

Physical and Chemical Properties of Soils under Contrasting Land Use Systems in Derived Savannah Agro – Ecological Zone of South-eastern Nigeria

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Abstract

The evaluation of the impact of six agricultural land use systems on the fragile and impoverished soils of derived savannah agro-ecological zone in south-eastern Nigeria was carried out with the aim of understanding the response of the soil to different management practices over time. Soil physical and chemical properties were used to evaluate the influence of Forestland, Grassland, Cashew Plantation, Rangeland, Continuously Cultivated Land within Homestead and Continuously Cultivated Land outside Homestead on the soil fertility status. The soil chemical properties studied were soil pH, organic carbon, total nitrogen, available P, exchangeable base (Ca^{2+} , Mg^{2+} , K^+ and Na^+) and exchangeable acidity (H^+ and Al^{3+}). The physical properties were aggregate stability, mean weight diameter, water dispersible clay and clay flocculation index. Two fractions of soil particles size (0.25mm and 2mm) were used to assess the influence of land use and particle size interaction on soil organic carbon, total nitrogen (TN) and available P. Organic carbon (OC) varied significantly ($P < 0.05$) with land use, but not with particle size, while TN was not influenced by both the land use and particle size. The available phosphorus (Av. P) varied significantly ($P < 0.05$) with only the particle size. Ranking the land use systems based on soil chemical properties other than pH and exchangeable acidity, the fertility status of the soils followed the order; Rangeland > Grassland > Forestland > Continuously Cultivated Plots within Homestead > Cashew Plantation > Continuously Cultivated Plots outside Homestead. There was no significant interaction between land use system and soil particle size fractions. Thus, OC, TN, and available P at the various land use systems were independent of the soil particle size fractions. Based on the soil physical properties, land use systems were rated as follows; Cashew Plantation > Grassland > Continuously Cultivated Plots outside Homestead > Forestland > Rangeland > Continuously Cultivated Plots within Homestead. The soil fertility seemed to be better enhanced by grassland, rangeland and forestland than the other land use systems.

Key words: Land use systems; Aggregate stability; derived savannah; particle size

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