Identifying arable soils from soil profile classes, going back to the future in northern Australia

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Sustainable development relies on accurate information on the distribution and extent of arable soil. Legacy soil mapping in northern Australia mapped broad soil patterns at a low resolution with uneven reliability from aerial photography and low intensity field survey. Public benefit DSM land resources assessment based on legacy surveys maps, with limited infill survey support, has delivered an array of continuous, imprecise soil layer properties across the landscape. The method is elaborate and not a significant improvement on legacy mapping.

The historical mapping approach had soil profile classification at its core. Once soil profile classes were described their presence or absence was mapped by association with photo map unit parameters using the ecological land unit model. Mapping land capability using recognisable soil profile class facilitated clear communication of arable soil properties. Formal soil profile classification systems incorporate subjectivity that is detrimental to DSM reliability.

An alternative approach using numerical soil profile classification and constraining mapping to the presence-absence of arable soil classes is demonstrated for the Tiwi Islands, 8,300 sq.km. in tropical, northern Australia.

Numerical classification was used to identify reference profiles from current soil databases to resolve classification issues. Then mapping the presence or absence of soil profile classes was made in two stages first with multivariate, ordination and network analysis, to identify independent, strong predictor variables; and second univariate methods namely indicator kriging with generalised additive regression models were used in the mapping phase.

Quality assurance was achieved by limiting mapping models being reported to soil classes that were reliably mapped according to a ROC>80%. A minimum of 100 survey sites was needed to support reliable models of extensive arable soils. There was a dramatic increase in the survey support required as landscape complexity increased. Numerical soil profile classification combined with constrained mapping of arable soil classes focuses DSM outcomes to facilitate communication both of arable land values and where improved survey support is needed to support reliable investment.