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Water Saving Potentials with TDR Measurements

Cornelius Jantschke, Constanze Müller, Karlheinz Köller

University of Hohenheim, Process Engineering in Plant Production, Germany

Abstract

The water saving potential of moisture detection is obvious for the different applications of irrigation. Under arid and tropic conditions, irrigation farming is facing a relentless conflict of water use interests. On one hand, irrigation water is essential for food security on the other it is bitterly requested by urban basic supply.

The instant measurement of the prevailing water content gives a hand, dealing with arguments of water waste in irrigation farming. The application of moisture sensors contains vast possibilities of controlling and setting irrigation strategies and techniques as well as detecting a deep percolation of irrigation water. But the test value has to be guaranteed reliable, to draw an accurate picture of the current site specific moisture.

For that reason, the Time Domain Reflectometry (TDR) was examined on its accuracy under diverse artificial scenarios, in order to represent worst cases on field. The approach focused on the deformation of TDR probes and the contortion of the measuring volume. The results showed, that large air pores did not effect the signals accuracy at all. However an inferior soil-probe contact undervalued significantly up to 7 % volumetric water content. A deformation of the sensor fork with up to 90° did not significantly effect the quality of the TDR reading, as long as the sensor-soil contact was ensured. Straddling the sensor rods showed a contrary effect with an underestimation of about 5 %.

For the trustworthy application in irrigation practice, there are two opportunities presenting. The direct control of a predestined water content within the root zone of the plant presuppose the knowledge of a suitable water content for the regarded plants. The detection of deep percolation losses is characterised by the sensor placement underneath the root zone. It serves as an emergency break of irrigation.

Keywords: Accuracy, contortion, deformation, moisture detection, TDR, water saving potentials

Contact Address: Cornelius Jantschke, University of Hohenheim, Process Engineering in Plant Production, Garbenstraße 9, 70593 Stuttgart, Germany, e-mail: cornelius.jantschke@uni-hohenheim.de