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GEOSTATISTICAL ASSESSMENT OF CADMIUM LEVELS IN DRY ZONE SOIL CATENA

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Cadmium (Cd) is a trace metal, present in small amounts and excessive accumulation of Cd in soils can cause a human health risk through contamination of the food chain. Information on spatial distribution of Cd in soils enables the implementation of strategies to minimize human exposure and risks. The objectives of this study were to explore the spatial distribution of Cd and its relationship with soil properties, in a dry zone catena using geostatistical tools.

The selected dry zone catena is situated in Rajanganaya and consists of paddy, vegetable and uncultivated areas. Fifty eight georeferenced soil samples were systematically collected at a depth of 0 - 30 cm using gouge auger. Soil samples were analyzed for pH, electrical conductivity (EC), soil texture, organic matter (OM) content and total Cd concentration. Descriptive statistics for the data set was calculated using the SPSS statistical software. Variogram for Cd was calculated and a theoretical model was fitted using Variowin software. Map of Cd was developed using the ordinary kriging interpolation technique. Pearson correlation was calculated to identify the relationships between the total Cd concentration and soil properties.

Cadmium showed a normal distribution with the skewness of 0.07 and kurtosis of -0.83. The mean content of the total Cd concentration was 0.31 mg kg⁻¹. A wide range of the total Cd concentration (0.01 to 0.65 mg kg⁻¹), and a larger coefficient of variation (58.8%) were observed, both indicating a greater variation of total Cd concentration over the catena. The exponential model was found as the best fitting model for the experimental variogram of Cd content. The range of spatial dependence for Cd content was 196 m in distance. Sill and nugget variances obtained were 0.025 and 0.006 respectively. Different spatial patterns of land uses led to strongly structured spatial dependence (Relative nugget effect: 18.2%) for Cd content. The Krigged map showed a difference in the Cd accumulation in uncultivated, paddy and vegetable cultivated lands of the catena. Cadmium accumulation was higher in paddy soils than in other land uses. Total Cd concentration in soils showed a significant positive correlation with soil pH while it did not show any significant correlation with other properties.

Soil pH affects the Cd accumulation in soils. Spatially strong autocorrelation exists within 200 m in the area for Cd concentration. Though total Cd concentration was not beyond the critical level in both cultivated and uncultivated areas, measures must be undertaken to avoid future risks.

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