

Soil Carbon and Nitrogen Stocks under contrasting Land-Use Systems of a Western Himalayan Valley

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Land use system influence soil organic carbon (SOC) and nitrogen (N) which are indispensable for soil health and food security. Different types of land use have different capacity to recycle SOC and TN which is necessary to understand for sustainable ecosystem productivity. In this context, surface (0-15 cm) and sub-surface (15-30 cm) soil was sampled from five different land use types (e.g., cropland, paddy, apple orchard, grassland and forest) of Leepa valley, District Hattian Bala, Azad Jammu and Kashmir (AJK) to assess SOC and TN stocks and associated soil properties. The results showed that, irrespective of soil depth, both SOC and N varied significantly ($p < 0.05$) across the land-use systems, and was highest in soils under forest and lowest in paddy soils. On the other hand, SOC and N contents declined significant ($p < 0.05$) with increasing soil depth being highest in surface soils. The mean total SOC and N stocks ranged from 22.12 to 42.36 Mg ha⁻¹ and 2.04 to 3.68 Mg ha⁻¹ in surface soils and 18.06 to 40.89 Mg ha⁻¹ and 1.95 to 3.54 Mg ha⁻¹ in sub-surface soils being highest under forest land use, respectively. The majority of the SOC and N were associated with macro-aggregates (Ma) in the 0-15 cm layer, with micro-aggregates (Mi) in the 15-30 cm layer, while the silt + clay fraction contained the least SOC and N across all land uses and soil depths. In terms of soil properties, bulk density (pb), pH and electrical conductivity (EC) were directly proportional to soil depth. The soil pH, EC, and pb were higher in sub-surface soil than surface soils. The results of the present study showed land use impact on SOC, TN and associated soil properties. The findings of the study could be used to restore SOC and TN for sustainable livelihood security in the valley.

Keywords: Land use system; Soil organic carbon; Total nitrogen; Soil properties; Azad Kashmir