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TRACE ELEMENT BASELINE CONCENTRATION IN A SELECTED SOIL MAP UNIT OF SRI LANKA

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Anthropogenic activities change the natural concentrations of trace elements in soil posing a threat to human health. Establishing baseline level as a reference value is important to estimate change in trace elements due to anthropogenic activities. Although establishment of baseline concentrations for trace elements has been done in many parts of the world, it has not been carried out yet in Sri Lanka. Therefore, this study was conducted to establish the baseline concentration for the trace elements Cu, Pb, Ni, Zn and Cd of surface soils in one selected soil map unit in the dry zone of Sri Lanka.

Soil samples were collected from 86 geo-referenced locations representing Madawachchiya, Ranorawa, Elayapattuwa, Hurathgama, Nawagattegama soil series, covering 2000 km². Three surface soil samples were collected from randomly selected 5 km x 5 km grids representing different land uses. Four sub samples were collected to obtain a composite sample. Soils were digested with 4 M nitric acid and analyzed for total Cu, Pb, Ni, Zn and Cd concentrations. Standard reference material (SRM-2586) from the National Institute of Standards and Technology were used for data validation and quality control. Geometric mean (GM) and geometric standard deviation (GSD) were used for the baseline establishment. Lower and upper limits of baseline concentrations were defined as (GM/GSD²) and (GM x GSD²).

Concentrations of Cu, Pb, Ni, Zn and Cd respectively ranged from 1.56 – 33.51, 0.96 – 19.22, 0.35 – 32.17, 7.44 – 71.32 and 0.13 – 1.22 mg/kg. Distributions of all the metal concentrations were positively skewed with very few high values. Log transformed metal concentrations showed linear trends for all the trace elements. Upper baseline concentrations for Cu, Pb, Ni, Zn and Cd were established as 26.51, 19.53, 38.8, 51.25 and 1.39 mg/kg respectively. Upper limit of the baseline concentration was used to assess the soil metal contamination. Observed metal concentrations were below the calculated upper baseline concentration except in a few samples (three samples of Cu and five samples of Zn). Observed metal data distributed normally making possible to establish baseline concentrations for the studied metals within the mapping unit. Soils collected from a few locations indicated metal contamination with Cu and Zn whereas all the other measured trace elements did not reach the contamination levels.

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