Changes in a Tropical Ultisol Under Different Management Systems in Southeastern Nigeria: 1. Soil Physical and Hydrological Properties

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Abstract

Five soil management practices were compared to evaluate their effects on soil physical and hydrological properties in a cassava/maize intercrop. The management practices compared over four years (2003 – 2006) at Umudike in the rainforest zone of southeastern Nigeria were fallow-grazing-cropping (FGC), traditional farming (TF), no-tillage (NT), minimum tillage (MT) and conventional tillage (CT). The FGC practice involved the one-year establishment of grass-legume fallow followed by one-year grazing by goats followed by two years cropping using the traditional tillage system. The TF treatment involved clearing, burning of the thrash and planting on flats using hoe; NT treatment involved no disturbance of any form on the land, while MT treatment involved ploughing the soil once. The CT treatment involved disc ploughing followed by harrowing. Management practices did not affect the soil texture. The high- est sand contents of 81.8% and 80.8% were obtained in the 0 – 0 cm and 10 – 20 cm depths of the CT treatment respectively. The highest clay loss of 8.8% (compared to the initial clay content) also occurred in the 0 – 10 cm depth of the same treatment. Bulk density averaged over the study period showed that FGC treatment produced the lowest value of 1.51 Mg m-3, while CT treatment had the highest value of 1.57 Mg m-3 for the 0 – 10 cm depth. The highest mean total porosity of 41.7% was obtained in the FGC treatment, while CT treatment had the lowest value of 37.6%. Soil total porosity averaged over the four years and three depths were of the order FGC>MT=NT=TF>CT. While soil water suction at 15cm depth started rising by the first week of November, the rise in suction was by the third week of November for 30 cm and 60 cm depths for all the management practices.

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