Present Status of Spatial Estimates of Soil Organic Carbon Stocks in Sri Lanka

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Soils store the Earth's largest terrestrial carbon (C) pool, and a small change in soil C pool can have dramatic consequences for atmospheric C concentration and the global climate. Countries are required to report changes in soil organic carbon (SOC) socks and associated anthropogenic greenhouse gas emissions under the Framework of the United Nations Framework Convention on Climate Change (UNFCCC). Therefore, detailed and accurate national inventories of soil organic carbon stocks are of a great importance in combating climate change and land degradation. Soil organic carbon stocks of Sri Lanka are represented in international data bases such as WISE30sec and SoilGrids250m. Moreover, several attempts have been made to estimate national soil organic carbon stocks but one peer reviewed international publication provides the most recent information of Sri Lankan national SOC stocks. Using advanced digital soil mapping techniques by coupling soil profile observations (n=120) with spatially explicit environmental datasets, spatial estimates of SOC stocks have been produced for surface 0–30 cm and subsurface 30–100 cm soil layers at a spatial resolution of 30 m. A considerable heterogeneity in SOC has been observed both in the surface (2.0–342.5 Mg ha–1) and subsurface (2.7–391.7 Mg ha–1) soil layers. Topography and climate were identified as main environmental controllers of the spatial distribution of SOC stocks in Sri Lanka. The wet zone retains the largest average C stock (110.2 Mg ha–1) in 0–100 cm depth followed by the intermediate zone (55.1 Mg ha–1) and the dry zone (41.6 Mg ha–1). Geographically weighted regression kriging derived maps of SOC stocks revealed that 0–100 cm soil layer of the tropical Island stores 500 Tg C contributing for 0.04% of the global SOC stocks. Further, this latest inventory of SOC revealed that global data bases have made a considerable over estimation of surface (upto 122%) and subsurface (upto 209%) SOC stocks in Sri Lanka. Digital soil mapping procedures have allowed to generate the most accurate spatial inventory of SOC up to date. However, a national initiative is needed to further improve the accuracies of national soil organic carbon stocks and greenhouse gas inventories.

Keywords: Soil organic carbon stocks, digital soil mapping, spatial estimates