Field Calibration of FDR Sensors -Limitations and Potentialities

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Abstract

Monitoring soil moisture content is an appropriate method to optimize agricultural irrigation. The use of capacitance sensors has increased over the last years because they have a convenient cost-benefit ratio when compared to neutron moisture gages or time domain reflectometers, which are the most accurate methods to estimate soil moisture content. This project is about the field calibration of a capacitance sensor in clay soils. Two calibration models were applied: a linear model and a quadratic one, which correlate the gravimetric content measured in field soil moisture samples with the excitation received by the sensor (mV) and with the measured dielectric permittivity (?b). The calibration equations were subsequently validated at two different depths at four field sampling sites. Despite the clay soil texture, high organic matter content and compaction of the soils, the equations correctly estimated soil moisture content with an estimation error of ± 0.02 m^3m^{-3}, a considerable improvement over the manufacturer's calibration equation, which has an average estimation error of ±0.12 m^3m^{-3}. A better understanding of sensor performance in the field should result in more precise water applications. A recommendation is made to perform tests in saline and different textured soils to ascertain the stability and sensitivity of these calibration equations.

Keywords: soil moisture sensors, soil water content, precision irrigation