Irrigator Pro is a public domain support system (DSS) for irrigation scheduling in peanuts that was developed by USDA ARS. (https://irrigatorpro.org)

- Widely used by peanut farmers and consultants in the Southeast.
- Original version requires weekly manual inputs of soil temperature and precipitation.
- Recently-released version uses soil matric potential from wireless soil moisture sensor networks.
- High soil variability in Coastal Plain fields requires an adaptive DSS that provides actionable decisions.
- Volumetric water content (VWC) or capacitance sensors with wireless telemetry are widely available.

### OBJECTIVES & GOAL

This project aimed to make Irrigator Pro an easier-to-use irrigation DSS by incorporating multiple data sources. Specific objectives were:

- Modify the DSS to accept VWC data from capacitance sensors (Figure 1).
- Develop water release curves to convert irrigation thresholds to VWC.
- Test and compare the new versions of the DSS to existing versions and other irrigation scheduling tools at the plot scale.

### METHOD & MATERIAL

- Rewrite the Irrigator Pro code to accept VWC data from capacitance probes.
- Code currently converts matric potential to VWC using empirical equations to estimate daily water use (DWU).
- Year 1 entailed using VWC and matric potential sensors (Table 1) to benchmark published Kc curves for peanuts at the plot scale. The research was conducted at two research farms (SIRP and HHERC) in southwestern Georgia, USA.
- Irrigation was scheduled using sensors and the soil temperature and precipitation.
- High soil variability in Coastal Plain fields requires an adaptive DSS that provides actionable decisions.

### RESULTS & DISCUSSION

- Scheduling with VWC sensors was the most efficient although the rainfall treatment outperformed all irrigation scheduling treatments in 2021 (Table 1).
- Root activity can be monitored using VWC.
- During 2022, VWC scheduling plots at the SIRP field produced the highest average yield among the Irrigator Pro options without any significant difference.
- IRWI for HHERC location during Year 2.
- VWC version is available for public use.

### Table 1. Yield and IWUE* results after the 2021-2022 seasons at the SIRP field, and the 2022 season at the HHERC field.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>SIRP Field (Year &amp; Precipitation)</th>
<th>HHERC Field (Year &amp; Precipitation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2021 (681 mm)</td>
<td>2022 (525 mm)</td>
</tr>
<tr>
<td>Yield (kg ha⁻¹)</td>
<td>Irrigation (mm)</td>
<td>IWUE (kg ha⁻¹ mm⁻¹)</td>
</tr>
<tr>
<td>ET-based</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Irrigator Pro (Temp)</td>
<td>6445 a</td>
<td>131</td>
</tr>
<tr>
<td>SWT (UGA SSA)</td>
<td>6605 b</td>
<td>74</td>
</tr>
<tr>
<td>Irrigator Pro (SWT)</td>
<td>6510 c</td>
<td>112</td>
</tr>
<tr>
<td>Irrigator Pro (VWC)</td>
<td>6480 b</td>
<td>55</td>
</tr>
<tr>
<td>Rainfed</td>
<td>6780 d</td>
<td>36</td>
</tr>
</tbody>
</table>

*IWUE = Irrigation Water Use Efficiency

Figure 1. VWC version of Irrigator Pro on a mobile device.

Figure 2. Peanut CropFIT interface on a mobile device.

Figure 3. Developed Kc-GDD curve compared to standard ET-based schedule from FAO-56 guidance. X series feature both DAP (top) and GDD (bottom).