

The dynamic of Carbon Pool along the elevation gradients in Subtropical Forests in Pakistan.

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Abstract: [Objective] To assess the impact of elevation gradients on forest composition, diversity, and carbon pools in the Bagh Drush Khel Forest area.

To evaluate how different tree diameter classes influence forest growth, structure, and carbon storage capacities across varying elevations.

[Methods]: In this study, forest inventory was conducted in the Bagh Drush Khel Forest area, Swat. Data collection included measurements of tree diameter at breast height (DBH), species identification, and soil sampling at various elevations. Carbon pools were estimated using biomass equations for live trees, litter and deadwood. Statistical analyses were performed to determine the relationships between elevation gradients, diameter classes, and carbon stocks, focusing on species diversity, soil organic carbon (SOC) and overall biomass.

[Results]: The study revealed significant differences in species composition, diversity, and carbon pools along elevation gradients in the Bagh Drush Khel Forest area. At lower elevations, *Eucalyptus camaldulensis* was dominant, while *Pinus roxburghii* dominated higher elevations. Species diversity was negatively associated with elevation ($R^2 = -0.44$; $P < 0.05$). Soil organic carbon (SOC) showed a positive correlation with diameter classes ($R^2 = 0.37$; $P < 0.05$) but was non-significant with elevation. Litter biomass positively correlated with elevation ($R^2 = 0.25$; $P < 0.05$) and diameter ($R^2 = 0.11$; $P < 0.05$), while deadwood biomass showed a negative correlation with elevation ($R^2 = -0.25$; $P < 0.05$). The highest carbon stock was 845.89 t C/ha at low elevations, decreasing to 516.27 t C/ha at high elevations, with an overall carbon stock of 2016.41 t C/ha.

[Conclusion]: The elevation gradients significantly influence species composition, diversity, and carbon pools in the Bagh Drush Khel Forest area, with lower elevations having higher carbon stocks. This study highlights the importance of considering both elevation and diameter classes in forest carbon assessments to guide sustainable forest management practices.

Key words: Elevation gradients, DBH classes, Forest Inventory, Important Value Index, Diversity, Carbon Pool.