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## Comparing Static and Dynamic Soil Tests for the Assessment of Nutrient Availability in a Low-fertile Lowland Rice Soil in the Red River Delta, Vietnam

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### Abstract

Little is known about suitable soil analyses methods for intensively cropped lowland rice soils of low fertility status. Therefore, we evaluated the phytoavailability soil test (PST) in comparison to standard laboratory methods (resin bags, chemical extractions) in different treatments of a long-term cropping system experiment on a degraded Acrisol. The trial evaluated three cropping systems (rice—soybean—rice, soybean—rice—maize, and rice—rice—maize) and seven combinations of N, P and K and FYM. Using the PST, the resin absorption quantities (RAQ) determined after 14 days of *in situ* installation of resin capsules indicated nutrient supply capacities for rice that were high for P, in the medium range for K and Fe, but low to very low for Ca, Mg, and Mn. Mixed ion-exchange resin bags extracted 12—26 %, 17—22 %, and 9—18 % of the exchangeable K, Ca and Mg soil contents, respectively, indicating a relatively high initial nutrient release from the soil. Resin capsules predicted the total P and K uptake of lowland rice better than standard soil tests. The correlation was similar for log(RAQ P) ( $r=0.98$ ) and Olsen-P ( $r=0.95$ ), while log(RAQ K) predicted 83 % ( $p < 0.01$ ) and exchangeable K only 62 % ( $p < 0.05$ ) of the variation in total plant K. It may be concluded that ion exchange resins provide better estimates of soil nutrient availability than routine soil tests and may be used to guide a site- and system-specific nutrient management approach. In addition, the PST allows the determination of all essential nutrient elements without the need of multiple soil extractions and does not require collecting, drying, grinding and sieving of soil samples.

**Keywords:** Acrisol, ammonium-acetate extraction, phytoavailability soil test, plant uptake, resin bags