**Estimation of soil properties with mid-infrared soil spectroscopy across yam production landscapes in West Africa**

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**Abstract**

Low soil fertility is challenging the sustainable production of staple crops in the yam belt of West Africa. Quantitative soil measures are needed to improve crop fertilization management with respect to biogeochemical conditions in the region. We developed and tested a mid-infrared (mid-IR) soil spectral library to enable timely and cost-efficient assessments of soil properties. Our library included 80 field composite soil samples in four landscapes (10km x 10km) across a gradient from humid forest to savanna, and 14 additional samples from one landscape that had been sampled within the Land Health Degradation Framework. We derived partial least square regression models to estimate the soil properties with spectra. Five times repeated 10-fold cross-validation was used to evaluate the models. The models produced accurate estimates of total carbon, total nitrogen, total sulfur, total iron, total aluminum, total potassium, total calcium, exchangeable calcium, effective cation exchange capacity, bioavailable iron and clay content (*R*2 > 0.75). The estimates of total zinc, pH, exchangeable magnesium, bioavailable copper and manganese were less accurate (*R*2 > 0.5). Our results suggest that mid-IR spectroscopy can be used to reliably assess the regional-scale variation of soil properties across a wide range of soil biophysical conditions within the studied landscapes.