# DETERMINATION OF OPTIMUM APPLICATION RATES OF BIOCHAR FOR IMPROVED MACRONUTRIENT RETENTION IN COCONUT-GROWING SOILS

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**Abstract:** This study aimed to determine the optimal biochar application rates to improve soil nutrient reserves and fertility in coconut-growing soils in Sri Lanka. The experiment utilized two soils commonly associated with coconut-growing areas: Madampe (Sandy) and Andigama (Sandy loam). Low nutrient reserves and poor soil fertility management in coconut cultivation have limited coconut productivity. Biochar is one of the best solutions to improve soil nutrient reserves and fertility over time. This study explored the best biochar application rate for coconut-growing soils to reduce leaching losses and macronutrient enrichment. Gliricidia wood biochar (BC) pyrolyzed at 700 °C was used to amend the 0-15 cm topsoil in PVC columns at the rates of 0% BC, 1% BC, 2% BC, and 3% BC (w/w) with recommended doses of inorganic fertilizer. Columns were arranged in a Completely Random Design (CRD) with three replicates and leached at 2-week intervals over five months. Our findings revealed two distinct scenarios for sandy and sandy loam soils. Considering the retention of macronutrients in sandy loam soil treated with 2% and 3% biochar, the retention order was P > K > Mg > Ca. However, soil N was not changed significantly (P > 0.05) with the amount of biochar amendment. Similarly, in sandy soil, 3% BC treatment demonstrated the sequence P>Mg>N=Ca, although soil K did not differ significantly (P>0.05) with biochar amendment rate. Even though a one-time application of 3% biochar might seem like a recommendation for coconut-growing sandy soils, it's essential to consider the economic viability. Therefore, the 2% application rate appears to be more suitable for both sandy and sandy loam soils. However, it is important to conduct long-term field experiments on major coconut-growing soils to validate these recommended application rates.

**Keywords:** Biochar, Coconut-growing soils, Macronutrients, Sandy, Sandy loam