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# Identifying soil management zones in a sugarcane field using proximal sensed electromagnetic induction and gamma-ray spectrometry data

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Over 70% of the Australian sugarcane industry operates in alluvial-estuarine areas characterised by sodic and infertile soils. There is a need to supply ameliorants and improve fertilisers and minimise off-farm pollution to the Great Barrier Reef. Therefore, information is required about the spatial variation in soils. However, traditional approaches are cost-prohibitive. Herein we showed how a digital soil mapping (DSM) approach can be used to identify soil management zones. In the first instance, ancillary data, including electromagnetic induction and gamma-ray spectrometry data were collected. Using a fuzzy k-means clustering algorithm management zones from two to six were identified. Using restricted maximum likelihood (REML) analysis of various topsoil (0–0.3m) and subsoil (0.6–0.9m) physical (e.g. clay) and chemical (e.g. exchangeable sodium percentage [ESP], exchangeable calcium and magnesium) properties, 3 zones were determined from minimising the mean squared prediction error. To manage the moderately sodic topsoil ESP of zones 3A and 3C and sodic 3B, different gypsum requirements were prescribed. Lime can also be added differentially to address low exchangeable Ca in zone 3A, 3B and 3C. With regard to exchangeable Mg, zones 3A and 3C do not require any fertiliser, whereas zone 3A requires the addition of a moderate amount. The results were consistent with percentage yield variance, suggesting the lower yield in 3C due to topsoil sodicity and strongly sodic subsoil with higher clay content. We concluded that the DSM approach was successful in identifying soil management zones and can be used to improve structural stability and soil fertility.