

SOIL PROPERTY ESTIMATION USING VISIBLE AND NEAR-INFRARED REFLECTANCE

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ABSTRACT

Site-specific management of crop production systems holds promise for maintaining high yields while preserving soil quality. This management requires detailed spatial data on soil physical and chemical characteristics but traditional testing can be slow and expensive. Recently, sensor-based approaches including reflectance spectroscopy have been proposed as alternatives for quicker, easier soil analysis. The objectives of this study were to investigate the soil property estimation capabilities of reflectance sensing with a spectrometer and with a mobile two-band sensor. In the spectrometer evaluation using profile (to 1 m) samples collected from 32 plots with varying soil characteristics, several important soil quality properties were successfully estimated. Highest accuracy was for dried and ground soil samples which had an R^2 of 0.97 and 0.91 for total carbon and nitrogen, respectively. Results with field-moist soil were nearly as accurate, showing that this may be a viable, and more efficient, option. The mobile two-band sensor was evaluated in two central Missouri production fields. It showed good accuracy ($R^2 = 0.75$) for estimating soil organic carbon (SOC) with 20 in-field calibration points. However, this accuracy was not maintained when calibration equations were applied in full-field mapping. Laboratory data collection showed that a sensor with different wavelength bands might provide more accurate results, but this would need to be verified with a wider range of soils.