# Co-Composted Chicken Litter Biochar Increases Soil Nutrient Availability and Yield of *Oryza sativa* L.


## ABSTRACT

Intensified cultivation of rice has accelerated weathering of most tropical acid soils leading to significant loss of base cations. In most developing countries, rice yield is low and this results in its production being costly because productivity versus labor is low. The objectives of this study were to (i) enhance soil chemical properties, nutrient uptake, and grain yield of rice grown on a mineral tropical acid soil using agro-wastes; (ii) determine the agro-waste (chicken manure, cow dung, forest litter, and Leucaena) that has the potential to significantly increase rice yield; and (iii) determine the residual effects of the organic soil amendments produced from the agro-wastes on soil and rice productivity. The treatments used in this three-cycle field study were (i) soil without amendments (S0); (ii) prevailing recommended rates for fertilizers (NPK-Mg); (iii) biochar–forest litter compost (OSA1); (iv) biochar–chicken litter compost (OSA2); (v) biochar–cow dung compost (OSA3); (vi) biochar–Leucaena compost (OSA4); and (vii) biochar–Leucaena–chicken litter compost (OSA5). Standard procedures were used to determine the plants' rice growth, grain yield, plant nutrient concentrations and uptake, and selected soil chemical properties. The use of organic soil amendments (OSA1 to OSA5) significantly improved the soil chemical properties, rice plant growth, nutrient uptake, and grain yield compared with the prevailing method of cultivating rice (NPK-Mg). The application of organic soil amendments reduced the use of inorganic N, P, K, MgO, and trace elements fertilizers up to 25%, 100%, 64%, 100%, and 100%, respectively. The organic soil amendments with Leucaena significantly increased rice grain yield of OSA5 at 11.17, 13.11, and 10.06 t ha−1 in the first, second, and third cropping cycles, respectively. The residual effect of the organic soil amendments also improved rice plant growth, nutrient uptake, and rice grain yield although these were slightly reduced as compared to those of the two previous cropping cycles, the afore-stated treatments were superior to the prevailing method of cultivating rice (NPK-Mg). Transforming agro-wastes into organic soil amendments can improve tropical mineral acid soils and rice productivity.