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## RELATIONSHIP BETWEEN CROWN DENSITY AND SOIL ORGANIC CARBON LEVELS IN PROTECTED FORESTS OF MIDHILLS OF NEPAL

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### Abstract

*This study evaluates the impact of crown density on Soil Organic Carbon (SOC) in Shivapuri Nagarjun National Park (SNNP), Nepal. SOC levels vary across forest types due to differences in tree species, soil, and topographic factors. The research quantifies carbon stocks and develops predictive models incorporating crown density as key variables. While trees are known to enrich soil carbon, the specific role of crown density in SOC dynamics remains insufficiently understood, requiring further research for effective management. In this study, a total of 108 plots from four forest types were randomly selected using stratified random sampling, extracting ~400 grams of soil with 5.7 cm diameter, 10 cm height soil corer. Samples were collected in zipped polythene bags and analyzed in the laboratory. Field measurements followed FRA (2015) guidelines, and SOC concentrations were determined using the Walkley-Black wet oxidation method (1934). Data analysis in R included ANOVA tests for model validation. Total SOC stock was 219.403 tha<sup>-1</sup> across four forest types in SNNP, with a significant positive correlation between SOC and crown density ( $p = 2.2 \times 10^{-16}$ ). Among five models tested, Model Equation 3 was the best fit, with higher adj.  $R^2$  and lower RMSE values. Results showed crown density significantly influences SOC stock across all forest types. These findings provide valuable insights to the local communities, park authorities, and researchers by enhancing understanding of soil and vegetation characteristics. Forest management should also consider tree variables like height, diameter, and stand age to optimize carbon stock assessment and management.*

### Author Keywords

Crown cover, Forest soil, Predictive modeling, Protected forest, Soil organic carbon.

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