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Carbon allocation, sequestration and carbon dioxide mitigation under plantation forests of north western Himalaya, India

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Abstract. The organic carbon and soils of the world comprise bulk of the terrestrial carbon and serve as a major sink and source of atmospheric carbon. Increasing atmospheric concentrations of green house gases may be mitigated by increasing carbon sequestration in vegetation and soil. The study attempted to estimate biomass production and carbon sequestration potential of different plantation ecosystems in north western Himalaya, India. Biomass, carbon density of biomass, soil, detritus, carbon sequestration and CO_2 mitigation potential were studied under different plantation forest ecosystems comprising of eight different tree species: *Quercus leucotrichophora, Pinus roxburghii, Acacia catechu, Acacia mollissima, Albizia procera, Alnus nitida, Eucalyptus tereticornis* and *Ulmus villosa*. Above (185.57±48.99 tha^{-1}) and below ground (42.47±10.38 tha^{-1}) biomass was maximum in *Ulmus villosa*. The vegetation carbon density was maxium in *Albizia procera* (118.37±1.49 tha^{-1}) and minimum (36.50±9.87 tha^{-1}) in *Acacia catechu*. Soil carbon density was maximum (219.86±10.34 tha^{-1}) in *Alnus nitida*, and minimum (170.83±20.60 tha^{-1}) in *Pinus roxburghii*. Detritus was higher in *Pinus roxburghii* (6.79±2.0 tha^{-1}). Carbon sequestration (7.91±3.4 tha^{-1}) and CO_2 mitigation potential (29.09±12.78 tha^{-1}) was maximum in *Ulmus villosa*. Pearson correlation matrix revealed significant positive relationship of ecosystem carbon with plantation biomass, soil carbon and CO_2 mitigation potential. With the emerging threat of climate change, such assessment of forest and soil carbon inventory would allow to devise best land management and policy decisions for sustainable management of fragile hilly ecosystem.