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Topographical Effects on Soil Carbon in a High Grown Tea Plantation of Nawalapitiya

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Abstract

Soil organic carbon (SOC) storage is an important component of global carbon cycle and climate change mitigation. SOC storage depends on climate, topography and soil properties. The main objective of this research was to quantify average soil SOC content across the toposequence of a selected mountain terrain. The secondary objective was to compare the impact of microclimatic variables and slope angle on soil organic carbon content. It was hypothesized that mountainous locations with an overall high percent slope have lower SOC than the mountainous locations with lower percent slope.

In this study, four slope positions across the toposequence of two tea fields (Field A and Field B) within Queensberry tea estate, Nawalapitiya were sampled for soil analyses. Measurements on micrometeorological variables (soil and air temperature, relative humidity, wind velocity, light intensity), litter and soil cores were taken in the field, and soil parameters including soil moisture, pH, texture and SOC stocks were analyzed in the laboratory.

The overall average soil organic carbon stock in the studied soils was 159.85 t/ha .The overall percent slope of field A (25 percent) was higher than that of field B (21 percent). A significant difference in soil carbon stock could be seen among the slope positions considered across the toposequence of each field ($P<0.0005$). Percent soil moisture ($P<0.0005$; adjusted $R^2=61.60\%$) and sampling fields (which differed in overall slope angle; $P<0.005$; adjusted $R^2=26.48\%$) have a notable effect on SOC stock while litter depth ($F=2.68$; $P>0.05$) have no significant effect on SOC stock. The SOC stock was higher at the field B (172.16 t/ha) which had the lower percent slope while SOC stock was lower at the field A (147.52t/ha) which had the higher percent slope. Therefor our hypothesis that mountainous locations with high percent slope would have lower SOC than the mountainous locations with lower percent slope was supported.

Overall, the SOC stocks were significantly different with regard to the differences in slope angle (as found for the two fields) and the slope position across the toposequence (as observed within each field) in the medium-gradient tea plantation considered in the current study. Among the microclimatic variables, only the moisture had a significant influence on the SOC stock.

***Keywords*:** SOC stock, Slope position, Slope angle, Percent soil moisture, Medium-gradient tea plantation