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Soil macrofauna and land use in Mékrou watershed: FLR implications

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Abstract

Soil degradation and drought threaten the sustainability of livelihoods in rural Benin, where deforestation for agricultural purposes may create a vicious cycle. Forest and Landscape Restoration (FLR) practices – such as agroforestry – could mitigate these effects in the region. However, the influence of these practices on soil ecosystem services through these region watershed, particularly soil living hoods communities, remains insufficiently studied. This study assessed the influence of three land use types (2–4-year-old cropland, fallow land and shea tree agroforestry) on soil related fauna through the altitudinal gradient of the Head of Mékrou watershed. Surface-active soil macrofauna abundance, taxonomic composition and Community richness, varied significantly across watershed sections ($p \leq 0.001$). On the other hand land use influenced abundance, with lower values recorded in cultivated land than in agroforestry systems ($p = 0.041$). Community composition was significantly structured by watershed location (Upper part, middle and down stream) (PERMANOVA, $R^2 = 21.7\,\%$, $p = 0.001$), and several indicator taxa were associated with specific watershed sections. This suggest that the FLR practice of preserving shea and néré trees in agroforestry parklands and natural regeneration promotes the presence of surface macrofauna, thus contributing significantly to improved long-term soil quality compared to conventional cropping systems. This makes them relevant early indicators of future developments not only in soil quality but also in the state of microclimates within watersheds. In the context studied, agroforestry systems and short-term natural regeneration therefore offer greater potential than continuous cultivation for the sustainable maintenance of soil health and associated ecosystem services. These results offer valuable insights for guiding forest landscape restoration (FLR) strategies implemented by local actors, particularly in similar systems in sub-Saharan Africa and other subtropical regions.

Keywords: Agricultural sustainability, agroforestry parkland, forest and landscape restoration (FLR), hydrological unit, macrofauna, sub-Saharan Africa

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