Can Soil Moisture Sensors Improve Irrigation Efficiency in Southwest Oklahoma?

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RURAL RENEWAL

INTRODUCTION AND HYPOTHESIS

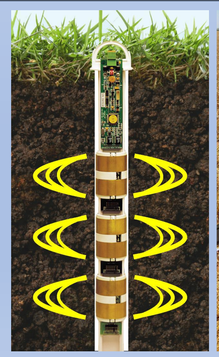
- Oklahoma frequently suffers from drought and its consequences.
- Oklahoma has the fourth highest number of farms in America[1].
- Consequently, Oklahoma could benefit from sensor technology to help mitigate the negative effects of drought such as crop failure[2].

Above: A house in Hollis during the drought and wind of the Dust Bowl.

- When compared to more traditional methods of soil moisture monitoring such as squeezing the soil or observing crops, moisture probes can collect data more quickly, thoroughly, and efficiently[3].
- Due to climate change, droughts may become more frequent and severe[4], increasing the importance of efficient water management.
- We hypothesize that soil moisture probes installed in southwest Oklahoma will provide accurate, reliable data and that farmers in the area will consider using these probes in the future.

METHODOLOGY

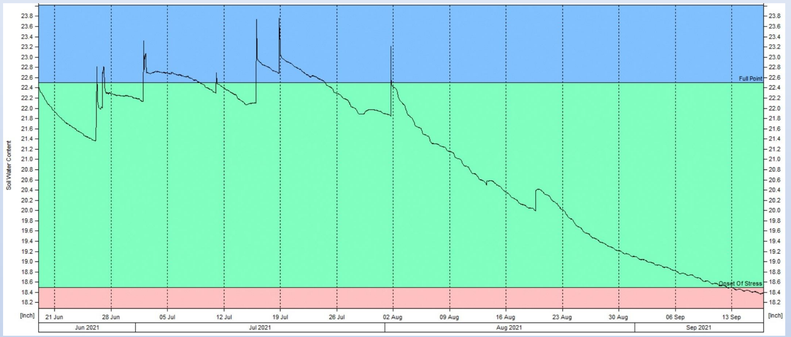
- At the start of the 2021 cotton season, we installed CropX probes ($600-$900 initial cost) and Sentek Drill-n-Drop probes ($1,625) in Harmon County, OK.
- We interviewed 7 local irrigators to understand their water management concerns and thoughts regarding sensor use.
- We used Microsoft Excel to evaluate groundwater trends for the county's aquifer, the Blaine Aquifer.



Above: A diagram of the Sentek probe's sensors.

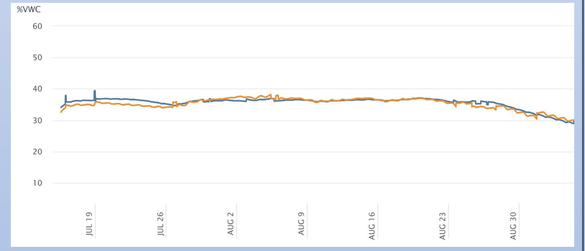
Above: Gabby Barber installing a Sentek probe.

RESULTS

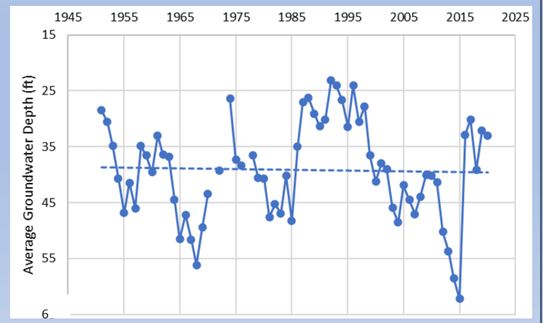


Above: A graph of soil water content percentage from one Sentek probe over the course of nearly 3 months. Vertical peaks indicate moisture events either by irrigation or rain.

- Through the Senetek probe's interface, users could define color-coded areas to show field capacity in blue and stress points in red, which would yield an optimum range in green. The CropX interface offered a similar visual aid.
- An analysis of data from 41 wells shows that groundwater levels have been consistently declining.

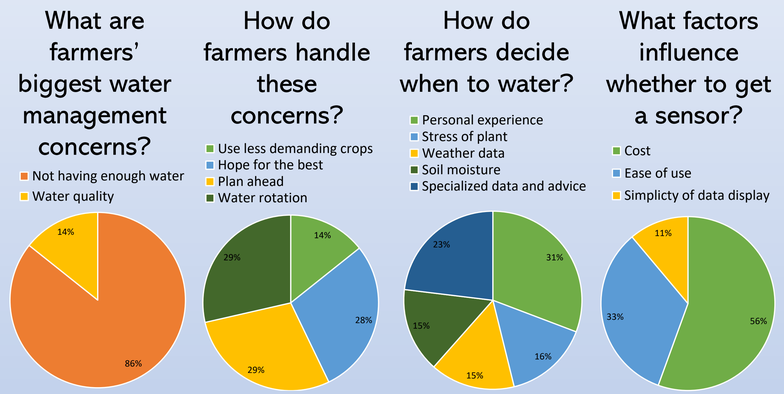


Above: One of many data display options from the CropX probe. This graph combines soil moisture for the probe's two sensors.



Above: A summary of average groundwater depth of the Blaine aquifer from 1945-2020.

INTERVIEW CONCLUSIONS



- Soil moisture sensor technology may be most helpful for new or first-generation farmers, according to our interviews.
- If an organization is to provide soil moisture probes to irrigators, they should do so with sufficient training, and set-up assistance.

ACKNOWLEDGEMENTS

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- This project relied on volunteers in Hollis, OK such as interviewees and farmers who provided fields for probe installation.

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