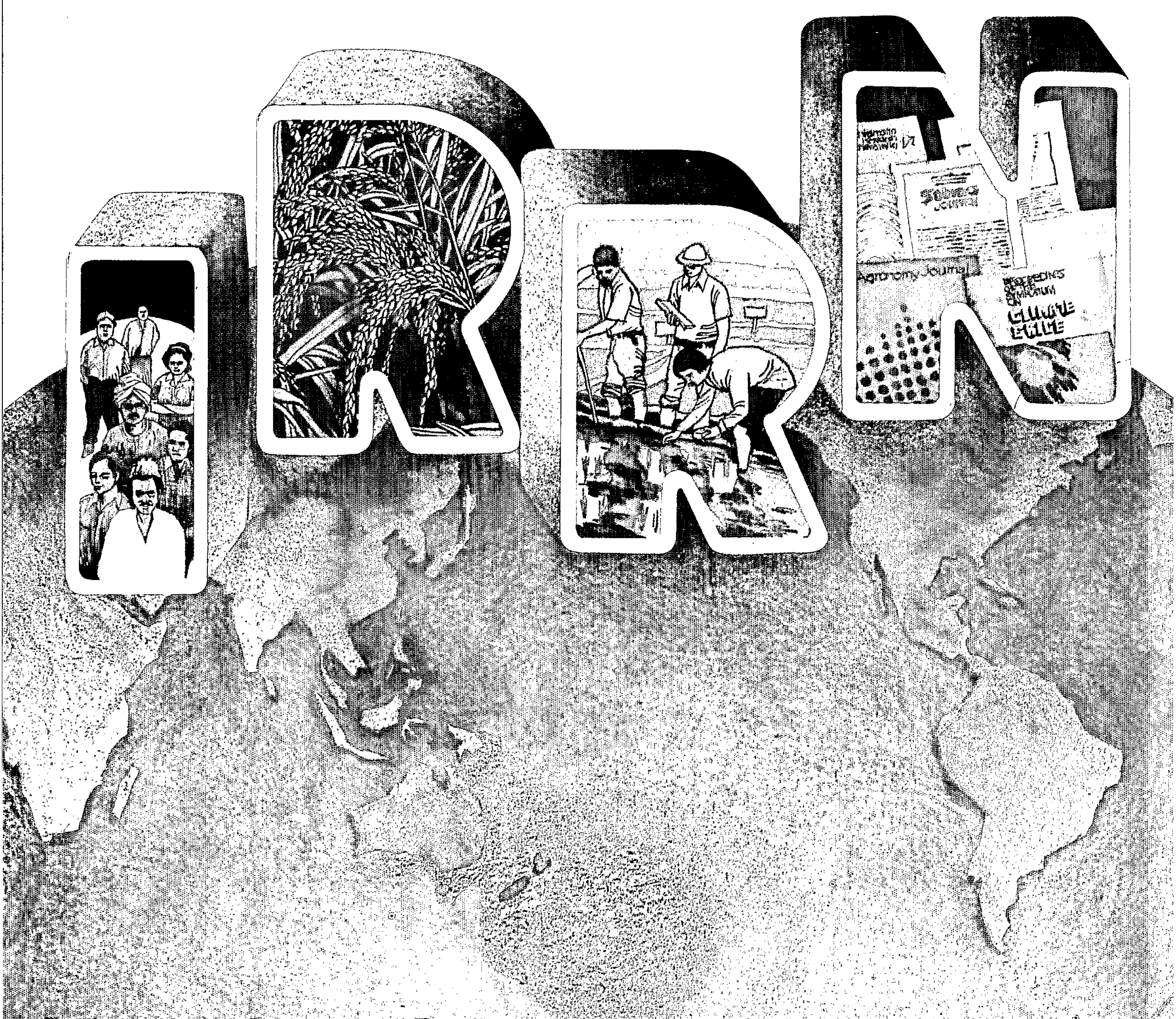

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