DEVELOPMENT OF A WIRELESS SENSOR NETWORK FOR MONITORING WETTING FRONT ADVANCE DURING IRRIGATION EVENTS

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Abstract

The objective of this study was to develop a rugged low cost wireless sensor network to track the wetting front during an irrigation event in an effort to improve irrigation management. By knowing the location and travel time of the wetting front one could use the information to improve existing irrigation planning tools. The Wetting Front Advance Detection (WFAD) units integrated a microcontroller, four or eight soil moisture sensors (as a low cost water detection probe) and wireless technologies to communicate information among multiple units. The key features of the network of WFAD's were 1) wireless communication among each unit, 2) synchronized data collection, and 3) geo-referenced datasets. A single WFAD unit with eight water detection probes was constructed at a cost of $613. To track the wetting front, prior to an irrigation event, WFAD units were installed in the field on the top of beds in two locations down the furrow. Each of the units' eight water detection probes were stretched across furrows, anchored to the bottom of the furrow with the sensor buried under 1.5 – 2.0 cm of soil. As the wetting front contacted the probes, the WFAD units recorded the latitude, longitude, UTC time, sensor analog-to-digital value and a water presence indicator value. The wireless network could transmit the information to a mobile device. After processing the data from each paired WFAD within the field, the wetting front was tracked and timed using the network.