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Interrelationship of Carbon Sequestration, Soil Fertility, and Microbial Indices as Influenced by Long-Term Land Uses in Lower Himalayan Region, India

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The study was conducted to determine the long-term impact of different land uses on carbon sequestration, soil fertility, and microbial indices and to establish their interrelationship in a light-textured hyperthermic Udic Ustochrept. Soil samples were collected from existing land-use systems of (1) Eucalyptus tereticornis, *(2)* Terminalia chebula, *(3)* Acacia nilotica, *(4)* Leucaena leucocephala, *(5)* Embilica officinalis, *(6)* Zizyphus *spp., and (7) maize–wheat rotation from depths of 0–15, 15–30, and 30–45 cm and examined for pH; organic carbon (OC); electrical conductivity (EC); available nitrogen (N), phosphorus (P), and potassium (K); micronutrients; microbial biomass carbon (MBC); microbial biomass nitrogen (MBN); and microbial biomass phosphorus (MBP). High-density plantations of* Eucalyptus teriticornis *had a greater potential in sequestering aboveground carbon (472.37 Mg* ha^{-1}*), compared to widely spaced trees of* Acacia nilotica *(376.05 Mg* ha^{-1}*).* Eucalyptus teriticornis *exhibited the greatest impact in increasing soil OC in all depths, followed by Acaccia* nilotica *and* Terminalia chebula, *and the lowest was in agriculture (0.778, 0.749, 0.590, and 0.471%, respectively, in surface soil). Available zinc and iron contents were greatest under* Eucalyptus tereticornis, *followed by* Acacia nilotica, Zizyphus mauritiana, Embilica officinalis, Terminalia chebula, *and* Leucaena leucocephala. *The MBC and MBN were greatest in* Eucalyptus tereticornis, *followed by* Acacia nilotica, *and lowest in agriculture. Correlation matrix revealed significant and positive relationships between carbon sequestered with OC, MBC, MBN, and MBP.*