

GEOSTATISTICAL MAPPING OF SELECTED SOIL CHEMICAL PROPERTIES IN RED LATOSOLS OF SRI LANKA

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Soils are highly variable even at the field scale and detailed studies of spatial variability of soil properties across the landscape are important to manage soils in a sustainable manner. Geostatistics enables to quantify the spatial variability and subsequently prepare detailed digital soil maps. In this study, an attempt was made to quantify the spatial dependence and map the selected soil chemical properties (*viz.* pH, exchangeable potassium (K) and available phosphorus (P)) in Red Latosols of Sri Lanka.

As the study site, 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 order to collect soil samples. The stratification was carried out using compact geographic stratification using k-means clustering algorithm and study site was divided in to five strata. Total of 100 sampling locations were sampled where 20 sampling locations were allocated to each stratum. For each considered soil chemical property we deployed a geostatistical approach to create higher resolution digital soils maps and to quantify the spatial distribution of respective soil chemical properties across the study site. The geostatistical models were cross validated and calculated mean error (ME) and root mean square error (RMSE) in order to assess the model quality.

Spatial model quality results obtained from the cross validation analysis revealed that, calculated ME values for soil pH (0.002) exchangeable K (0.403 ppm), and available P (0.004 ppm) were closer to zero which suggests unbiased estimation. In case of RMSE, all considered soil chemical properties reported lower values, which includes for soil pH (0.354), exchangeable K (13.581 ppm), and available P (1.673 ppm), respectively suggesting accurate estimation. In analysis of spatial dependence, nugget-to-sill ratio showed strongly structured spatial dependencies with negligible random variations for all considered soil chemical properties. Results further revealed that spatial correlation (range parameter) of pH, exchangeable K and available P reported as 31 m, 98 m and 54 m, respectively. This information is vital to carry out future soil sampling of Red Latosols in order to optimally characterize the spatial variability of considered soil chemical properties by maintaining sampling interval within the estimated range parameter. Furthermore, it was indicated that pH values in most areas of the study site varied from very strongly acidic (4.5) to strongly acidic (5). The exchangeable K and available P levels are mainly distributed within fairly low (58.5-78 ppm) to medium (78-97.5 ppm) and fairly low (7.5-15 ppm) categories, respectively.

Maps produced in this study provide valuable information on spatial distribution of considered soil chemical properties including nutrient status within the study site that can be used as a guide to conduct site specific fertilizer applications, intercropping and other management practices, in an environmental friendly manner.

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