

Florida Agricultural Soil Moisture Sensor Network

Engaging growers, agents, and technology industry to conserve and protect water resources

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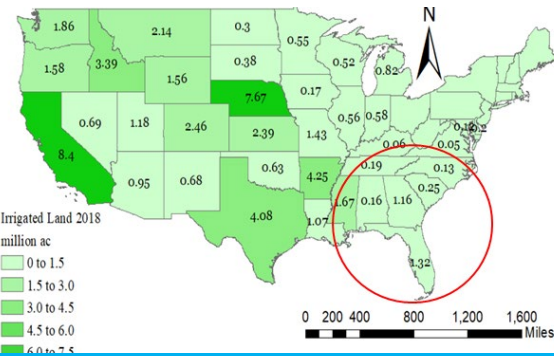
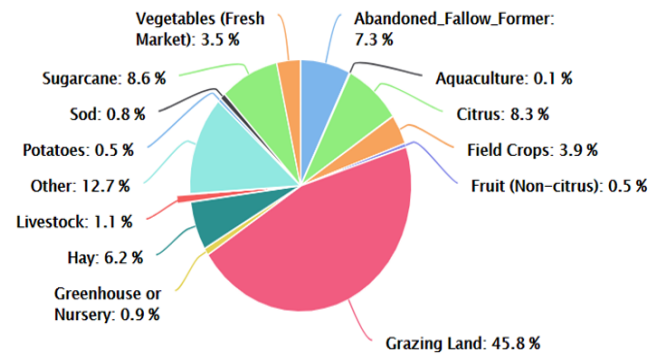
³UF-IFAS Extension

**University of Florida
Water Institute Symposium
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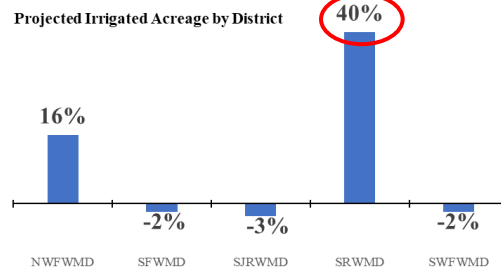
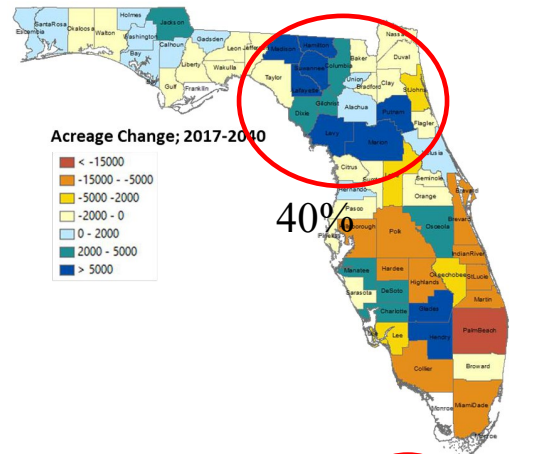
Florida Irrigated Agriculture

“The water wars that defined the American West are heading East”
The wall street Journal, December 2019

Specialized crops and Irrigated Ag



Water Quantity Challenges



Water Quality Challenges



Increased nitrate-nitrogen (NO³-N) concentrations, Impaired waterbodies, harmful algal bloom

Source: (NASS, FDACS, FDEP, Springs Eternal Project, by InDepth)

4% increase in Florida Water use by 2040

Precision Irrigation Management

- Maximizing the benefit of irrigated agriculture through well designed Ag water management network is critical in Florida.
- Irrigated lands are limited in the adoption of newer technologies/tools.
- **Excessive irrigation can result in:**
 - Runoff, Soil Erosion.
 - Deep Percolation of Water and Nutrients.
 - Effect grain yield and quality.
 - Environmental Degradation
 - Anaerobic Soil Conditions (Yield Penalty)
 - Increased Pumping Cost (i.e., energy cost)
- **Insufficient Irrigation can reduce:**
 - Limit transpiration
 - Total Biomass
 - Grain Yield
 - Grain Quality
 - Net Return (\$ per acre)

Soil Moisture Sensor Technology

Manual



Gravimetric Method

Dataloggers



Watermark



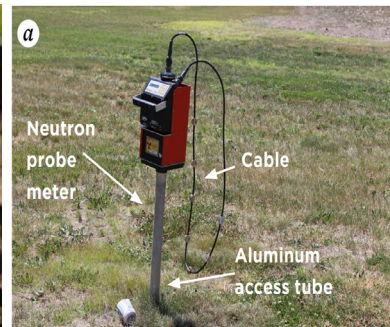
Sentek Probe



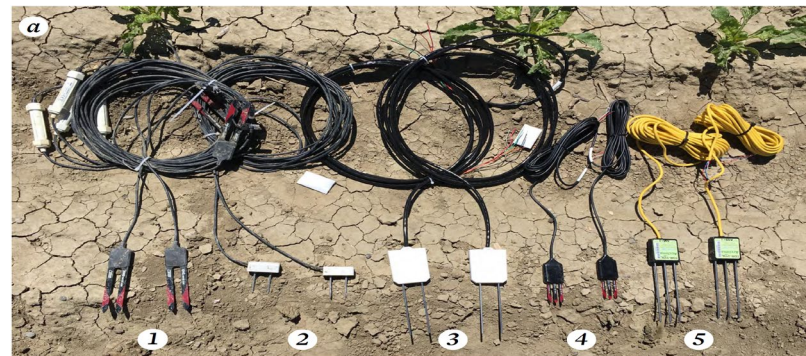
BMP logic



Tensiometer

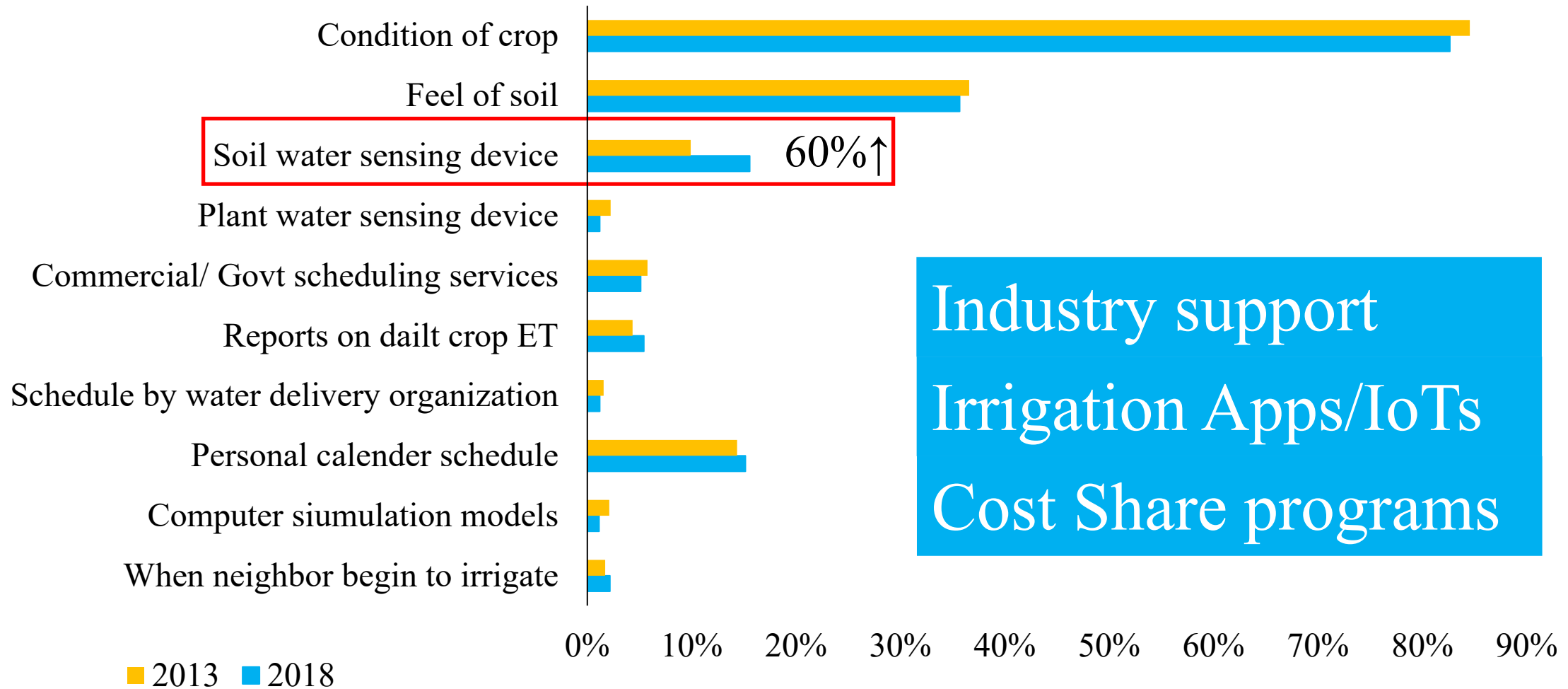


Neutron Probe



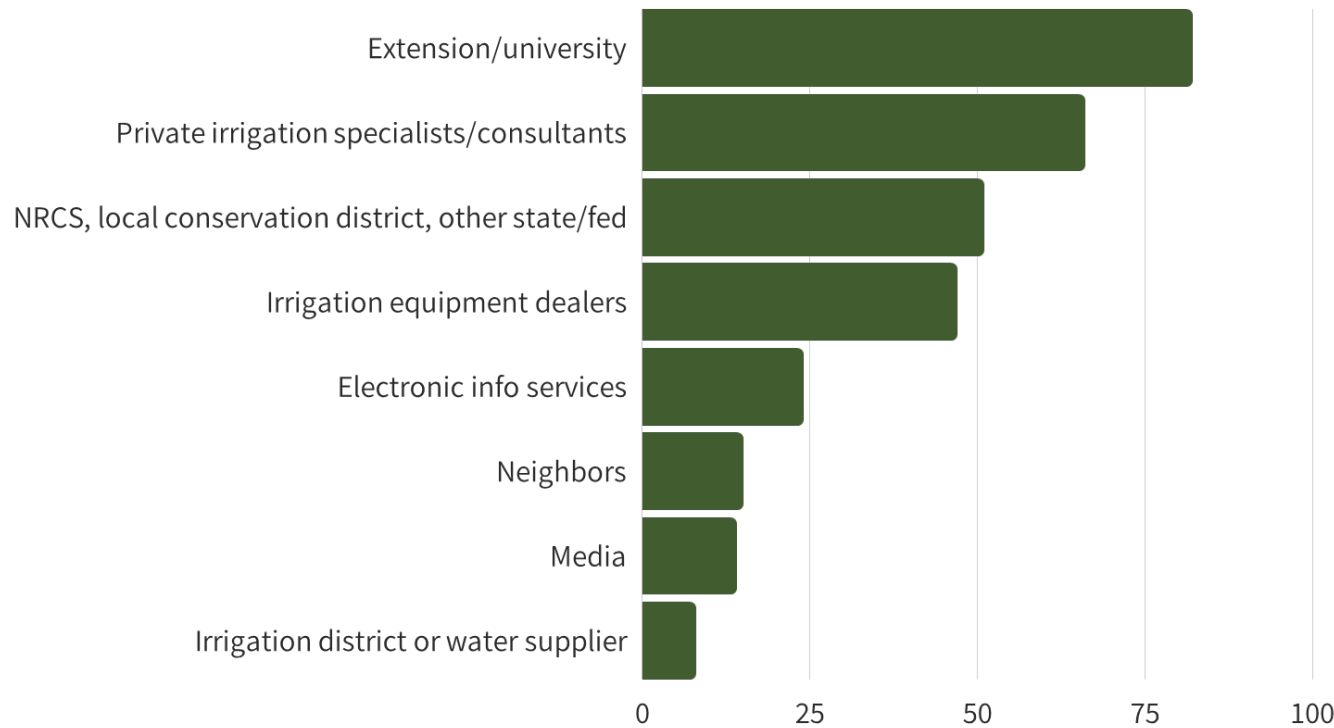
Single depth sensor

Irrigation Scheduling in Florida



Extension Services

WHO DO FARMERS TURN TO FOR WATER CONSERVATION PRACTICES?



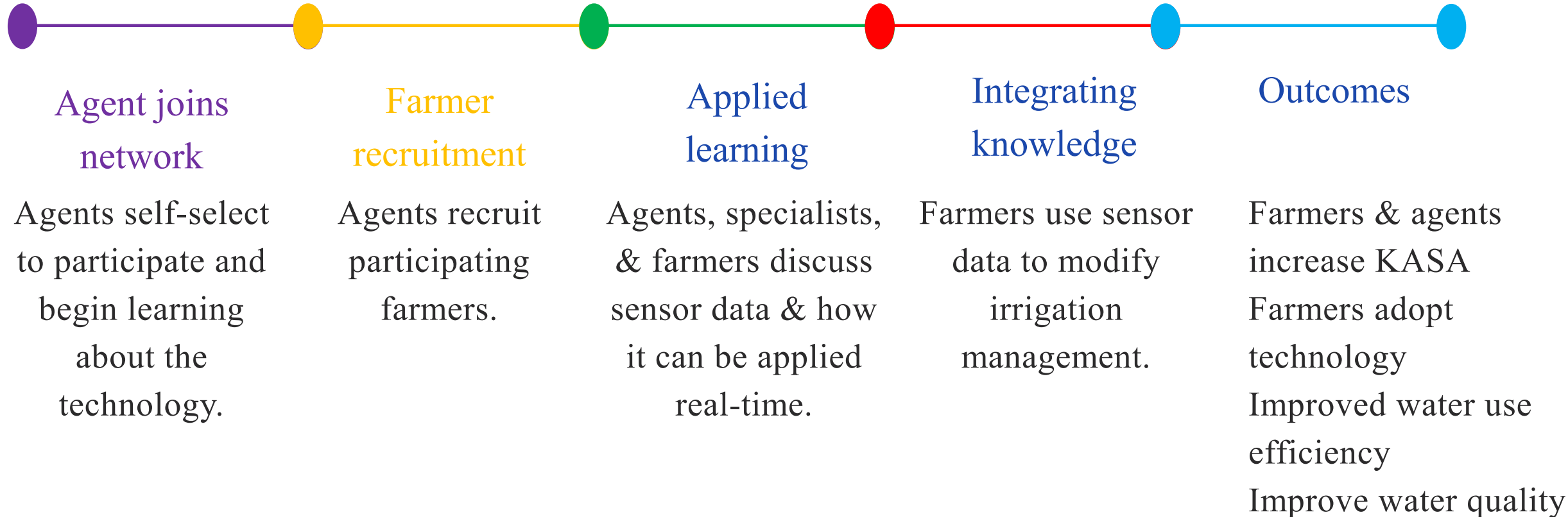
Extension agents of change

Most Florida farmers turn to extension services and Universities for water-conservation guidance. When we bring forth new technologies and make them easy to try out, we are helping farmers, and our environment and economy.

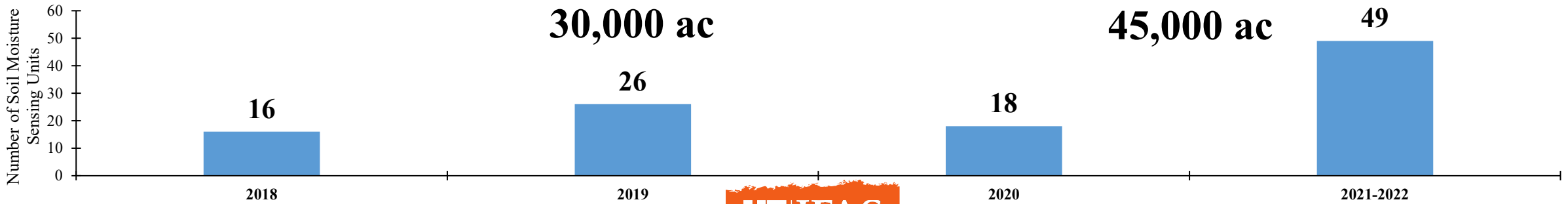
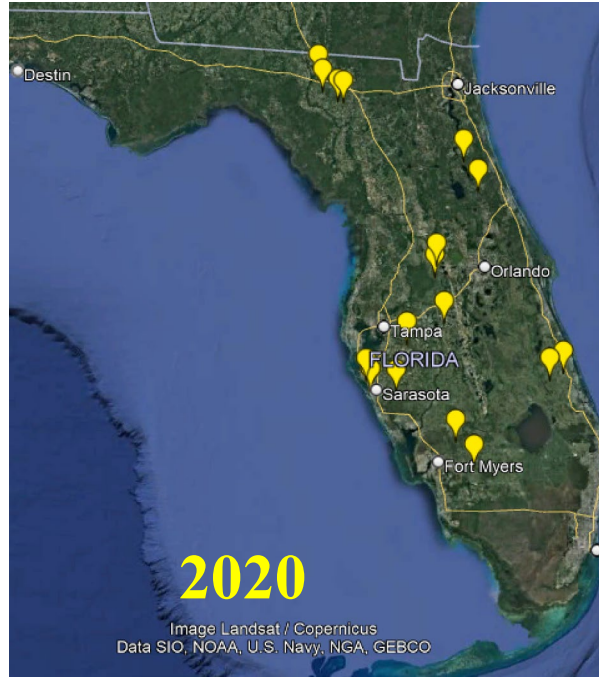
Network's Objectives

- The main objective of this network is to lend soil moisture sensors to interested farmers in various types of agricultural systems for them to try and adopt them, which will likely lead to irrigation water and nutrient savings.
 - Provide advanced technical training to extension agents in the installation and use of soil moisture sensor technology, so that they feel confident to share this knowledge and skills with growers,
 - To increase producers' adoption of water and nutrient BMPs, and
 - Continuous expansion of Florida Soil Moisture Sensor Network;

Technology Transfer Model



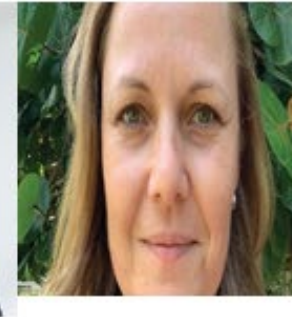
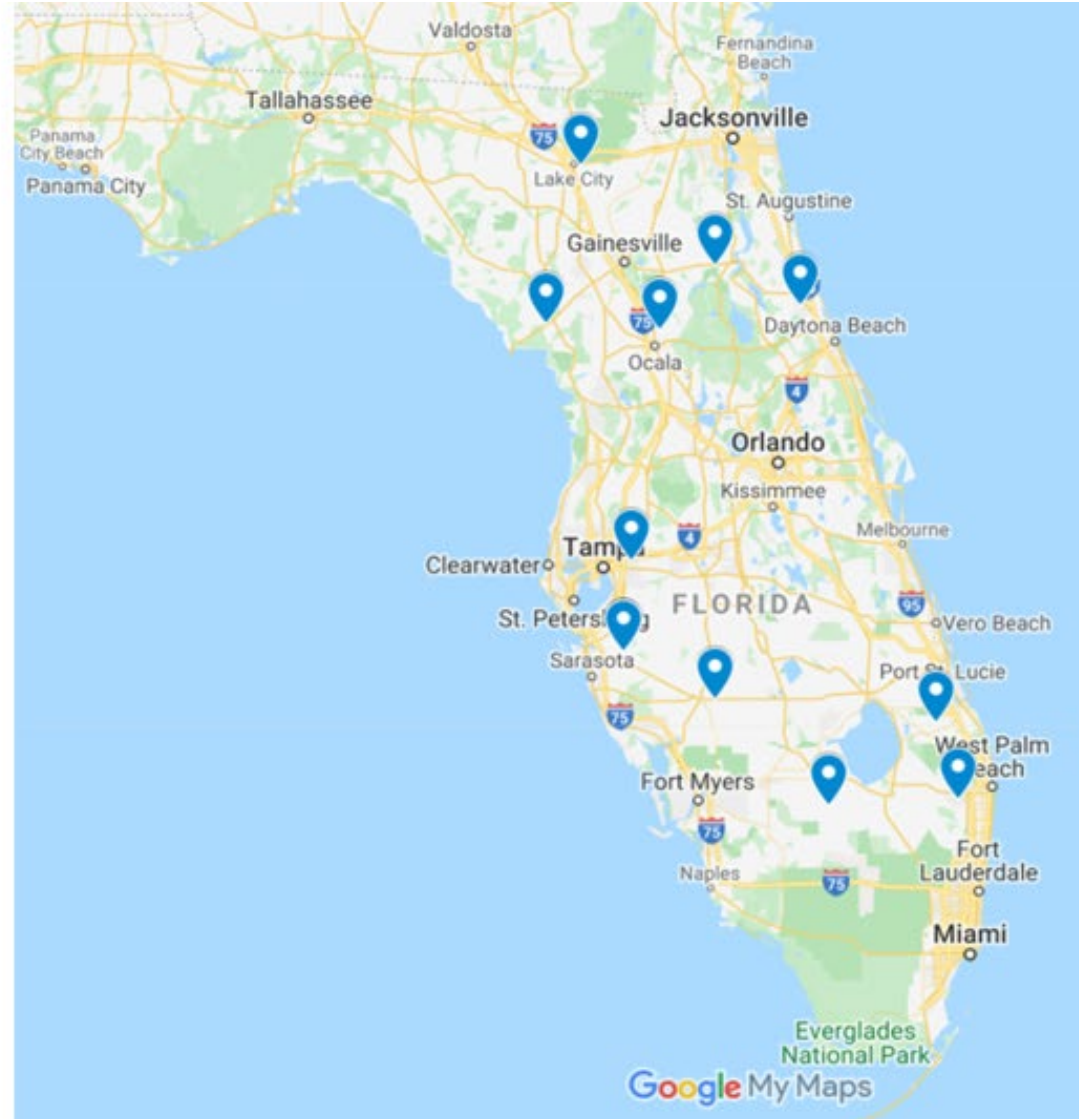
Network Expansion



30,000 ac

45,000 ac

Extension Agent Network

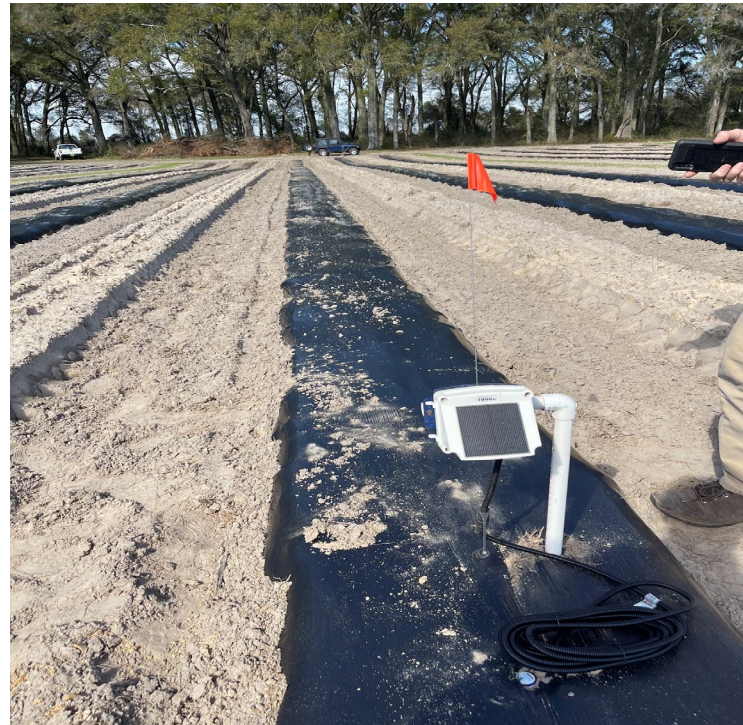


Sensor Technologies

- The project seeks to use the most appropriate, cost-effective, and advanced technology to expand the soil moisture network in the state of Florida.



Sentek Drill and Drop Sensors



BMP Logic



AquaSpy

Training Program

- One-on-One training
- Workshops
- In-Service Training (ISTs)

In 2019-2020 growing season:

- 3 field days,
- 4 workshops and
- 37 one-on-one or group trainings

In 2020-2021 growing season:

- 2 IST workshops (online) and
- Multiple one-on-one or group trainings (online)

In 2021-2022 growing season:

- 3 invited sessions (online)
- Multiple online one-on-one or group trainings (online)



**Soil Moisture Sensor Technologies IST – May 2022
Announcement will be released soon!**

Success Stories – 1

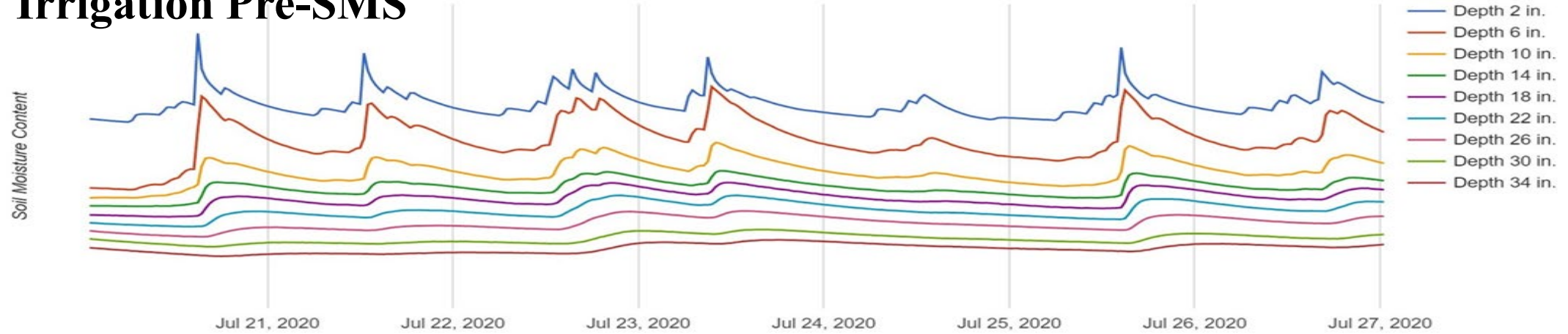
1D Tree Farm, Hillsborough County



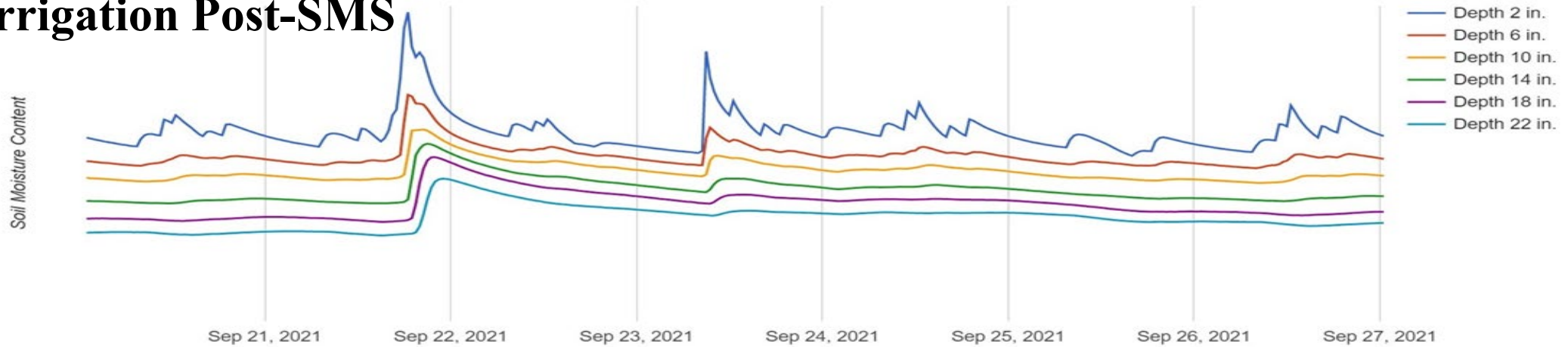
- Located in Plant City, Hillsborough County FL
- 25 acres of container & in-ground ornamental trees
- New at business; only 3 years in operation
- No experience irrigating trees
- Primary issues:
 - in-ground trees with leaf loss and root rots

Irrigation Management Pre and Post SMS

Irrigation Pre-SMS

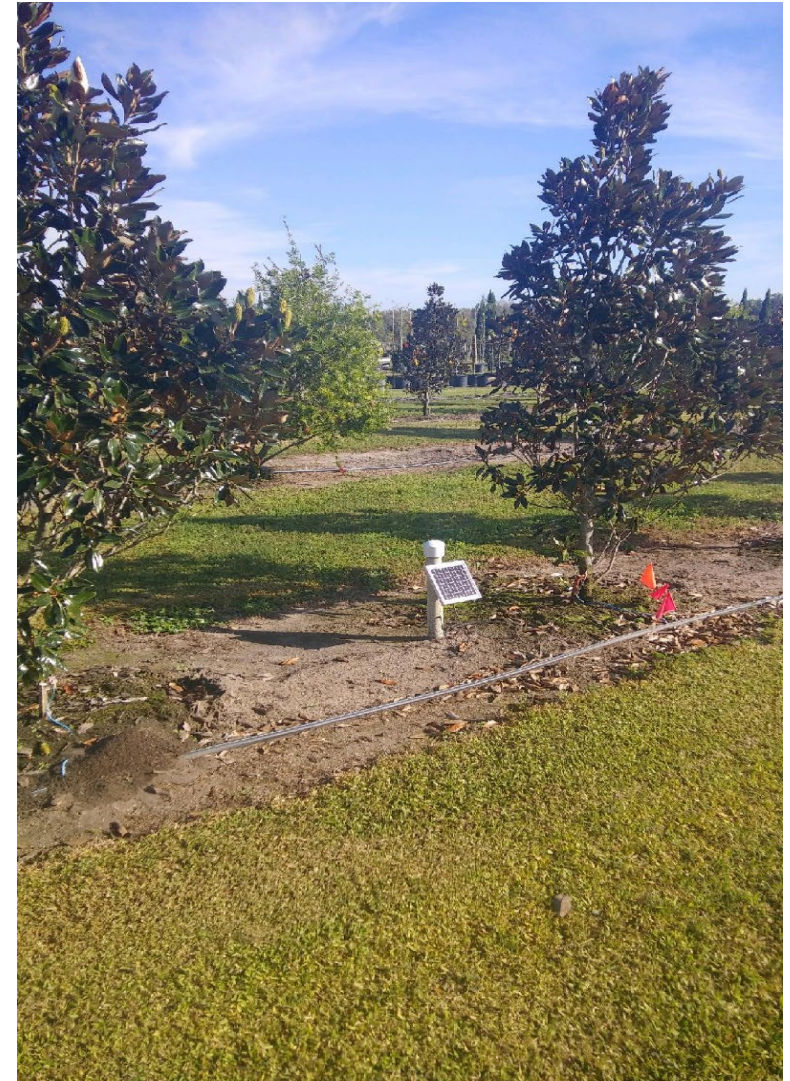


Irrigation Post-SMS



Major Outcomes

- Changed how they irrigated the farms
- Reduced irrigation by about 20%
- Changed strategy on how they checked for leaks
- Improved quality of trees grown in-ground
- Turned problem trees back to salable



Success Stories – 2

Pope's Citrus Farm – Hillsborough County

Irrigation Pre-SMS

- Bought farm in 2017 as a retirement hobby, 30-acre grove
- Yellow/lime green leaves he thought was citrus greening
- 2 irrigation zones – 8-hour periods watering cycle, rotating cycles continually
- High diesel fuel & fertilizer expenses



Major Outcomes

- Irrigation was reduced to 1 hour per zone, twice a week in sandy soil and every 10 days for loamy soil.
- Diesel fuel savings over 2.5-year period- \$45K (avg \$3.73/gal).
- Highest yield was 2021 after SMS was installed & received Tropicana contract to pick.
- Reduction in fertilizer expenses by \$8,000

Success Story – 3

Institutional Collaboration

- The Nature Conservancy; The Mosaic Company and Mosaic Foundation and University of Florida
 - 16 new soil moisture sensors provide to UF extension agent in:
 - Desoto,
 - Hardee,
 - Polk,
 - Manatee and
 - Hillsborough Counties.

Conclusion

- Increasing interest among growers on using soil moisture sensors for irrigation and nutrient management.
- Increasing interest among extension agents to be a part of the Florida Agricultural Soil Moisture Sensor Network.
- Network is bringing behavior changes such as grower adoption of the technology, reductions in irrigation application, understanding of the impacts of their irrigation decisions on crop water and nutrient availability.
- Project team is currently working on a grower and agent survey to quantify the impact of network and knowledge gain.
- In 2020-2021, the network reached 45,000 ac with an average saving of 0.5 inches of water, which is equivalent to 617,753,500 gallons of water.
- Continuous expansion is required to broaden the scope of the network, targeting new growers and new cropping systems.

Thank you for your attention!
Questions

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