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Research Article

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Detection of some soil properties using hyperspectral remote sensing of semi arid region of Tamil Nadu

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Summary

Remote sensing with hyper spectral sensors can provide the fine resolution required for site-specific farming. The within-field spatial distribution of some soil properties was found by using multiple linear regressions to select the best combinations of wave bands, taken from among a full set of 512 narrow bands in the wavelength range of 350 to 1050 nm. The resulting regression equations made it possible to calculate the value of the soil property with a spatial resolution of 3.0 nm FWHM (Full Width Half Maximum). Both surface and subsurface samples of soil profile were taken from the three research stations. The soil samples were tested in a laboratory for 20 different properties. The per cent sand was found to be detectable with a reasonable degree of accuracy with $R^2 = 0.851$ for a three parameter model; the best combination of wavelengths was 426.81, 730.47 and 1037.7 nm. For silt, clay, field capacity, wilting point, Available water content, pH, electrical conductivity and $CaCO_3$ the results were ranges of degree of accuracy with R^2 from 0.609 to 826. The soil exchangeable properties such as Ca, Mg, Na and CEC, chemical composition such as SiO_2 and Fe_2O_3 R^2 values varied from 759 to 906. The poorest fit was for organic carbon with $R^2 = 0.220$ followed by Al_2O_3 ($R^2 = 0.313$). Available micronutrients (Fe and Mn) had R^2 0.491 and 0490. For all the properties except organic carbon and Al_2O_3, the correlation was statistically significant. The main findings were that some soil properties can be accurately detected using hyper spectral remote sensing.

Key words : Band selection, Soil profiles, Hyper spectral remote sensing, Multiple linear regression, Soil properties

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