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"Reconcile land system changes
with planetary health"

Impact of forest landscape restoration practices on soil physical properties dynamics: The case of the head of Mékrou watershed in Benin

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Abstract

Deforestation and forest loss have led to the degradation of soil health, compromising essential ecosystem services such as water regulation and biodiversity support. While forest landscape restoration (FLR) efforts are ongoing, more research is needed to evaluate their effectiveness in improving soil health, particularly through changes in soil physical properties. This study addresses this gap by assessing the impact of FLR practices on bulk density, organic matter content, and pH, key indicators of soil health in the head of Mekrou watershed. Soil samples were collected at three depths (0–20 cm, 20–40 cm, and 40–60 cm) across different restoration types within the watershed, namely agroforestry, fallow, and riparian restoration. Laboratory analyses were conducted to measure organic matter content, bulk density, and pH. Organic matter content was highest under agroforestry systems, particularly in the 0–20 cm soil layer. Bulk density was generally higher in fallow areas compared to other restoration types, with no significant variation across soil depths. Concerning pH, it was not significant by restoration type but was significantly higher at 40–60 cm depth layer. Overall, FLR practices have a significant impact on improving soil physical properties, although the effectiveness varies by restoration type and soil depth. These variations may be influenced by interactions with other land uses, such as cropping systems. These findings provide valuable insights for policymakers and land managers, helping them prioritise restoration interventions based on the vulnerability of soils to human activities. Additionally, the study highlights the potential benefits of FLR practices for enhancing soil health in watersheds like the head of Mekrou watershed. By demonstrating the effectiveness of FLR interventions, this research supports evidence-based decision-making and promotes public awareness of the crucial role that sustainable land management plays in maintaining soil quality, agricultural productivity, and environmental resilience.

Keywords: Agroforestery, Benin, landscape restoration, Riparian restoration, soil health

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