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Long term effects of natural and plantation forests on carbon sequestration and soil properties in mid-hill sub-humid condition of Himachal Pradesh, India

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Abstract

Natural forests of *Quercus*, *Pinus roxburghii*, Oak and pine, mixed broad leaved, *Acacia catechu*, scrub and grassland and eight different planted tree species *viz.*, *Quercus leucotrichophora*, *P. roxburghii*, *Acacia catechu*, *Acacia mollissima*, *Albizia procera*, *Alnus nitida*, *Eucalyptus tereticornis* and *Ulmus villosa* were studied for carbon sequestration and soil properties. In natural forest, maximum and minimum biomass was produced in *P. roxburghii* (214.90 t ha⁻¹) and grasslands (10.87 t ha⁻¹), respectively. Maximum carbon sequestration was in *P. roxburghii* (107.5 2.43 t ha⁻¹) and minimum in grassland (5.44 t ha⁻¹). In natural forest, detritus carbon sequestration varied from 0.49 t ha⁻¹ in grassland to 12.24 t ha⁻¹ in mixed broad leaved. Soil carbon sequestration ranged from 156.64 t ha⁻¹ in grassland to 238.53 t ha⁻¹ in natural forest of *A. catechu*.

increasing atmospheric concentrations of carbon (CO₂, CH₄, CO *etc.*) may be mitigated by increasing C sequestration in vegetative biomass and in soils. Soils are of major significance for carbon sequestration, as they contain an estimated 2400 to 2500 Gt (Gigatons) of OC to a depth of 2 m, which is about 3 times that contained in living biomass (Kirschbaum, 2000).

Carbon sequestration in terrestrial ecosystems, especially in soil, is a win-win strategy for developing countries, where land use change and agricultural intensification is most frequent (Lal, 2004). These stocks are dynamic, depending upon various factors and processes operating in the systems, the most significant being land use, land-use changes, soil erosion, and deforestation. The objective of study was to assess the long term effects of natural and plantation forests on carbon sequestration and soil properties in Indian sub-