# A Holistic Solution to Using Soil Moisture Data for Scheduling Irrigation

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**Objective:** Integrate Irrigator Pro into the Dynamic Variable Rate Irrigation (VRI) System.

**Results:**

The overall goal of the project is to improve our dynamic variable rate irrigation (VRI) system and refine its use with peanuts. Our dynamic VRI system consists of a VRI-enabled pivot, the UGA Smart Sensor Array (UGA SSA) and our irrigation scheduling Decision Support Tool (DST). The operational paradigm for our dynamic VRI system is that the field is divided into irrigation management zones (IMZs) and UGA SSA sensor nodes are installed in large numbers to monitor soil moisture within the zones and provide regular soil moisture measurements to the DST. The DST uses the soil moisture data to develop irrigation scheduling recommendations for each IMZ. The recommendations are then approved by the user (farmer) and downloaded wirelessly the VRI controller on the center pivot as a precision irrigation prescription. When the center pivot irrigation system is engaged by the farmer, the pivot applies the recommended rates. During 2015, with support from the Georgia Peanut Commission (GPC) and the Southern Peanut Research Initiative (SPRI) we conducted a dynamic VRI "proof-of-concept" study on which we reported last year. During 2016 we again leveraged GPC and SPRI funds to conduct a field-scale dynamic VRI experiment on a grower's field near Leary to test our dynamic VRI control system. During 2017, ***we leveraged GPC funds*** with SPRI funds and with funds from the Georgia Environmental Protection Division's (EPD) Regional Water Plan Seed Grant Program and expanded the study to two fields – one near Leary in Calhoun County (Field1) and the other near Colquitt in Miller County (Field2).

In both fields we established pairs of parallel strips (Figure 1) – 8 strips in Field1 and 4 strips in Field2. Each pair of strips contained one conventionally irrigated strip and one dynamic VRI strip. In Field1, irrigation scheduling in the conventional strips was based on the original version of Irrigator Pro which uses manually-read soil temperature. In Field2, the conventional strips were irrigated using the grower's standard irrigation practice which was to apply 0.6 in every Tuesday and Saturday unless it rained. In the dynamic VRI strips, we used the soil moisture sensor-based Irrigator Pro (hereafter

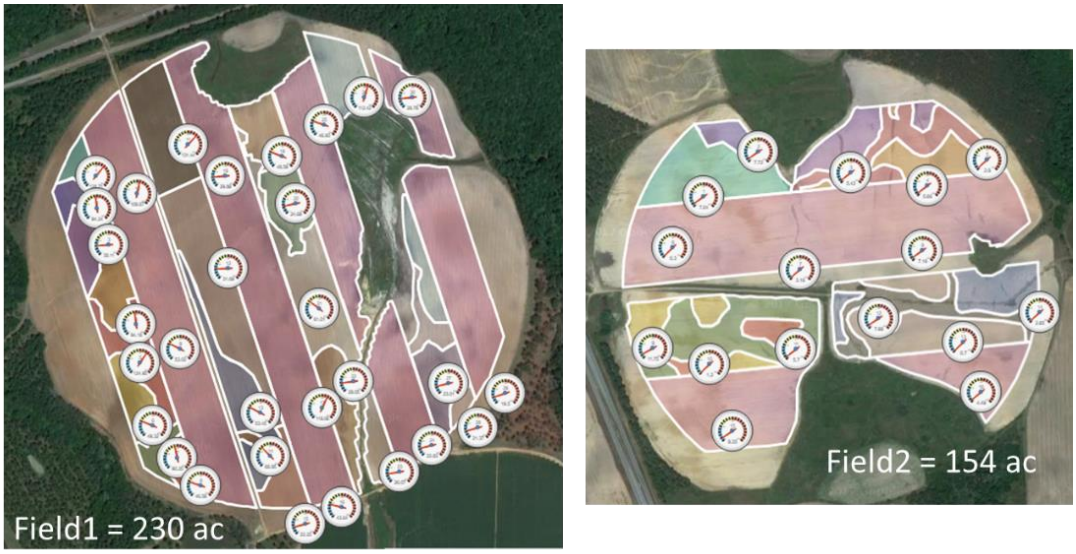


Figure 1. The two fields used in the study. Field1 was divided into 8 parallel strips while Field2 was divided into 4 strips.

referred to as IPsensor) to make Yes/No irrigation decisions and our UGA SSA DST to determine how much to apply to each IMZ. Each zone within the dynamic VRI strips was irrigated with the amount of water needed to bring the soil profile to within 75% of field capacity. When irrigation was initiated, the VRI system varied the rates accordingly.

The rainfall patterns at the two fields were quite different. Field1 received 10.7in of precipitation. Mid-July through August were particularly dry and the field was irrigated intensively during this period. Uniform strips received 7.5in of irrigation and VRI IMZs ranged from 5.4in to 8.8in of irrigation. In contrast, at Field2, rain was distributed throughout the growing season with 61 rainy days and 28in of precipitation from May 1st to September 30th. In this field, the uniform strips received 2.2in while the IMZs received 1.9in.

In Field1, dynamic VRI resulted in an average 0.8% gain in yield and an average 35% gain in IWUE. In Field2 dynamic VRI resulted in an average 1.3% gain in yield and an average 16% gain in IWUE (Table 1). Because in Field2, there were only four irrigation events with the difference in total water applied between dynamic VRI and conventional being less than 0.3in, it is difficult to make definitive statements about IWUE gains in this field. The gains in Field1 are however significant and validate our conclusions from 2016 that IPsensor is an excellent irrigation scheduling tool because it incorporates crop physiology, soil temperature, and soil moisture into its decision making.

Table 1. Summary of results from the dynamic VRI experiment conducted during 2017.

| Field | Treatment | Area (ac) | Yield (lbs/ac) | Avg Irrig (in) | IWUE (lb/ac-in) | % Diff Yield | % Diff IWUE |
|---|---|---|---|---|---|---|---|
| 1 | VRI | 56 | 5695 | 3.6 | 1589 | 0.8% | 35.0% |
| 1 | Uniform | 60 | 5650 | 4.8 | 1177 | | |
| 2 | VRI | 66 | 5438 | 1.9 | 2821 | 1.3% | 15.6% |
| 2 | Uniform | 56 | 5369 | 2.2 | 2440 | | |