A HOLISTIC SOLUTION TO USING SOIL MOISTURE DATA FOR SCHEDULING IRRIGATION

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OBJECTIVE: Evaluate an ET model-based dynamic variable rate irrigation (VRI) system.

The overall goal of the project is to develop and demonstrate that dynamic variable rate irrigation (VRI) is a viable and implementable solution for peanuts. Over the past four years we have demonstrated that by using a VRI system linked to an automated soil moisture sensing system, we can consistently achieve irrigation water use efficiency gains (IWUE) of between 30% and 40%. This means that we can produce 30-40% more crop with every drop of irrigation water than other irrigation scheduling methods.

However, the truth is that soil moisture sensor-driven dynamic VRI is expensive and difficult to implement because it requires a minimum of one and likely two or three sensors for each irrigation management zone (IMZ) for it to perform to its maximum potential. That is how we achieved the results described above. An alternative way may be to use evapotranspiration (ET) –based soil water balance models to schedule irrigation. To use a model-based dynamic VRI approach, we would still delineate the field into IMZs and apply the model individually to each IMZ. The model outputs would be used to write the VRI prescription map. During FY2020 we conducted a field experiment to begin collecting data from which to develop an ET model-based dynamic VRI approach for peanut production We leveraged funding from a USDA NRCS Conservation Innovation Grant to conduct this project. We divided a grower's field into pairs of parallel strips. Each pair of strips contained one conventionally irrigated strip and one dynamic VRI strip. The conventional strips were irrigated uniformly using the grower's standard method. The VRI strips were divided into IMZs. Irrigation decisions were made individually for each IMZ. We installed UGA SSA sensor nodes in each of the IMZs as well as in the conventional strips to monitor soil moisture as shown in Figure 1. At the end of the growing season, we harvested each strip individually and compared yields and IWUEs to assess the effectiveness of the dynamic VRI approach (Table 1).

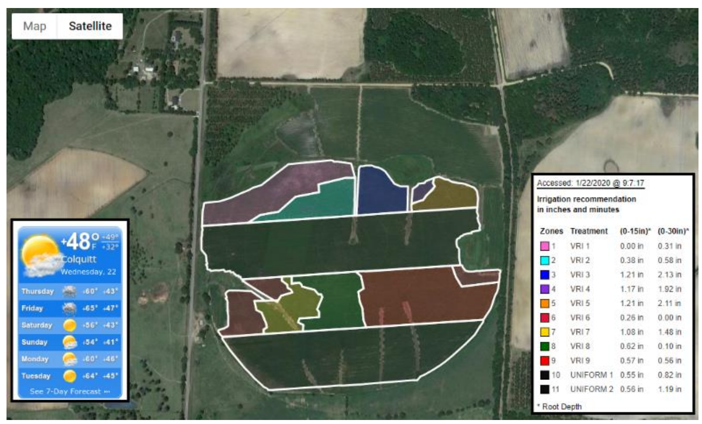

Figure 1. The field used for the study in 2019. The approach of pairs of parallel conventional and VRI strips will be used again in 2020. The table at right indicates the amount of water needed to bring the soil profile to field capacity at the end of the 2019 growing season – just before sensors were removed.

Table 1. Comparison of VRI versus conventional irrigation in the field shown in Figure 1. Results or totals or averages of the VRI and conventional treatments.

Treatment	Size (ac)	Weight (lb)	Avg Yield (lb/ac)	Avg Irrigation (in)	IWUE (lb/in)
VRI	39.4	221,058	5644	3.6	1564
Conventional	40.6	207,936	5099	5.6	911
Percent Difference			+10.7%	-35. 5%	+71.8%