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SPATIAL VARIABILITY OF ORGANIC CARBON DESNITY IN CASHEW CULTIVATED RED LATOSOL SOILS OF SRI LANKA

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Soils contribute to regulate major biochemical cycles and in case of carbon (C) cycle it plays a vital role. In fact soil act as the largest terrestrial pool of C. Therefore, much attention is given to quantification of below ground C stocks or densities and uses this information for long term monitoring of C sequestration potential. In this study, an attempt was made to quantify the spatial variability and subsequently map (predict) the soil organic carbon (SOC) densities under cashew grown in Red Latosol soils. For this, a sub set of 22 ha was selected from the cashew seed garden in Elluwankulama, Puttalam district managed by Sri Lanka Cashew Corporation. A design-based sampling scheme namely stratified random sampling was adopted in this study. The stratification was carried out using compact geographic stratification (based on coordinates) with the aid of k-means clustering algorithm and the study area was divided into five strata. Total of 100 sampling locations were sampled where 20 sampling locations were allocated to each stratum. For all sampled locations, SOC density (kgm^{-2}) was calculated. In calculating of SOC density, a pedotransfer function (PTF) was used to predict the bulk density for sampling locations which did not measure bulk density in the field. Geostatistical approach was used to create higher resolution digital soil map of SOC density across the study site. Both PTF predicted bulk density values and geostatistical models were validated and statistically assessed using mean error (ME) and root mean square error (RMSE) indices.

Summary statistics revealed that mean SOC %, bulk density and SOC density reported as 0.96 % (±0.21), 1.43 gcm^{-3} (±0.03) and 4.12 kgm^{-2} (±0.82), respectively. Results revealed that the bulk density values predicted by PTF reported ME of 0.0041 gcm^{-3} and RMSE of 0.0044 gcm^{-3} values for Red Latosols in the study site. The optimum spatial model for SOC density was identified as spherical model which reported lowest RMSE (0.769 kgm^{-2}) and ME (0.00084 kgm^{-2}) values. The nugget-to-sill ratio showed a moderate spatial dependence for SOC density (0.43). Furthermore, results revealed that spatial auto-correlation (range parameter) of SOC density goes up to 82 m. This indicates that in future sampling of Red Latosols in order to characterize the spatial variability of SOC density, sampling interval should be maintained within 82 m. Predicted SOC density over the study area reported a mean value of 4.14 kgm^{-2} (±0.34) while 3.95 kgm^{-2} and 4.34 kgm^{-2} for quantiles one and third, respectively. Results further revealed that majority of the land extent (13.4 ha) in the study site reported SOC density in between 4.0 to 4.5 kgm^{-2}. The information generated in this study could be useful in national carbon accounting programs, carbon credit programs and for site specific fertilizer application.

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