Soil Particles In Agricultural Landscapes Of A Derived Savanna In Southwestern Nigeria And Implications For Selected Soil Properties

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Abstract

The vast area of savanna ecology in Africa plays a significant role in food production, making a study of soils in this zone very important. Therefore, soil physical and chemical properties of 14 soil profiles were studied in a derived savanna zone of southwestern Nigeria on 2 toposequences at 2 locations (Ibadan and Alabata), which were 20 km apart. Six soil profiles were studied at Ibadan while 8 were studied at Alabata. Morphological descriptions of profiles were carried out. Data collected included particle size distribution, bulk density, clay dispersion, water retention characteristics, pH, organic carbon, exchangeable K, Ca, Mg and available P. Soil profiles along the toposequences were well-developed with depths exceeding 180 cm, except for one profile at the lower slope position where an indurated plinthic layer was found at 68 cm depth. The horizons were easily distinguished with color, texture and consistency. Total sand, with the main component being coarse sand, decreased with depth from 813 to 502 g kg− 1 at Ibadan and from 824 to 635 g kg− 1 at Alabata. The clay content increased with depth from 54 to 356 g kg− 1 at Ibadan and from 63 to 279 g kg− 1 at Alabata. Gravel concentration was highest for soil horizons found between 20 and 102 cm depth. Also, bulk density increased with soil depth from 1.35 to 1.51 g cm− 3 at Ibadan and from 1.38 to 1.64 g cm− 3 at Alabata, indicating that subsoil horizons were more compact due to higher clay and gravel contents, and sticky consistency. The A horizon had a significantly higher water content at water potentials > 2 kPa while the subsoils had higher water content at < 2 kPa. Soil organic C and total N decreased with soil depth at both locations with the A horizon having significantly higher organic C (7.10–12.69 g kg− 1) and total N (0.84–1.2 g kg− 1) than deeper horizons (1.9–4.47 g kg− 1 for organic C and 0.12–0.58 g kg− 1 for N). Particle size distribution was significantly different among the slope positions at both locations. Also, soil water retention, soil pH, total N and exchangeable K were distinguishing parameters among slope positions. The interaction of soil depth and slope position was, however, not significant suggesting that processes influencing soil horizon development acted independently in the vertical and lateral directions. Soil pH was the only attribute that distinguished the toposequences between the two locations.

Keywords: Derived savanna; Soil profile; Physical and chemical properties; Agricultural landscape