

Accumulation and Distribution of Soil Organic Carbon in Oxisols, Tshivhase Estate, Limpopo Province

Authors : M. Rose Ntsewa, P. E. Dlamini, V. E. Mbanjwa, R. Chauke

Abstract : Land-use change from undisturbed forest to tea plantation may lead to accumulation or loss of soil organic carbon (SOC). So far, the factors controlling the vertical distribution of SOC under the long-term establishment of tea plantation remain poorly understood, especially in oxisols. In this study, we quantified the vertical distribution of SOC under tea plantation compared to adjacent undisturbed forest Oxisols sited at different topographic positions and also determined controlling edaphic factors. SOC was greater in the 30-year-old tea plantation compared to undisturbed forest oxisols and declined with depth across all topographic positions. Most of the SOC was found in the downslope position due to erosion and deposition. In the topsoil, SOC was positively correlated with heavy metals; manganese ($r=0.62-0.83$; $P<0.05$) and copper ($r=0.45-0.69$), effective cation exchange capacity (ECEC) ($r=0.72$) and mean weight diameter (MWD) ($r=0.72-0.73$), while in the subsoil SOC was positively correlated with copper ($r=0.89-0.92$) and zinc ($r=0.86$), ECEC ($r=0.56-0.69$) and MWD ($r=0.48$). These relationships suggest that SOC in the tea plantation, oxisols is chemically stabilized via complexation with heavy metals, and physically stabilized by soil aggregates.

Keywords : oxisols, tea plantation, topography, undisturbed forest

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