

## Available P Dynamics in a Tropical Soil Amended with Natural Organic and Inorganic Fertilizers



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Alleviating P deficiency with natural inorganic phosphates and organic residues has significant economic and environmental advantages in the tropics. But more insight into P dynamics in this system is required for successful adoption of the technology.

This was studied in an amended Ultisol (Bungor series) in laboratory incubation and glasshouse experiments. Treatments were a factorial combination of green manures, GMs (*Calopogonium caeruleum*, *Gliricidia sepium* and *Imperata cylindrica*) and phosphate rocks (PRs) from China and Algeria replicated 3 times. The GMs were labelled with  $^{33}\text{P}$  in the glasshouse trial. Olsen P, mineral N, exchangeable Ca and pH were monitored in the incubation at 0,1,2,4,8,16,32 and 64 weeks after establishment (WAE). Soil P fractions were also determined after 64 WAE. Phosphorus available from the amendments at 4, 8, 15, and 20 WAE, was quantified by  $^{33}\text{P}$ - $^{32}\text{P}$  double isotopic labelling in the glasshouse using *Setaria sphacelata* (Setaria grass) as test crop. Olsen P was unaffected by P fertilizers alone, and hardly changed within 16 WAE in the legume GM and legume GM+P treatments, which coincided with  $\text{NH}_4\text{-N}$  build-up and the elevation of soil pH. Afterwards Olsen P and exchangeable Ca increased as  $\text{NH}_4\text{-N}$  and soil pH declined. The legume GMs augmented reversibly sorbed P in the Al-P and Fe-P fractions resulting in high residual effect, whilst fertilizer-P was irreversibly retained. GM-P availability was very low (< 4%), but GMs enhanced PR solubility and mobilized soil P irrespective of quality, probably by the action of organic acids. Soil P mobilizing capacity was dependent on GM characteristics and ranked *Gliricidia*<*Imperata*< *Calopogonium*, and appears to be reduced by Ca content. The results are further evidence of the importance of the soil P mobilization capacity of organic components in integrated P management systems.



Glasshouse experiment on P dynamics in soil amended with organic and inorganic fertilizers

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