A HOLISTIC SOLUTION TO USING SOIL MOISTURE DATA FOR SCHEDULING IRRIGATION

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OBJECTIVE: Field-test peanut response to our holistic solution to using soil moisture data for scheduling irrigation.

RESULTS:

The goal of the project is to develop an easy-to-use Web-Based Irrigation Scheduling Tool which will allow peanut, cotton, and corn producers to convert soil moisture data into irrigation recommendations. With support from the Georgia Peanut Commission, we made significant progress towards this goal during 2013 and are continuing to make progress in early 2014.

We deployed the UGA Smart Sensor Array (UGA SSA) in 11 producer fields in southern Georgia and tracked soil moisture conditions throughout the growing season. The fields are in a peanut, cotton, corn rotation for the 2012 - 2014 growing seasons. All of the fields are equipped with variable rate irrigation (VRI) enable center pivots. The fields were each instrumented with between 10 and 12 nodes of the UGA SSA. Each UGA SSA node contains a probe of three Watermark soil moisture sensors installed at depths of 8, 16, and 24 inch depths. Data from each node were transmitted wireless to a base station located at the pivot point. From the base station, the data were sent via cellular modem to our web server. For the 2013 growing season, we developed the UGA SSA Data Portal which allowed participating producers to access their soil moisture data remotely in real time from any internet capable device including smartphones and tablets. As expected, the data showed that there is tremendous variability in soil moisture within any given field and that *the key to optimizing water use and maximizing yield potential is to apply water at the rates needed by the plants in different locations of the field*. The graphs in Figure 1 illustrate the great variability of soil moisture in one of the project fields which was planted to peanuts.

Throughout the growing season, we used the data from each node to manually run Irrigator Pro and then sent the model's irrigation decision to each participating producer. Since then, we have automated this process so that during the 2014 growing season, participating producers will automatically receive the Irrigator Pro decision by email or txt message. We were not able to create a yield map of a participating field during 2013 because of weather conditions – the producer harvested the field earlier than planned because of forecasted rain.

Although Irrigator Pro is a great tool, it provides only a Yes/No decision. It does not recommend the amount of irrigation needed to replenish soil moisture. To fully enable VRI, we need to know the optimal irrigation amount for each irrigation management zone (IMZ) within the field. To achieve this we are now developing a web-based irrigation scheduling tool hereafter referred to as the Web Tool which will allow producers to remotely check soil moisture of fields but will also provide recommend irrigation depths for each IMZ instrumented with a UGA SSA node and a VRI irrigation prescription map which can be downloaded to the pivot's VRI controller. Figure 2 shows a preliminary design of the Web Tool's user interface. Please note the irrigation recommendations by zone. As indicated in the FY14 proposal, t*he Web Tool will be ready for the 2014 growing season*. We are pleased to also note that the UGA SSA was recently licensed by FirstWater Ag – a new company which will be offering variable rate irrigation (VRI) systems and a commercialized version of the UGA SSA by 2015. This means that the technology will be soon readily available to peanut producers.

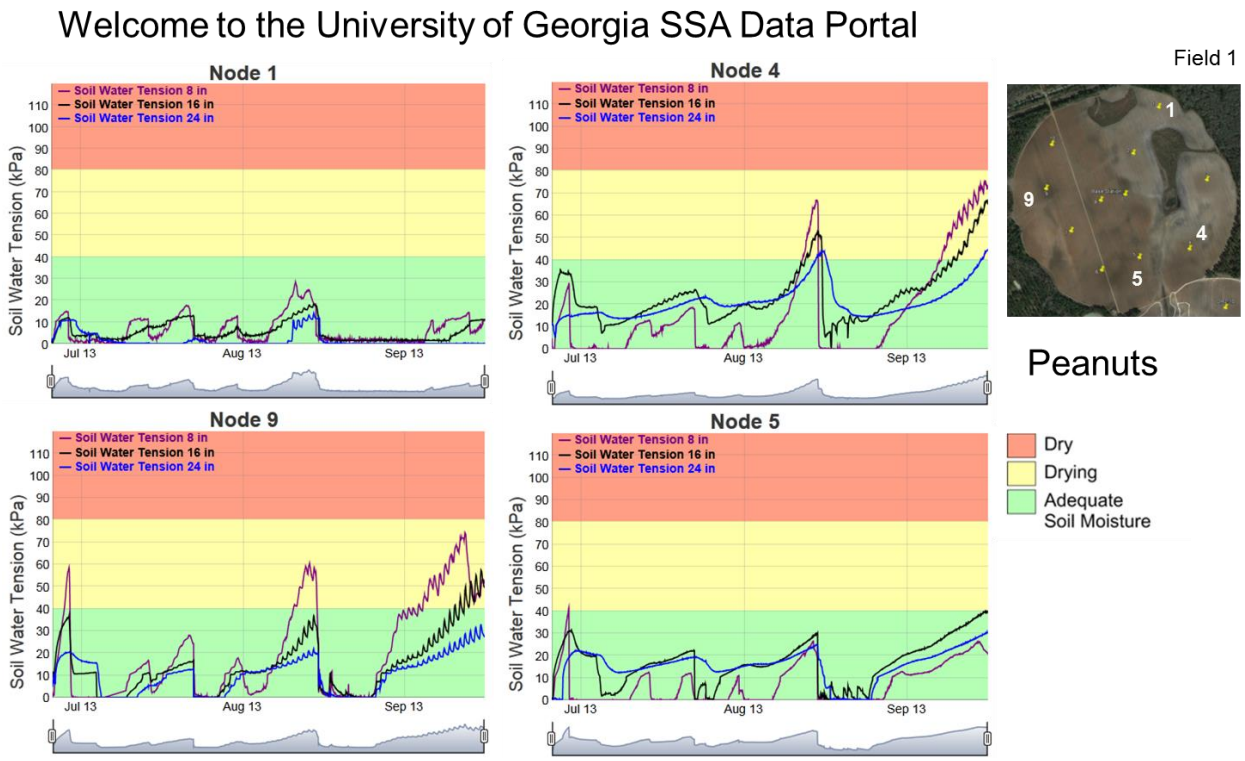


Figure 1. UGA SSA Data Portal showing soil water tension graph from 4 nodes in one of the projects peanut fields during 2013. The graphs show the great variability in soil moisture condition across the field. Participating producers were able to access this information in real time.

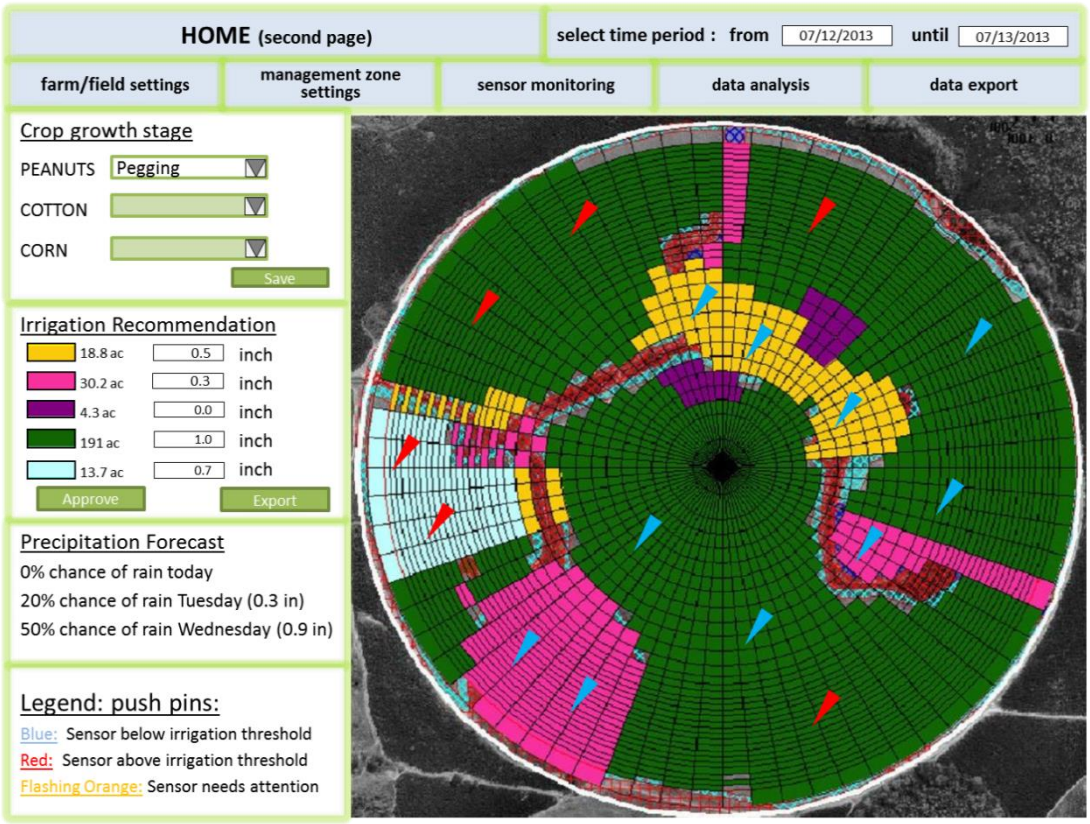


Figure 2. Web Tool user interface dashboard showing irrigation scheduling recommendations for a VRI-enabled center pivot system with 5 irrigation management zones. Once the recommendations are approved by the user, they will be automatically exported to a VRI controller-ready prescription map.