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Determination of suitable irrigation lengths and intervals using capacitance humidity sensors for a sandy soil

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This study aims to analyze the irrigation performance at a farm in Tordesillas (Spain) dedicated to sugar beet production, during the summer of 2010. This farm is integrated at the Spanish research network for the sugar beet development (AIMCRA) which regarding irrigation, focuses on maximizing water saving and cost reduction. According to AIMCRA's perspective for promoting irrigation best practices, it is essential to understand soil response to irrigation i.e. maximum irrigation length for each soil infiltration capacity. The Use of Humidity Sensors provides foundations to address soil's behavior at the irrigation events and, therefore, to establish the boundaries regarding irrigation length and irrigation interval. In order to understand to what extent farmer's performance at Tordesillas farm could have been potentially improved, this study aims to address suitable irrigation length and intervals for the given soil properties and evapotranspiration rates.

In this sense, several humidity sensors were installed: (1) A Frequency Domain Reflectometry (FDR) EnviroScan Probe taking readings at 10, 20, 40 and 60cm depth and (2) different Time Domain Reflectometry (TDR) Echo 2 and Cr200 probes buried in a 50cm x 30cm x 50cm pit and placed along the walls at 10, 20, 30 and 40 cm depth. Moreover, in order to define soil properties, a textural analysis at the Tordesillas Farm was conducted. Also, data from the Tordesillas meteorological station was utilized.

Farmers integrated at the AIMCRA's network are facilitated with a weekly MSM service regarding Sugar beet water requirement; different meteorological station and evaporation pans located throughout AIMCRA's territory that monitored ET gave farmers the opportunity to figure out weekly sugar beet irrigation needs. However, irrigation programming entirely depends upon farmer's consideration where any kind of scheduling is generally based on local knowledge and, generally, aiming to match off-peak tariffs (generally at the weekend). In a sense, the need for better

The main finding of this research was that the irrigation time for the different irrigations during the irrigation campaign in the Tordesillas farm could have been strongly reduced; results from the Sensorica installed showed quick infiltration rates that made soil water content at the first 60 cm depth to reach the saturation much earlier than expected—between two and three hours. Furthermore, the irrigation time was not correctly addressed; the need for reducing electricity costs lead farmers to increase irrigation frequency, making sugar beet plants to suffer from water stress.

A second finding generated at this study was the better suitability of the EnviroScan Probe compared to the TDR probes; greater accuracy and lower time response was obtained.