

type. The number of panicles per square meter tended to increase as seedlings per hill increased, but the increment did not contribute to yield. With root pruning, BR3 yielded less than the control; the trend was reversed in HbjB VI. Symptoms of nitrogen deficiency in both varieties appeared earlier with increased number of seedlings per hill. ❧

A test of tillage practices in Thailand

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Sandy, relatively infertile soil was used in a test of four tillage practices in Khonkaen province, Thailand. The practices and the yields of the local, sticky rice Kao Yai were: no tillage with weeds controlled by paraquat, 0.14 kg/sq m; 2 plowings by water buffalo and 1 harrowing, 0.19 kg/sq m; 1 plowing by water buffalo and 1 harrowing, 0.20 kg/sq m; and 2 plowings by power tiller and 1 harrowing, 0.22 kg/sq m.

The only significant differences in yield were between no tillage and tillage with a power tiller. ❧

Zinc deficiency in Sierra Leone rice

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Zinc deficiency on lowland rice had been reported from the Philippines, Thailand, Korea, Japan, Pakistan, Colombia, Brazil, and Nigeria. In Sierra Leone, the zinc status of rice soils was cloudy since no systematic work had been done on zinc nutrition of rice based on soil and plant analysis. Therefore, a cooperative research project with FAO/IAEA, Vienna, was initiated in June 1975 to delineate the zinc-deficient soils.

Rice plant and soil samples were collected from 25 sites from various agroecological zones of Sierra Leone — inland valley swamps, mangrove swamps, and bolilands. Samples were taken at midtillering and at panicle-initiation stages. Available zinc in soils was

extracted with 0.005 M DTPA and 0.05 M HCl, while plant samples were digested with $\text{HNO}_3 + \text{H}_2\text{SO}_4 + \text{HClO}_4$ mixture and analyzed by atomic absorption spectrophotometer.

The 0.05 M DTPA-extractable zinc ranged from 0.01 to 1.62 ppm with an average of 0.59 ppm, while 0.05 M HCl extractable zinc ranged from 0.30 to 6.18 ppm with an average of 1.47 ppm. HCl seemed to extract more zinc than M DTPA. Based on critical levels established by scientists at the Philippine Bureau of Soils and at IRRI, the zinc levels of those soils are very low, low, and

Nutritional disorders of upland rice in Sierra Leone

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In the 1974 crop season, bronzing was widespread in trials at the Rokupr Rice Station and in irrigated fields at Mange. A cooperative investigation was initiated to determine the effects of soil problems and nutritional imbalances on bronzing. Soil and plant samples for analysis were obtained from rice fields at the maximum-tillering stage. The plant samples were analyzed by the methods used at the Service Analytical Laboratory, International Institute for Tropical Agriculture, Ibadan, Nigeria.

The pH of the experimental soils ranged from 4.9 to 5.5; organic carbon, from 0.77 to 2.0%; nitrogen, from 0.10 to 0.30%; and available phosphorus, from 0.63 to 18.90 ppm.

Mineral composition of upland rice plants at the maximum-tillering stage. Rice Research Station, Rokupr, Sierra Leone.

Sites	N (%)	P (%)	K (%)	S (%)	Ca (%)	Mg (%)	Fe (ppm)	Mn (ppm)	Cu (ppm)	Zn (ppm)
1	1.31	0.11	1.50	0.29	0.54	0.13	1100	1000	10	38
2	1.37	0.07	0.88	0.17	0.35	0.10	900	650	10	40
3	1.02	0.12	1.00	0.26	0.34	0.12	1100	154	10	52
4	1.14	0.08	0.46	0.21	0.65	0.23	450	340	5	42
5	1.14	0.07	1.38	0.16	0.73	0.22	700	580	10	102
6	1.14	0.09	0.88	0.22	0.33	0.10	600	306	10	36
7	0.80	0.07	1.00	0.16	0.36	0.26	1250	274	10	134
8	1.20	0.08	0.35	0.16	0.48	0.22	1350	78	10	62
9	2.16	0.18	2.13	0.38	0.55	0.21	950	388	10	106
10	1.37	0.15	1.38	0.26	0.91	0.13	1150	298	10	38
Av.	1.27	0.10	1.09	0.23	0.52	0.17	955	406	9.50	65

adequate.

The plant zinc values ranged from 13 to 40 ppm (av. = 26.7 ppm) and 16 to 32 ppm (av. = 22.5 ppm) at 30 and 60 days after transplanting. The zinc values at a later growth stage were lower than at the earlier, perhaps because of a dilution effect. Also 21.7 and 34.8% of the total sites were deficient in zinc at two growth stages, respectively.

The zinc deficiency symptoms were also observed by scientists at the Rice Research Station, Rokupr, in upland rice soils where phosphorus was applied at 80 and 120 kg P_2O_5 /ha. ❧

The plant nitrogen content varied from 0.80 to 2.16% with an average of 1.27%, which was in the deficient range. Phosphorus values ranged from 0.07 to 0.18% with an average of 0.10%, indicating that 60% of the sites were in the deficient range. The potash values varied from 0.35 to 2.13% with an average of 1.09%, which is slightly higher than the critical level. Four sites were deficient in potash (see table).

The average values of sulfur (0.23%), calcium (0.52%), and magnesium (0.17%) were above the critical level.

Iron concentration levels averaged 955 ppm, which is in the excessive range. All sites were in the toxic range in iron. Bronzing may be due to an excess of iron in these soils (similar results were found in a nutritional survey of citrus orchards in Sierra Leone). Manganese levels averaged 406 ppm. All sites were in the excessive range.

The copper levels averaged 9.5 ppm, and the zinc levels 65 ppm — both above the critical level. ❧