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“Development on the margin”

## Rapid Soil Resource Survey Using Radiometric Signatures

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### Abstract

Climate change and human activities are responsible for a shift in properties and spatial distribution of soil resources. In order to monitor such changes, more quantitative and multi-temporal soil mapping methods are required. Classic soil surveys based on field augering and laboratory analyses are costly and time consuming. This calls for more rapid soil mapping methods, among which gamma-ray spectrometry is one option, as it is not solely depending on surface reflection but detects gamma-rays produced within the top 0.5 m of the soil, thus providing also subsoil information.

The objective of this study was to investigate the potential of gamma-ray spectrometry for mapping soils and soil properties under consideration of soil parent material. Therefore, the radioelement signature (K, eTh, eU) of soils from different parent materials (limestone, granite, gneiss, sandstone, and claystone) in N-Thailand was investigated.

Results reveal that the radioelement signature can be used to distinguish different reference soil groups according to the World Reference Base for Soil Resources (FAO 2006). The prediction accuracy using classification trees of Acrisols, Alisols, Chernozems and Ferralsols was well above 90 %. Additionally, occurrences of Umbrisols and Cambisols were predicted with 77 % and 64 %, respectively.

Especially, the potential of gamma-ray spectrometry to distinguish different clay illuviation soil types in the field (*e.g.* Acrisols vs. Alisols) is of paramount interest, since it can replace costly and time consuming laboratory analyses.

In addition, gamma-ray spectrometry offers an option for multi-temporal mapping via airborne remote sensing. A first comparison of airborne gamma-ray with classic soil survey data of a limestone area is promising. However, the relation of ground-based with airborne measurements needs further reflection.

**Keywords:** Classification trees, gamma-ray, northern Thailand, pedology