

# Proximal soil sensor surveys using gamma radiometrics assist delineation of precision management zones

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A gamma radiometric sensor has been used to survey two Hawkes Bay farm sites (33 and 102 ha). The sensor detects gamma ray photons that are emitted naturally by the atomic nuclei of certain elements (potassium, thorium, uranium) in soil minerals as well as the integrated signal over the whole range of the sensor (total counts). The mobile radiation detection system (Radiation Solutions RS-700) continuously recorded georeferenced values, as the vehicle travelled at a speed of approximately 10 kph, providing a dense point cloud for the survey areas. The raw data were pre-processed and converted into maps, using ordinary block kriging. Electrical conductivity (EC) and fine-scale pedological surveys were also conducted at both sites. At the first site, gamma radiometrics clearly distinguished a Brown soil from Recent soils; the Brown soil having lower total counts and the soil boundary between these two soil orders more clearly delineated than by the EC survey. The EC map was effective at differentiating soil texture and moisture differences in the Recent soils. At the second site, both gamma radiometrics and EC survey differentiated the patterns of Takapau, Rawai, and Poporangi soils. The poorly drained Poporangi soils with pans, are found in depressions and parts of the landscape where surface channels are common, and are delineated particularly well by the EC, gamma total counts and U maps, but less so by the K and Th maps. The maps derived from the gamma and EC surveys showed good agreement with the maps produced by pedological survey at these two sites, although sometimes grouping more than one soil type into one class. This numerical approach to mapping and classifying soil differences is being used to guide sampling and monitoring positions for precision management of productive land.