in the soil of the incorporated azolla and azolla incorporated with nitrogen treatment was almost the same before the residuals study, the azolla-incorporated treatment yielded higher. ■

Azolla manuring and grain yield of rice

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Azolla at 10, 20, and 30 t/ha tested at this station gave significant increase in grain yield. To determine the response of the highest level of azolla that would give a significant yield increase, a replicated trial was conducted during 1979 thaladi season. Azolla at 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 t/ha was applied in the plots, and incorporated.

Data on grain yield of rice. Aduthurai, Tamil Nadu, India.

Azolla manure (t/ha)	Grain yield (t/ha)
0	3.9
10	4.4
20	5.0
30	5.6
40	6.2
50	6.7
60	7.3
70	7.6
80	7.8
90	8.0
100	8.0
C.D = (*P* = 0.05%)	465

A week later, the short-duration variety ADT31 was planted. Data on grain yield are in the table.

Yield increases in the short-duration ADT31 were significant up to 60 t azolla/ha. ■

Clay mineralogies and available phosphorus and exchangeable potassium status of some Philippine rice soils

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Clay fractions of 160 surface soil samples from 12 major rice-growing provinces in the Philippines were analyzed by x-ray diffractometry. The dominant compositions were vermiculite, beidellite, montmorillonite; all three minerals with and without halloysite; halloysite; and x-ray amorphous materials.

Table 1. Clay mineralogy in relation to exchangeable potassium in Philippine soils. IRRI, 1980.[a]

Exchangeable K (meq/100 g)	Dominant minerals	Major minerals	Minor minerals
< 0.1	Vermiculite, beidellite	–	Occasional halloysite
0.1–0.2	Vermiculite, beidcllite	–	Montmorillonite
0.2–0.5	Montmorillonite, halloysite, x-ray amorphous material	Montmorillonite, halloysite, x-ray amorphous material	–
> 0.5	Montmorillonite	Hydrous mica	Feldspars

[a]Dominant = > 50%, major = 20–50%, minor = < 20%, – = not observed.

Table 2. Clay mineralogy in relation to available phosphorus in Philippine rice soils. IRRI, 1980.

Olsen P (ppm)	Dominant/major minerals[a]	Minor minerals
< 5	Halloysite/kaolinite/x-ray amorphous material	Vermiculite/beidellite/ montmorillonite
5–10	Vermiculite/beidellite/ montmorillonite	Halloysite/kaolinite/x-ray amorphous material
> 10	Vermiculite/beidellite/ montmorillonite	Hydrous mica/feldspars

[a]Dominant = >50%, major = 20–50%, minor = <20%.

All soils with dominant vermiculite or beidellite, the exchangeable potassium content was less than 0.1 meq/100 g; when those 2 minerals were accompanied by montmorillonite as a minor component, the exchangeable potassium value rose to 0.2 meq/100 g. In almost all other soils the exchangeable potassium content exceeded 0.2 meq/100 g, reflecting an adequate level of available potassium (Table 1).

All soils containing halloysite or x-ray amorphous material had (Olsen) available phosphorus values below 10 ppm, indicating an inadequate available phosphorus status. The mean for samples with dominant halloysite was 2 ppm; the mean for samples with x-ray amorphous material or with halloysite as a secondary component was about 5 ppm. Olsen phosphorus values for almost all other soils containing dominant beidellite, vermiculite, or montmorillonite ranged from 10 to 50 ppm (Table 2), showing a high available phosphorus status.

Farmers' experience and trials by the Philippine Bureau of Soils showed severe potassium deficiency and lack of response to potassium fertilizers on many soils in Zambales, Pampanga, TarIac, and Nueva Ecija Provinces, in which vermiculite and beidellite were dominant. Phosphorus deficiency appeared related to the presence of halloysite or x-ray amorphous material in the clay fraction. Soils in which montmorillonite is dominant apparently have adequate supplies of both available phosphorus and potassium.

Because soils with dominant vermiculite and beidellite clay mineralogies fix potassium and ammonium fertilizers and those with dominant halloysite and x-ray amorphous material may inactivate phosphate fertilizers, fertilizer management practices suited to such soils should be developed. ■

Development of semidwarf dryland rice cultivars tolerant of iron chlorosis

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In Maharashtra State, the high yielding semidwarf varieties such as IR8, TN1, Jaya, and their progeny are traditionally