PRACTICAL APPLICATION OF SOIL MOISTURE SENSORS FOR IRRIGATION SCHEDULING IN COTTON

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Abstract

Uncertainty in the amount and timing of precipitation is one of the most serious risks to the producers in the Mississippi Delta. In recent years, the producers have become increasingly reliant on irrigation to ensure adequate yields and reduce risks of production. Increasing groundwater withdrawal is resulting in a decline in the levels of Mississippi River Valley Alluvial Aquifer. Improved irrigation technologies are needed to increase water use efficiency for sustainable use of water resources in this region. Irrigation can increase cotton yield and improve fiber quality. Soil moisture sensors are capable of monitoring soil water conditions. Soil moisture sensors were evaluated for developing sensor-based irrigation scheduling methods on cotton in Mississippi Delta. Studies on use of soil moisture sensors were conducted in a field with silt loam soil in Stoneville, MS. Soil moisture sensors (EC5, Decagon, Pullman, WA) were installed in a cotton field at depths of 15 cm, 30 cm, and 61 cm belowground. Soil moisture in the field was automatically measured by the sensors in a time interval of an hour during the crop growing seasons. Soil moisture data along with weather data were wirelessly transferred onto internet through a wireless sensor network (WSN) so that the data could be remotely accessed online. Soil moisture measured at 3 depths were interpreted using a weighted average method to better reflect the status of soil water in plant root zone. Weighted average of soil moisture content was used for irrigation scheduling. The weighted average measured by the sensors at 48 hours after the soil is saturated was used as sensor-measured field capacity (FC). Irrigation was triggered when soil moisture content was dropped close to 74% of the sensor-measured FC. An antenna mounting device was developed for operation of the WSN. Using the antenna mounting device, the soil moisture measurement would not be interrupted by crop field management practices. This sensor-based irrigation scheduling method has been used for irrigation scheduling in cotton for three years in a USDA-ARS research farm in Stoneville, MS.