

# Short-term changes in soil properties under tillage systems and their effect on sweet potato (*Ipomea batatas* L.) growth and yield in an Ultisol in south-eastern Nigeria

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**Abstract.** Tillage influences soil quality via its effects on soil physical, chemical, and biological properties, which in turn affect crop productivity. This study evaluates the effects of conventional (CT) and no-till (NT) systems on (1) soil temperature, bulk density, soil gravimetric water content (GWC), saturated hydraulic conductivity (Ksat), soil organic carbon content (SOC), and total nitrogen (N), and (2) growth and yield of 3 sweet potato (*Ipomoea batatas*) (L) Lam varieties (87/00/87, ex-Igbariam, and 8164). A field experiment was conducted in 2005 and 2006 on a Typic paleudult in south-eastern Nigeria. The experimental plots comprised 6 treatments (CT 87/00/87 variety, CT ex-Igbariam, CT 8164, NT 87/00/87 variety, NT ex-Igbariam, NT 8164 variety) laid out in the field using randomised complete block design replicated 3 times. Soil temperature was 1–2°C higher in CT plots during early stages of crop development. CT plots had significantly lower soil dry bulk density (1.30–1.35 Mg/m<sup>3</sup>) than NT plots. Soil GWC was higher, whereas Ksat was lower, in NT plots than CT plots at 35 and 65 days after planting (DAP) for both planting seasons. NT plots had a 0.22–0.26-fold increase in SOC and 16–27% higher N content compared with CT plots at 35 and 65 DAP. The 3 varieties of sweet potato used did not significantly influence soil properties at the different times after planting. Sweet potato yield obtained in CT 87/00/87 variety (21.7–24.9 Mg/ha) for both seasons was higher ( $P < 0.05$ ) than sweet potato tuber yield obtained from NT ex-Igbariam plots (which had the lowest yield) by about 88%. For each variety, CT plots has significantly higher yield than NT plots. This study showed that although NT practices conserved soil moisture, decreased soil temperature, reduced water infiltration, and increased SOC and soil total N content when compared to CT plots, the reduction in soil compaction at the early stages of crop development (0–65 DAP) in CT plots had a more positive impact on tuber yield and masked the positive effect of other soil productivity parameters for this crop.

**Additional keywords:** soil properties, sweet potato varieties, tillage practices, tropical agro-environment.

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