

Calibration of HydraProbe for Soil Water Content Measurement in Sri Lankan Soils

R. Manoharan¹, R.S. Dharmakeerthi^{1*}, T. Karunainathan², D.N. Vidana Gamage¹

¹*Department of Soil Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka.*

²*Agriculture Research Station, Department of Agriculture, Thirunelwely, Jaffna.*

* dharmakeerthirs@gmail.com

Soil water content (SWC) is a key variable for understanding and modelling hydrological processes. Electromagnetic (EM) point-based sensors are increasingly being used to characterize the spatio-temporal dynamics of SWC, despite the reduced accuracy of such EM point-based sensors with the default calibration. Further, little is known about the performance of the sensors on soils with contrasting textures, organic matter contents and salinity levels. Therefore, this study compared the accuracy of default and soil specific calibrations of a Stevens HydraProbe sensor using ten contrasting soils of Sri Lanka. The calibrations were carried out in seven consecutive water contents from dry to saturated conditions, using repacked soil glass beakers in the laboratory. The predictive accuracy of the default and soil specific calibrations was evaluated against the gravimetric method. The default calibration resulted in high root mean square error (RMSE) for all soils. RMSE ranged from 13.6 [Vertisols, local classification (Grumusols)] to 3.6 % [Entisols (Regosols)] which indicated poor prediction accuracy of the default calibration for a range of soils. However, soil specific calibrations showed a substantial reduction in the RMSE for all the soils except for Entisols (Regosols) and Haplustalfs (Non-Calcic Brown). Results of this study indicated the importance of using soil specific calibrations to measure SWC accurately in contrasting soils. Overall, it can be suggested that soil specific calibration is necessary to obtain satisfactory accuracies in SWC using the Stevens HydraProbe sensor for all the tested soils while both default and soil specific calibrations could be used to measure SWC in Entisols (Regosols) and Haplustalfs (Non-Calcic Brown). It is suggested to perform the *in-situ* calibrations and validations to verify the results at field scale.

Key words: Predictive accuracy, Root mean square error, Soil texture, Stevens HydraProbe sensor, Soil water content

Financial support provided by National Research Council, Sri Lanka (NRC/TO/16-07) is greatly acknowledged.