

A photograph of a large agricultural field, likely a vegetable or fruit field, showing rows of young plants in furrows. The field is covered with plastic mulch, and the rows are spaced out, illustrating the concept of drip irrigation. The background shows a line of trees under a clear sky.

Drip Irrigation Considerations

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2025 Mater Irrigator Training

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Irrigation Efficiency

Irrigation Efficiency:

Measures how much of the water applied is beneficially used by the crop.

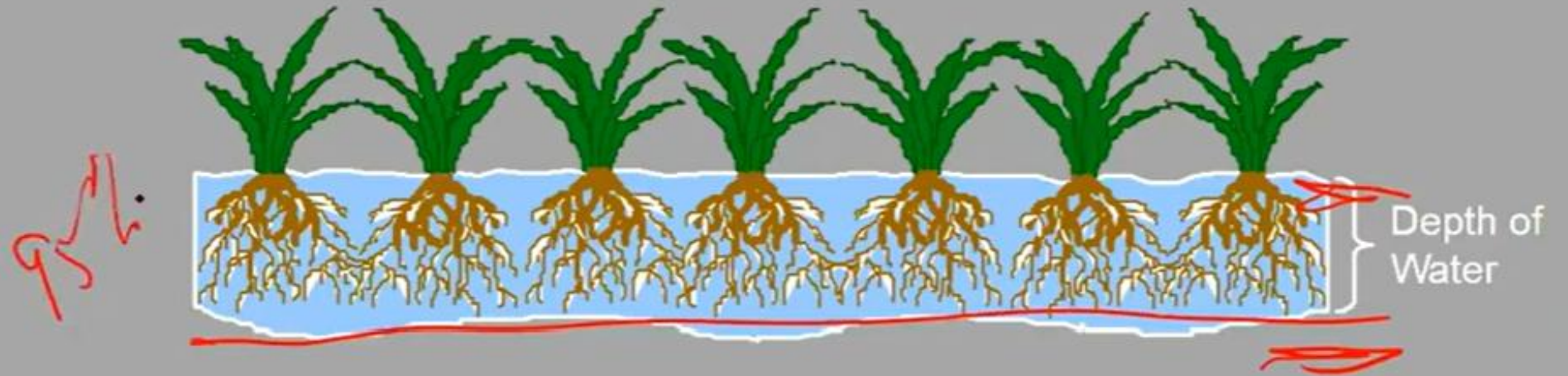
Formula:

Efficiency = (Water Beneficially Used) / (Total Water Applied)

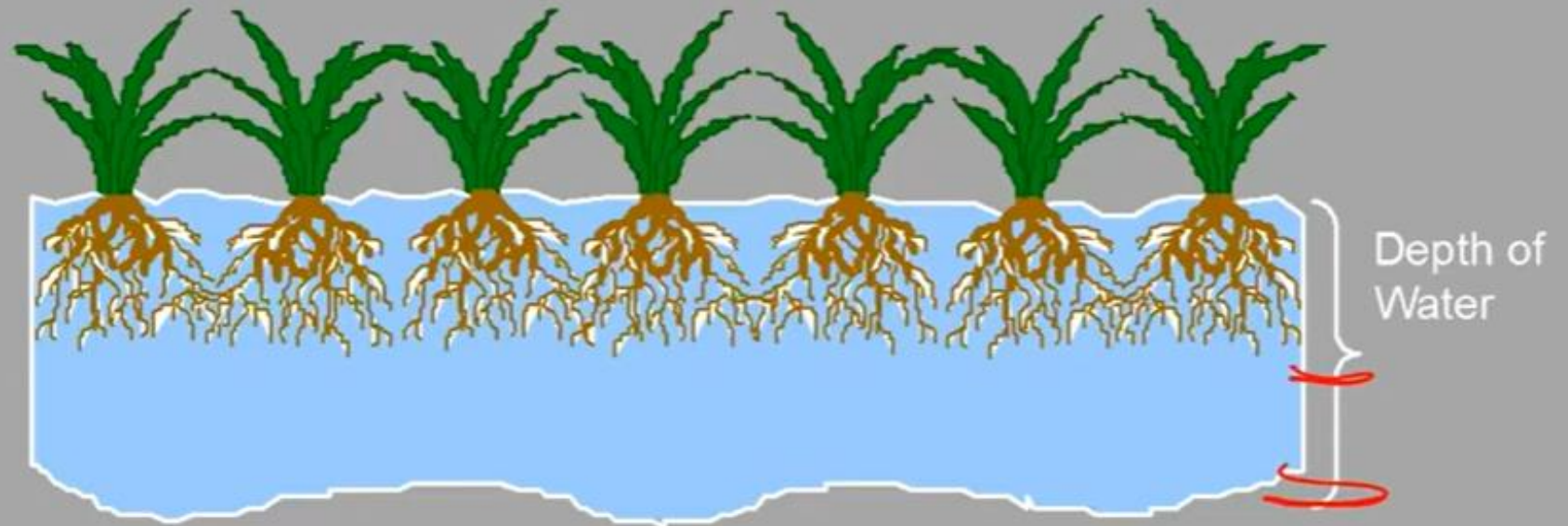
Challenges to Measure Efficiency:

- It depends on the water that reaches the root zone or plant.
- Soil moisture sensors provide critical insights into root zone water availability.

Efficient



Not Efficient



Credit: Dr.
Franklin Gaudi,
Laurel Ag and
Water

Beneficial Uses of Water

- **Primary Beneficial Use in the Southeast:** Meeting crop evapotranspiration (ET) – Ensures crops receive the water they need to grow effectively.
- **Other Beneficial Uses:** Climate Control. Cooling crops during high heat.
- **Weed Germination:** Watering weeds for management later.
- Unlike arid areas, water use for salt leaching is typically unnecessary in the Southeast

What is Distribution Uniformity (DU)?

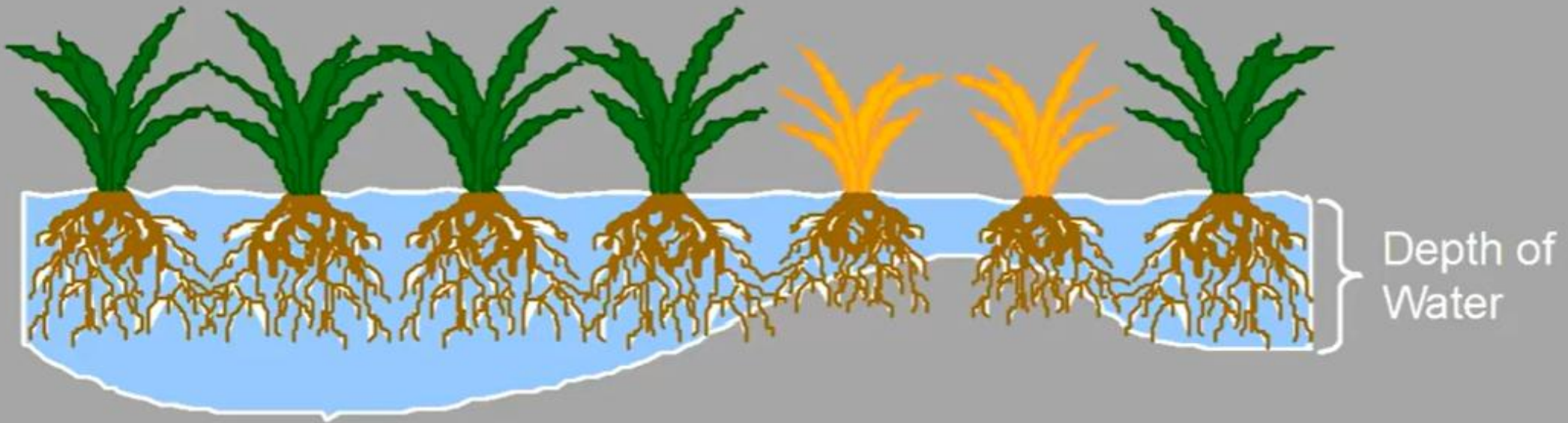
- Measures evenness of water application across a field.
- Ideal DU: 90% or greater
- Assessed using the **catch can method**:

Why It Matters:

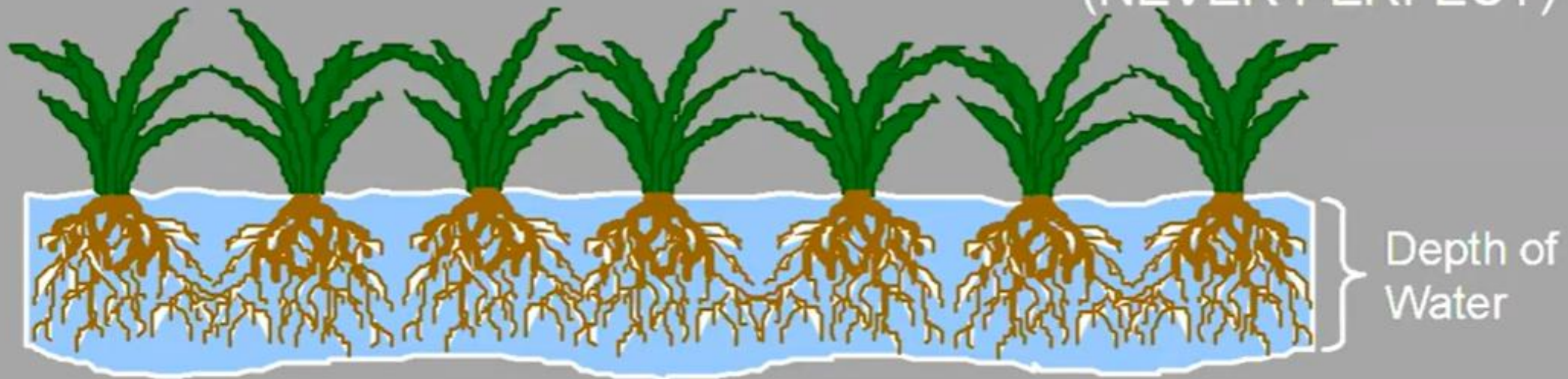
- Uniform crop growth & yield
- Efficient water and fertilizer usage
- Early detection of clogs, leaks, or system design flaws



POOR UNIFORMITY



GOOD UNIFORMITY (NEVER PERFECT)



Credit: Dr.
Franklin Gaudi,
Laurel Ag and
Water

What Affects DU in Drip Systems?

Emitter Manufacturing Quality

- The **Coefficient of Variation (CV)** indicates how consistently emitters are produced (flow rate variation).
- Lower CV = more consistent flow rates = higher DU.

Why CV Matters

- Understanding the manufacturer's CV helps you choose emitters that deliver more uniform water application.
- Even slight variations can compound over time, leading to under- or over-irrigation in different zones.

Cost vs. Benefit

- Achieving extremely high DU may increase upfront costs (premium emitters, advanced filters, etc.). So balance financial investment and benefits (crop yield, water savings, etc.)

Measuring DU with Catch Cans

Setup

- Place identical containers under selected emitters (start, midpoint, end)
- Run system under normal operating pressure for a set time
- Collect Data
- Measure water volume in each container
- Sort volumes (smallest to largest)
- **Calculate DU:** $DU = (\text{Average of lowest 25\% of volumes} / \text{Average of all volumes}) \times 100\%$



Credit: Government of Western Australia Department of Primary Industries and Regional Development.

Why Flushing Drip Irrigation Is Important

- Removes Debris: Clears sediment, algae, and mineral buildup from lines
- Prevents Emitter Clogging: Regular flushes minimize partial blockages
- Extends System Life: Reduces stress on drip tape and fittings
- Preserves Uniformity: Maintains consistent flow and pressure across lines



Credit: Jeremy Giddings

Checking Drip Tape Pressure

- In-line gauge or portable pressure-test kit
- Where to Measure: Start, middle, and end of each lateral
- Recommended Range: Typically 8–15 psi (check manufacturer specs)

Interpretation

- Too Low → Possible blockages, leaks, or undersized pump
- Too High → Use pressure regulators or adjust pump settings

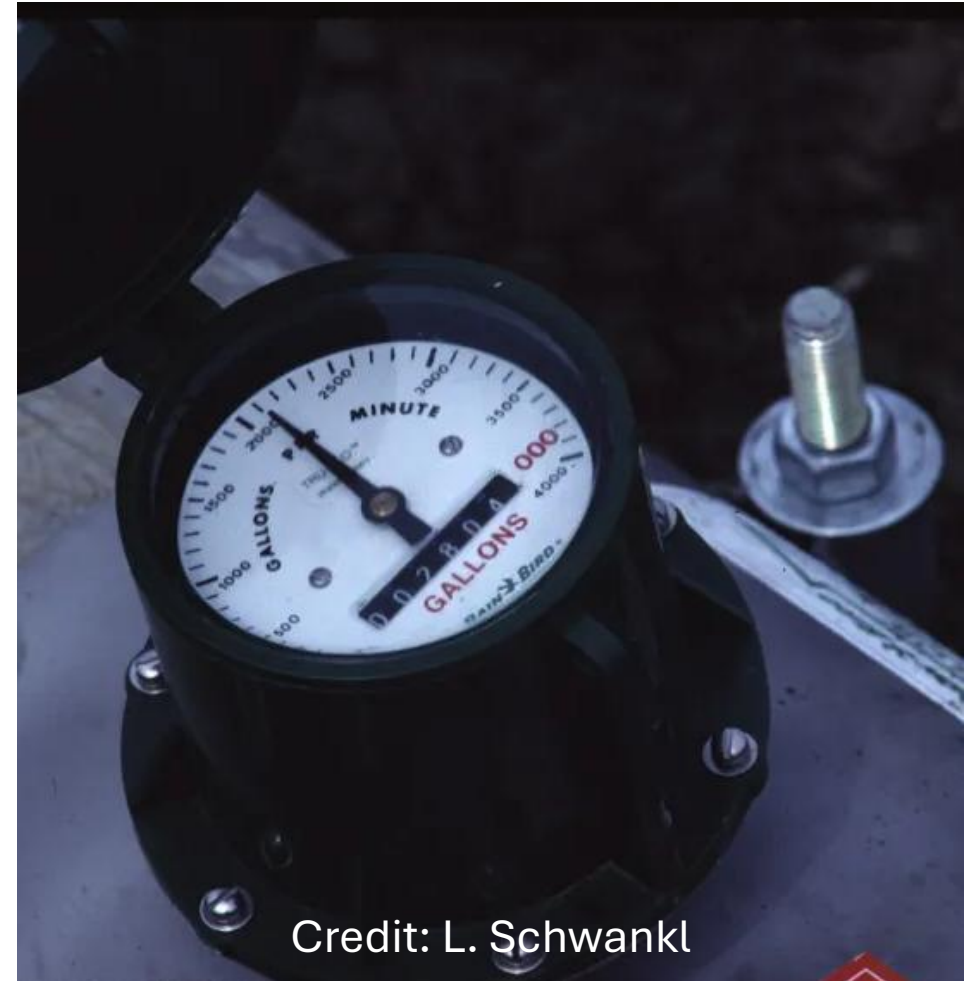
Why Flow Rate & Pressure Variation Matter

Identifying Leaks and clogs

- High flow + Low pressure often indicates a leak or damaged tape
- Low flow + High pressure suggests partial blockages or emitter clogging

Track Baseline

- Know your normal flow rate & pressure to quickly detect changes
- Early detection saves time, water, and protects yields



Credit: L. Schwankl

Example: Watermelon Irrigation Runtime and Frequency

Irrigation Duration

- For drip tape at 0.4 gal/100 ft/min, limit each irrigation event to 1–1.5 hours.
- Longer run times push water (and nutrients) below the 12–15 inch root zone.

Irrigation Frequency

- Replace single long events (e.g., 3–4 hours) with **two or three shorter events** per day.
- Improves water availability in the root zone and reduces nutrient leaching.

Adjusting for Different Flow Rates

- Lower flow tapes (0.22–0.25 gal/100 ft/min) require longer run times.
- Match irrigation runtime to drip tape output.

Correct Irrigation

- **Soil moisture sensors** can help confirm moisture reaches 12–15 inches (full root zone).
- **Blue dye** can reveal how deep irrigation water is percolating visually, helping to fine-tune run times. Useful extension demo.

Soil Moisture Sensor Use

Water Efficiency Improvements:

- Adoption of optimal irrigation schedules reducing water waste.
- Increased water retention within the root zone, enhancing crop health.

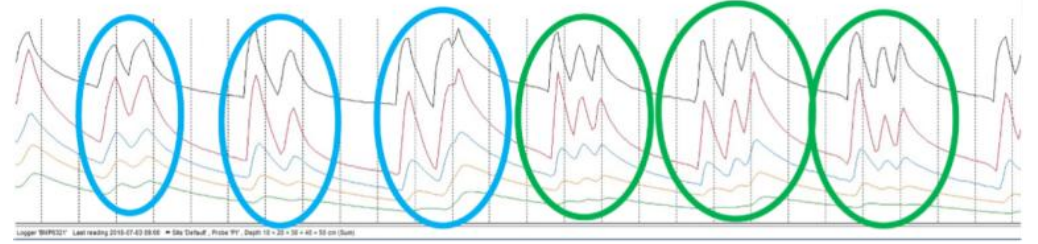
Nutrient Management:

- Minimization of nutrient leaching, preserving soil fertility and reducing environmental impact.

Economic Benefits:

- Reduced water usage leading to lower operational costs for farmers.
- Improved crop yields and quality due to better irrigation practices.

What do the lines tell us?



Salinity Measures Pre-plant Conventional Fertilizer

Decrease in all depths except at 20-inches.

Highest fertilizer at planting at 16 and 20 inches



Credit: B. Hochmuth, M. Warren, V. Sharma, M. Morrow,

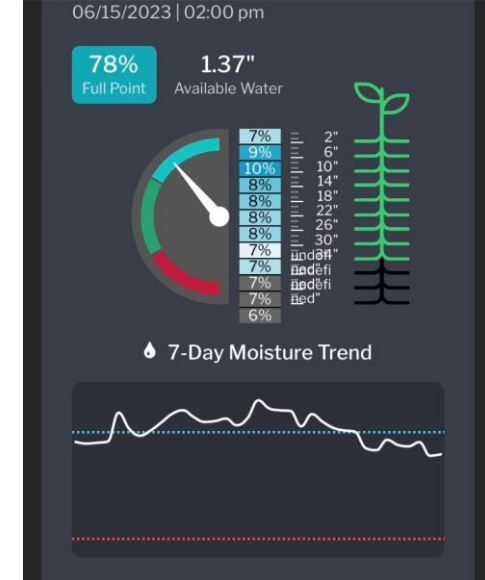
Soil Moisture Sensor (SMS) Adoption

High Adoption Rate

- Nearly **80%** of Suwannee Valley watermelon producers use soil moisture probes.

Collaboration

- Many Suwannee Valley farmers share probe login credentials with Extension agents for support and troubleshooting



Right Irrigation: Soil Moisture Sensor Network

Loaner Soil Moisture Sensors:

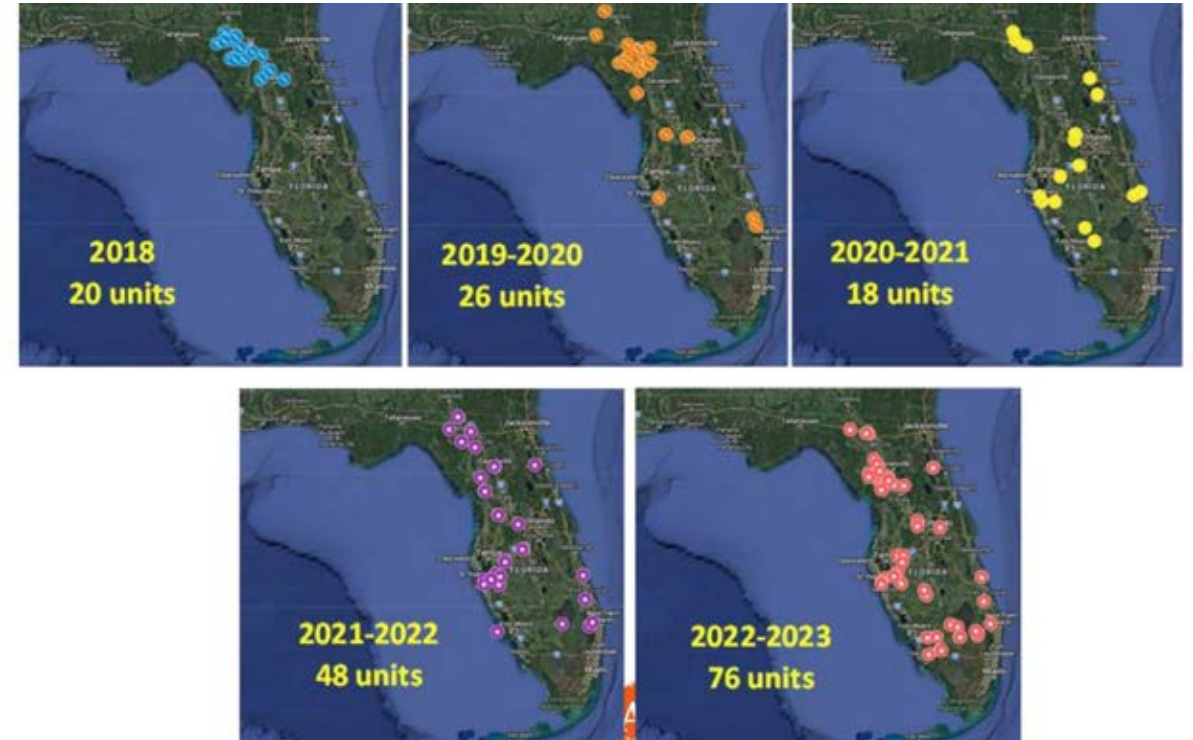
- About 80 Soil Moisture Sensor units deployed throughout Florida on various commodities
- In 2023 these probes assisted in irrigation scheduling across 300,000 acres across Florida

Technology Transfer:

- Agents join the network, learn the technology, and recruit farmers
- Agents, specialists, and farmers discuss and apply sensor data in real-time to modify irrigation
- Outcomes include Increased knowledge and skills, technology adoption, improved water use efficiency, and enhanced water quality

Facilitate Agricultural Cost Share Adoption:

- Cost-share opportunities available through local water management districts ranging from 75 – 90%



Credit: Dr. Vivek Sharma, University of Florida

Integrating DU and Efficiency with Soil Moisture Sensor Use

- Soil moisture sensors can be used to assess water reaching the root zone.
- **Accurate Placement:** Sensors must be located in representative field areas to reflect overall irrigation effectiveness.
- **Impact of Poor DU:** Placing sensors in areas with poor DU can provide misleading data, affecting irrigation scheduling and decisions.





Blue Dye Demonstrations

Automated Irrigation Systems

- Manually turning on and off irrigation valves on multiple fields was identified as a time consuming logistics problem for farmers.
- Automated irrigation equipment adopted on approximately 2000 acres of watermelons approximately 25% of the total Suwannee Valley Watermelon Acreage.

Credit: Tyler Pittman, UF/IFAS Gilchrist County



Automated Irrigation Systems

Remote Control & Monitoring

- Turn systems on/off from anywhere
- Receive alerts on flow rate or pressure issues

Labor & Cost Savings

- Less fuel/time driving to fields

Improved Water Use and Energy efficiency

- Only run irrigation as needed (e.g., rain shut-off)
- Potential for considerable water savings compared to traditional methods
- Reduced pump run times

Scalable Technology

- Multiple communication options (cellular, Wi-Fi, LoRa, etc.)
- Add sensors (flow meters, pressure gauges, soil moisture) as desired

Drip Irrigation EC Flush Tests

- Irrigation System Flush Tests
- Impacts of system design on fertigation efficiency
- Reduces excess water use
- Helps eliminate fertilizer leaching because of improper system operation

Credit: Mark Warren, UF/IFAS Levy County Extension



Conclusion

Importance of DU

- DU foundational building block of reducing input costs, allowing for more efficiency management, and increasing profitability.

Correct Irrigation Practices

- Matching duration and frequency to crop needs (rootzone depth) is key to preventing over- or under-irrigation.

Technology Aids Precision

- **Soil moisture sensors** or **blue dye** confirm water is reaching the intended root depth.
- **Automated irrigation** saves growers time by remotely turning systems on/off and monitoring flow.

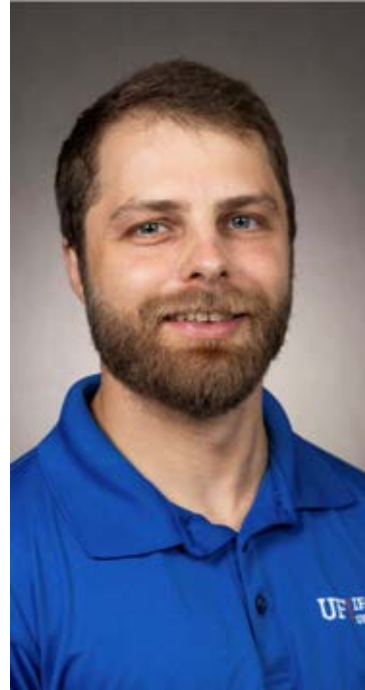
Extension & Industry Partnerships

- Extension programs support growers with training and field demonstrations.
- Industry innovations continue to improve and market cutting-edge irrigation technologies.

UF/IFAS Extension Suwannee Valley Watermelon Agents



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