Distribution of Soil Organic Carbon in Sri Lanka: A GIS Based Modelling Approach

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ABSTRACT

Soil Organic Carbon (SOC) is widely considered as an index of sustainable land management and SOC plays an important role in enhancing crop production and mitigating greenhouse gas emissions. Although information on SOC variability is prepared as continuous maps, SOC data are mostly available as discrete point data in Sri Lanka. In this study, Regression Kriging (RK) which combines both the correlation between a soil parameter and environmental parameters and the spatial autocorrelation in the residuals of the soil variable was tested for SOC mapping in Sri Lanka with available SOC point data using r-modelling language in R-Studio free software. SOC measurements from 240 locations for model development and 78 locations for model validation were used for the study. Thirty covariates, which influence SOC content including soil type, land use, climatic factors, topographic attributes, and Normalized Difference Vegetation Index (NDVI) were selected as environmental factors. The best model through step wise regression was selected followed by variable selection base on co-linearity, and evaluation of regression R^2 and adjusted R^2. The resulted best model with model-R^2 of 0.5 consisted with slope, soil type and monthly rainfall from January to April as covariates were the most significant predictors. The predicted maps of SOC at a 250 m resolution were produced using RK approach and the predicted SOC values ranged between 0.46 to 43.5 g/kg with a mean value of 4.2 and standard deviation of 2.7. Mapping accuracy as assessed with validation data set and found better accuracy with 0.79 for coefficients of determination (R^2) of the regression constructed for measured and the predicted SOC values.

Key Words: Digital mapping, Regression Kriging, Soil organic carbon

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