

Wireless Soil Moisture Sensor Performance in Irrigated Cropland: On-Farm Evaluation

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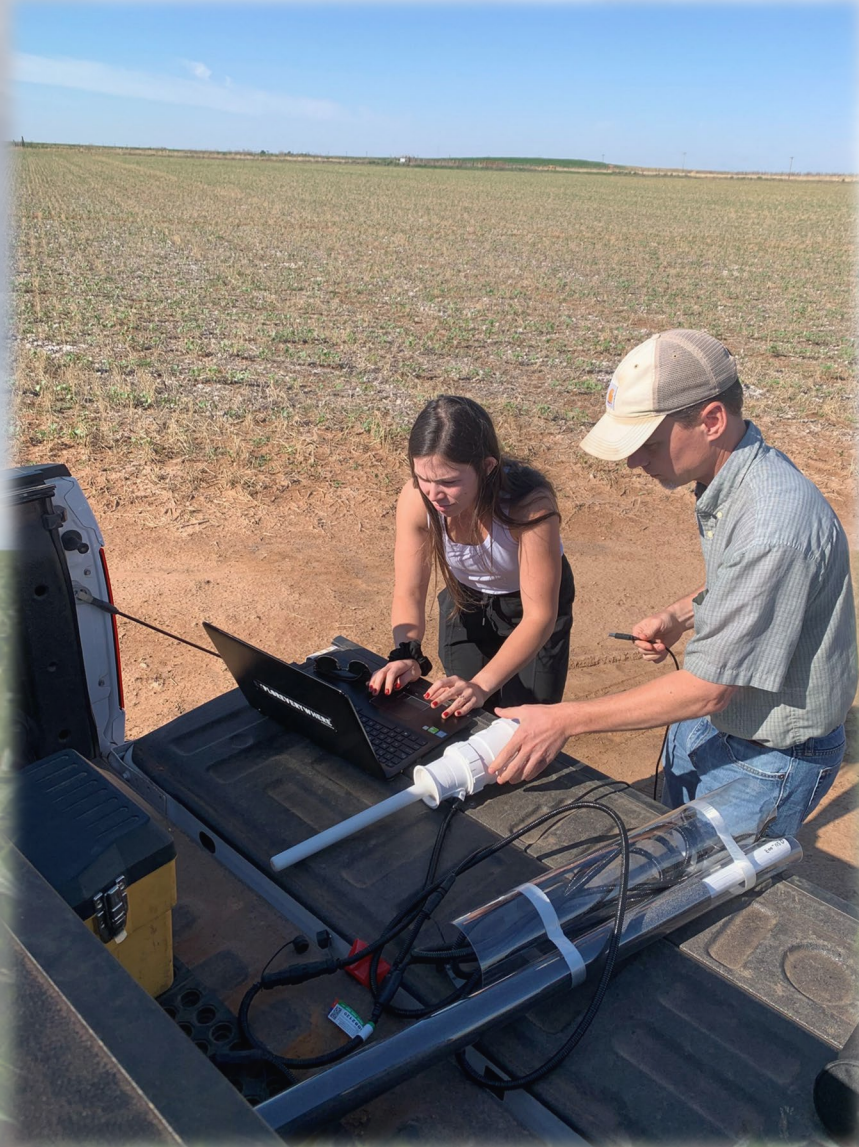
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The Importance of Irrigation Water Management in Rural Communities

- Concern for water availability: climate changes and increases in water use due to population increase threaten water levels across the world.
- Over irrigation: arid regions are often over-irrigated, not only causing water availability issues but also possibly contributing to nitrate pollution in groundwater.
- Risk of running out of water: Southwest Oklahoma agricultural producers often run out of water before the end of growing season, compromising their crop and cutting their revenue.





How Accurate Do Soil Moisture Sensors Need to be to Benefit Water Management?

On-farm assessment of the use of wireless soil moisture sensors as a means to improve irrigation water management.

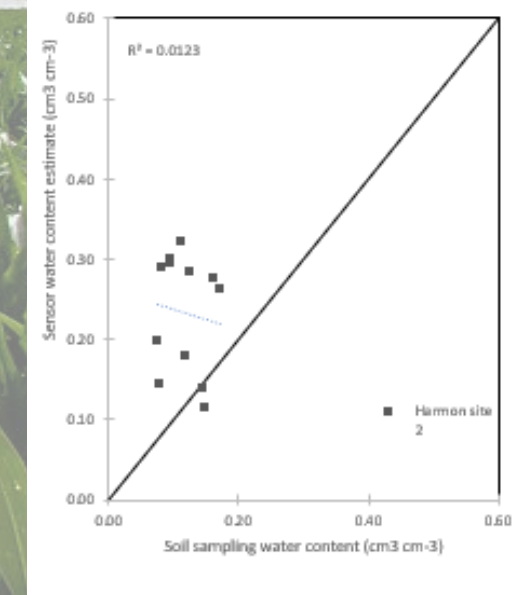
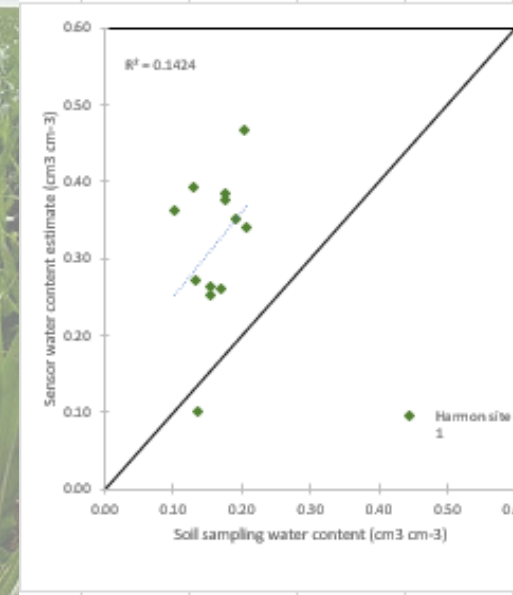
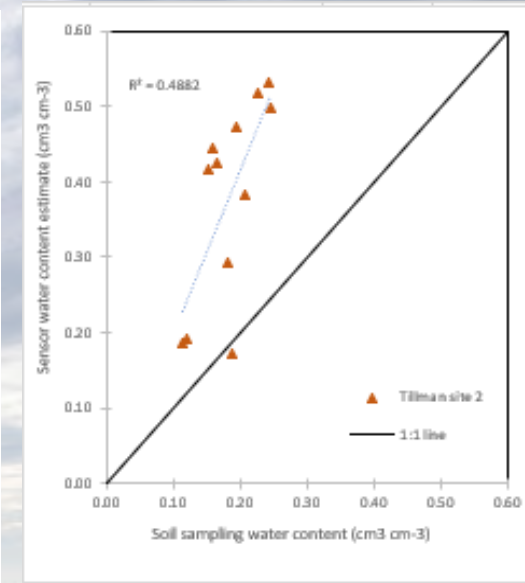
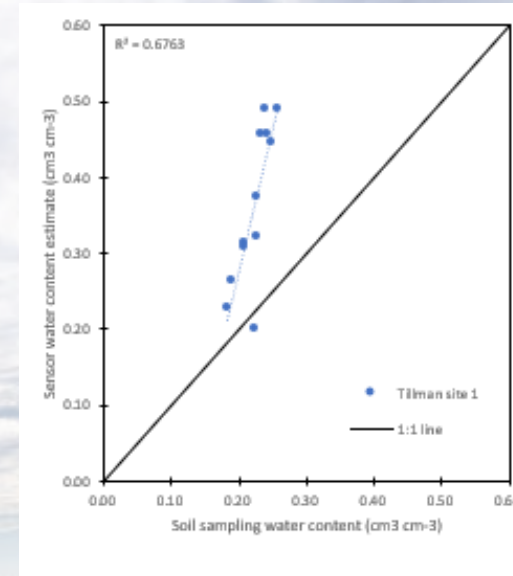
Objectives:

- 1) Evaluate the accuracy of soil moisture, soil temperature, and electrical conductivity measured by wireless sensors;
- 2) Document time, effort, and complexity of installation and setup process for the sensors and associated software;
- 3) Determine the amount of missing data and estimate the battery life under field conditions.

Looking Forward: the Future of Soil Moisture Sensing

Though the accuracy of the sensors is questionable, the soil moisture data from the sensors seems to consistently overestimate the actual soil moisture, which could reveal error in calibration or maintenance of the sensors.

There is an opportunity for further research and exploration into the effectiveness of soil moisture sensors as a step toward improved water management in irrigated agriculture.



WIRELESS SOIL MOISTURE SENSOR PERFORMANCE IN IRRIGATED CROPLAND: ON FARM EVALUATION

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PROBLEM

As global water availability continues to threaten irrigated agriculture, a method for improved water management in irrigation is necessary. In Oklahoma, irrigation accounts for a vast majority of water use at approximately 73%. Farmers in the state are struggling to maintain sufficient water levels to make it through the season, often running out of water and losing a sizeable amount of their crop.

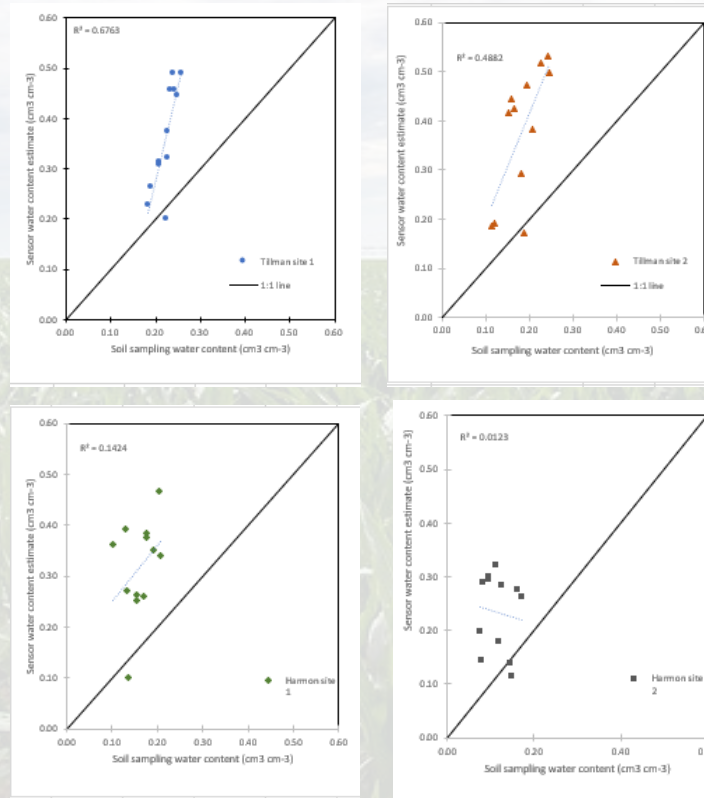
APPROACH

One promising approach is to improve the use of irrigation management technologies, such as wireless soil moisture sensors. Using Sentek Drill and Drop Soil Moisture Sensors, this on-farm assessment worked with four producers in Southwest Oklahoma (two in Harmon County; two in Tillman County) to address the usability, accuracy, and practicality of using these sensors to enhance irrigation water management. Our method was to:

- 1) Evaluate the accuracy of soil moisture, soil temperature, and electrical conductivity measured by the wireless sensors;
- 2) Document time, effort, and complexity of installation and setup process for the sensors and associated software (IrriMax Live) and;
- 3) Determine the amount of missing data and estimate the battery life under field conditions.

HOW ACCURATE DO SOIL MOISTURE SENSORS NEED TO BE TO BENEFIT WATER MANAGEMENT?

RESULTS



The graphs above show the relationship between water content measured via soil sampling and water content estimated by the Sentek Soil Moisture probe on the four sites studied.

DISCUSSION

The data reveals a divergence between the water content estimated by the soil moisture sensors and the data measured through core soil sampling. The data shows that the sensor consistently overestimates the soil moisture content. However, the data may still be useful for irrigation management at sites where correlation is strong, such as in Tillman Site 1.

Potential Explanation:

Further research into the investigation of the effectiveness of soil moisture sensors and their calibration and maintenance requirements may be necessary. High electrical conductivity of the soil or irrigation water may be limiting the accuracy of these sensors.



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