



Estimation of the Soil Organic Carbon (SOC) Content of Mangroves in Human-Disturbed and Undisturbed Areas in Rekawa Lagoon, Southern Sri Lanka

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Mangrove ecosystems store carbon in large quantities within their ecosystem pool. As a ‘Blue carbon ecosystem’, mangroves play a crucial role in sequestering carbon dioxide (CO₂) and maintaining the balance of atmospheric CO₂ levels. However, anthropogenic disturbance is a major threat to mangrove areas that directly affects ecosystem functions. Therefore, the current study aims to estimate the Soil Organic Carbon (SOC) content of mangroves in human-disturbed and relatively undisturbed areas in Rekawa Lagoon, Southern Sri Lanka. Soil samples were collected using the transect method from the three regions: fringe, middle, and back mangrove regions using a soil corer (50cm length and 3.4cm diameter). In total, 216 soil samples were collected in two depth ranges: 0-25cm and 25-50cm and analyzed using the Loss on ignition (LOI) method. T-test and ANOVA test were performed to analyze the data using R-4.2.2 statistical software. The total average SOC contents in the 0-50 cm depth range of the relatively undisturbed and disturbed mangrove areas were 312.85±14.76 Mg C ha⁻¹ and 260.52±26.34 Mg C ha⁻¹, respectively ($p < 0.05$). The relatively undisturbed mangrove areas showed higher average SOC content across all regions when compared to the disturbed areas. The average SOC contents of the fringe, middle, and back, in the relatively undisturbed areas were 279.50 ± 21.88 Mg C ha⁻¹, 312.56±13.06 Mg C ha⁻¹, 346.47±34.54 Mg C ha⁻¹ respectively, and the disturbed areas were 207.59±33.65 Mg C ha⁻¹, 238.22±36.00 Mg C ha⁻¹, and 335.74±37.66 Mg C ha⁻¹, respectively ($p < 0.05$). The current study concludes that anthropogenic disturbances significantly lower the SOC content. The reduction of the SOC content in disturbed areas suggests that anthropogenic disturbances could lead to the potential release of approximately 52.33 Mg C ha⁻¹ from the topsoil (0–50 cm) into the atmosphere. Further, the study emphasizes the importance of conserving undisturbed mangrove areas, with insight towards climate change mitigation.

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