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LEVEL OF CONTAMINATION AND SOURCES OF CADMIUM AND ZINC AND THEIR CHANGES WITH SOIL PROPERTIES IN A DRY ZONE SOIL CATENA

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Cadmium (Cd) and Zinc (Zn) are known as co-contaminants due to their similar behavior in soils and plants. The investigation of the present level of contamination of Cd and Zn in soils is a necessary task to mitigate the contamination, minimize human exposure and to reduce the environmental risks. Therefore, this study was conducted to determine the level of contamination of Cd and Zn in soils of agricultural and non-agricultural lands of a selected dry zone catena of Sri Lanka and to investigate the differences of the sources of Cd and Zn.

A dry zone catena located in Rajangana (0.9 km^2) was selected as the study area. Georeferenced surface soil samples (0-30 cm) were selected on the basis of Latin hypercube sampling approach and those were collected from non-agricultural (n=15) and agricultural (n=43) lands. Soil samples were analyzed for Cd, and Zn, along with a standard reference material. Soil pH, electrical conductivity (EC), organic matter content and soil texture were also determined. Exploratory data analysis, correlation and principal component analysis (PCA) were performed using SPSS statistical software. The level of contamination of Cd and Zn were assessed using geochemical load index (GLI).

Trace metals and soil properties showed normal distributions. Cadmium in non-agricultural and agricultural areas ranged from 0.04-0.50 mg kg^{-1} and 0.01-0.63 mg kg^{-1} respectively. Zinc in non-agricultural and agricultural areas ranged from 9.3-31.4 and 5.0-23.4 mg kg^{-1}, respectively. Coefficient of variation of both trace metals (Cd: 33%, Zn:37%) indicated their moderate variations. The ranges of GLI of Cd in non-agricultural (-8.37 to -0.06) and agricultural areas (-4.16 to -0.03) and the ranges of GLI of Zn in non-agricultural (-2.61 to -0.86) and agricultural (-2.33 to -0.96) areas suggested that soils in both land uses were at unpolluted category. A relationship between Zn and pH was observed by correlation (r=0.7, p=0.01) and PCA analysis in non-agricultural lands. The relationships between Cd and EC (r=0.4, p=0.01), Zn and clay (r=0.317, p=0.05) were confirmed by correlation and PCA analysis. The results of the PCA analysis of two land uses indicated differences in associations of Cd and Zn with other soil properties.

These results indicated that sources of these heavy metals depend on the land use. The level of contamination by Cd and Zn in non-agricultural and agricultural lands were at unpolluted levels in the studied soil catena. The correlation and PCA analysis confirmed different sources are responsible for Cd and Zn levels in this soil catena.

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