Research & Demonstration Grant Funding Program Annual Report

Please return the completed form along with the below referenced supplemental information to Jason Coleman at jason.coleman@hpwd.org.

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PROJECT TITLE: Field Evaluation of a New, TDR-Based Downhole Profiling Soil Water Sensor	
TOTAL FUNDING: $22,140	
PROJECT COMPLETED: ☐ Yes or ☒ No	**EXPECTED COMPLETION DATE: Nov 2020**
PREFERRED PRESENTATION MONTH: November or December 2020	

Attached to this document please provide the following supplemental information:

- Financial report showing expenses, remaining funds, and financial contributions from cooperators and other funding sources.
- Any supplemental materials you would like the HPWD Board of Directors to review.
- A copy of the presentation materials for the HPWD Board of Directors meeting presentation.

1. Describe your progress to date with the project (Word Limit 150):

The awarded equipment including sensors, dataloggers, and communication devices were installed in the fall and winter of 2019, ahead of the 2020 growing season. This allowed for soil settling around the installation sites prior to the growing season. Complementary sensors and equipment from Texas A&M AgriLife Research and USDA-ARS Bushland were also installed. The experimental design consists of six measurement sites, with two each in irrigated corn treatments (50, 75, and 100% of crop ET) under center pivot irrigation. Each site consists of a SoilVue sensor, a suite of Acclima 315 TDR probes installed at matching depths, and a neutron probe (NP) access tube. A NP fitted with a custom source cable with depth stops to match the sensor depths is used to record volumetric water content (VWC) at each depth twice weekly, weather permitting. These measurements provide the basis for VWC comparisons.

2. Describe successes or setbacks observed with implementing the project (Word Limit 150):

The project has been largely a success with field operations following the schedule outlined in the proposal. Collaboration between researchers at both agencies has been excellent. This speaks to the professionalism and experience of the research team with soil water sensor installation and operation. All are anxious to see the results at the conclusion of the growing season. One initial setback was issues with communications between the datloggers and a PC during data transfers. This was eventually resolved, and no data were lost as the dataloggers have onboard storage capacity.

3. Describe the results of the proposed work objectives and expected impact of the research/demonstration being conducted (Word Limit 250):

The project is ongoing, and a complete analysis will be performed at the conclusion of the growing season. However, preliminary data prior to the growing season suggested that the SoilVue reported zero values for VWC for the near surface depths during extended periods of drying. This is expected as the clay content of the Pullman soils shrinks during drying, resulting in the soil medium pulling away from the electrodes. This condition is common to all electrode-based sensors during dry conditions in clay soils. However, we are more interested in the in-season sensor performance under an irrigation regime where some level of soil water will be expected throughout the season. Preliminary results following irrigations show periods of both under- and over-estimation of VWC as compared to the NP data. One of the objectives of the analysis will be to determine when and why these differences may occur.

4. Describe the conservation impacts to the District (Word Limit 150):

Data from this study will serve to evaluate the efficacy of both the SoilVue and the Acclima 315 TDR-based soil water sensors to provide accurate VWC values and integrated soil water profile totals. Combined with knowledge of plant available water and targeted management allowed depletion values, total soil water within the rooting and soil water deficit are expressed in meaningful units, e.g., “inches of water”. Such information may serve to prevent overwatering late in the growing season, a time which is commonly believed to be most prone to overwatering. Knowing how much water remains in the soil allows producer to terminate irrigation accordingly, allowing crops to finish on stored soil water, while reducing irrigation and preventing undue compaction during harvest operations.

5. **Please describe any outreach and communication plans you have for this project, including any awards submissions or potential opportunities for publishing (<u>Word Limit 150):</u>**

At the conclusion of the 2020 growing season, the findings of this study will be compiled, analyzed, and published in a peer reviewed journal of high quality. The SoilVue is relatively new and novel sensor and many in research and academia are interested in its performance. Similarly, producers we have spoken to are equally interested in the performance of the SoilVue. Dissemination of study results will be conveyed to producers via our collaborating extension personnel.

Field Evaluation of a New, TDR-Based Downhole Profiling Soil Water Sensor

Kevin Heflin[1], Ph.D., Extension Specialist, Agronomy

Gary Marek[2], Ph.D., Research Agricultural Engineer

Jourdan Bell[1,3], Ph.D., Assistant Professor, Agronomy

Thomas Marek[3], P.E., TAMUS Regents Fellow, Senior Research Agricultural Engineer

Yong Chen[3], Ph.D., Assistant Research Scientist, Texas A&M AgriLife Research

[1]Texas A&M AgriLife Extension, Amarillo, TX

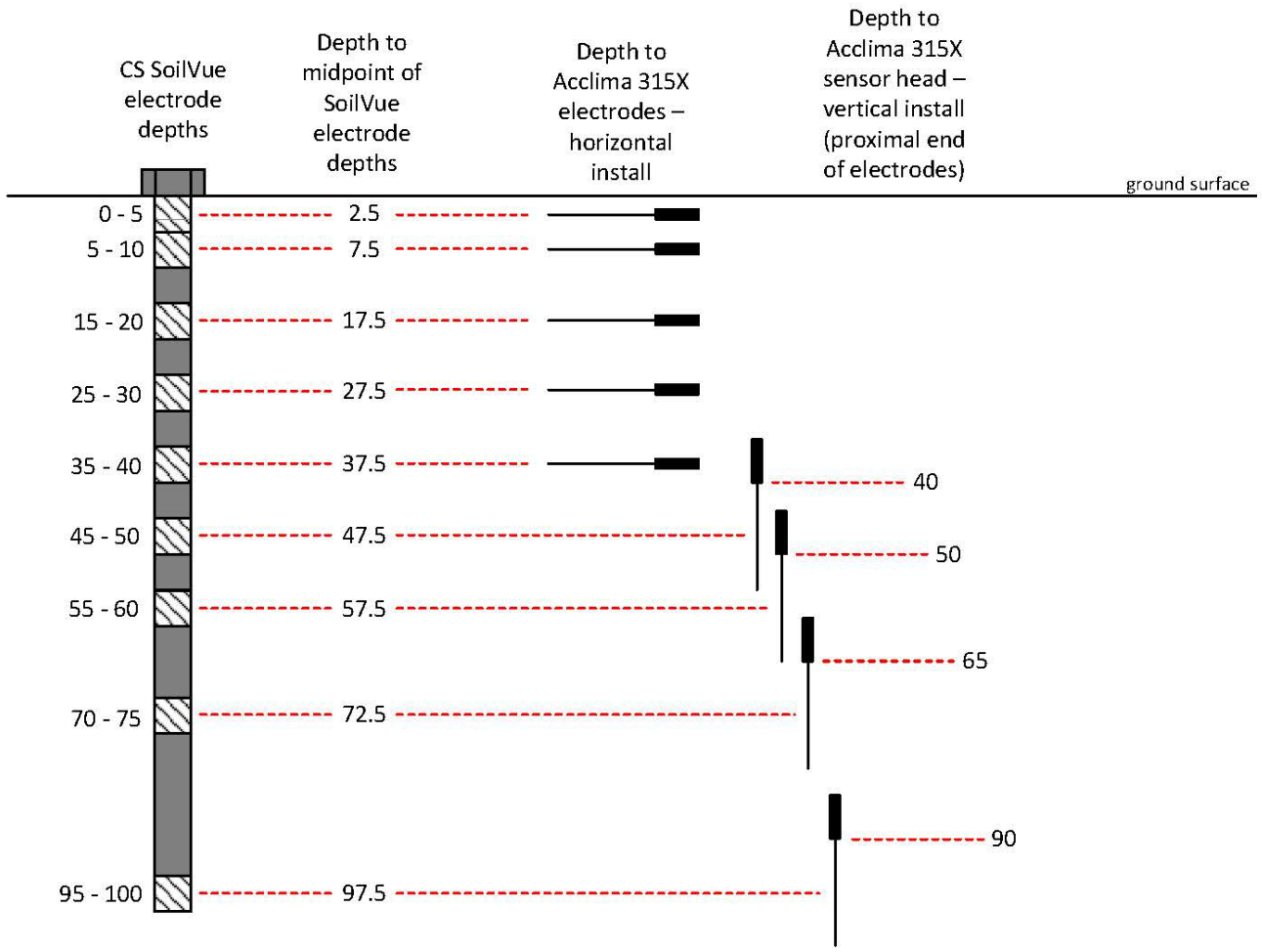
[2]USDA-ARS, Bushland, TX

[3]Texas A&M AgriLife Research, Amarillo, TX

The requesting agency of the following collaborative proposal is Texas A&M AgriLife Extension, Amarillo

SoilVue install
December 3, 2019

CS SoilVue and Acclima 315X Comparison Study
Sensor Installation and Measurement Depths




CAMPBELL SCIENTIFIC
SoilVUE10