

Fine Tuning Your Water and Nutrient Program

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Background



- Suwannee River Basin of North Florida
- 30 Years of Plasticulture Vegetables
- Deep (10-12 ft) Sandy Soils (<1.5% OM)
- Environmentally Sensitive Area
- 1986-1996 Plasticulture Adoption
- 1996-2018 Plasticulture Management
- Water and Nutrient Management







Florida BMP Program

- Water Quality and Quantity
- Suwannee Valley Nitrates in Ground Water
- Research Funded by Several Agencies
- Signup Benefits
 - Presumption of Compliance
 - Waiver of Liability
 - Cost Share Programs



2010 → Numerical Criteria for Water Bodies (EPA)

2013-2018 Basin Management Action Plans

Changes in
production in
Florida in
past 30 years



Current Florida Recommendations (BMPs) for Drip Irrigated Vegetables



1. Soil test
2. All Phosphorus and Micronutrients applied in bed pre-plant (not in deep groove)
3. 1/3 of N and K applied in bed pre-plant
4. Remaining N & K fertigated
5. Sap Test or Tissue Analysis to fine tune, especially in wet year
6. Terminate N&K fertigations prior to final harvest
7. Manage irrigation to keep nutrients in root zone





4 Rs of Fertilizer BMPS

- **Right source.** A soil test is necessary to accurately identify specific nutrients needed.
- **Right rate.** Use IFAS rates as a starting target. Adjust with documentation of added amounts (leaching rain events, etc.).
- **Right time.** Base timing of applications on plant growth stages.
- **Right placement.** Avoid vulnerable broadcast applications of leachable nutrients. Use sidedressing, banded, or drip-fertigation applications.

Example: The right rate

- More than 20 studies
- Maximum yield with 150 lb/acre with 8-ft beds
- Yield declined above 200 lb/acre N (8-ft centers)
- **A Summary of N, P, and K Research with Watermelon in Florida, 2010, by G. Hochmuth and E. Hanlon, <http://edis.ifas.ufl.edu/cv232>**

Keep in mind, “rate” is only part of a fertilizer recommendation

Monitoring and fine tuning in-season fertilizer applications



- Traditional dry leaf analysis
- Fresh petiole-sap testing
- Both use most-recently-matured whole leaf

PETIOLE SAP TESTING-WATERMELON

CROP STAGE	SAP NITRATE-N (PPM)	SAP K (PPM)
VINES 6 INCHES	1200-1500	4000-5000
FRUITS 2 INCHES	1000-1200	4000-5000
FRUITS HALF MATURE	800-1000	3500-4000
AT FIRST HARVEST	600-800	3000-3500

On-Farm Test of Petiole Sap Testing



- **Farmer 1** 520* ppm NO₃-N
- **Farmer 2** 1100
- **Farmer 3** 350*
- **Farmer 4** 1000
- **Farmer 5** 800*
- **Farmer 6** 950

- **Recommended level is 600-800 ppm near 1st harvest**

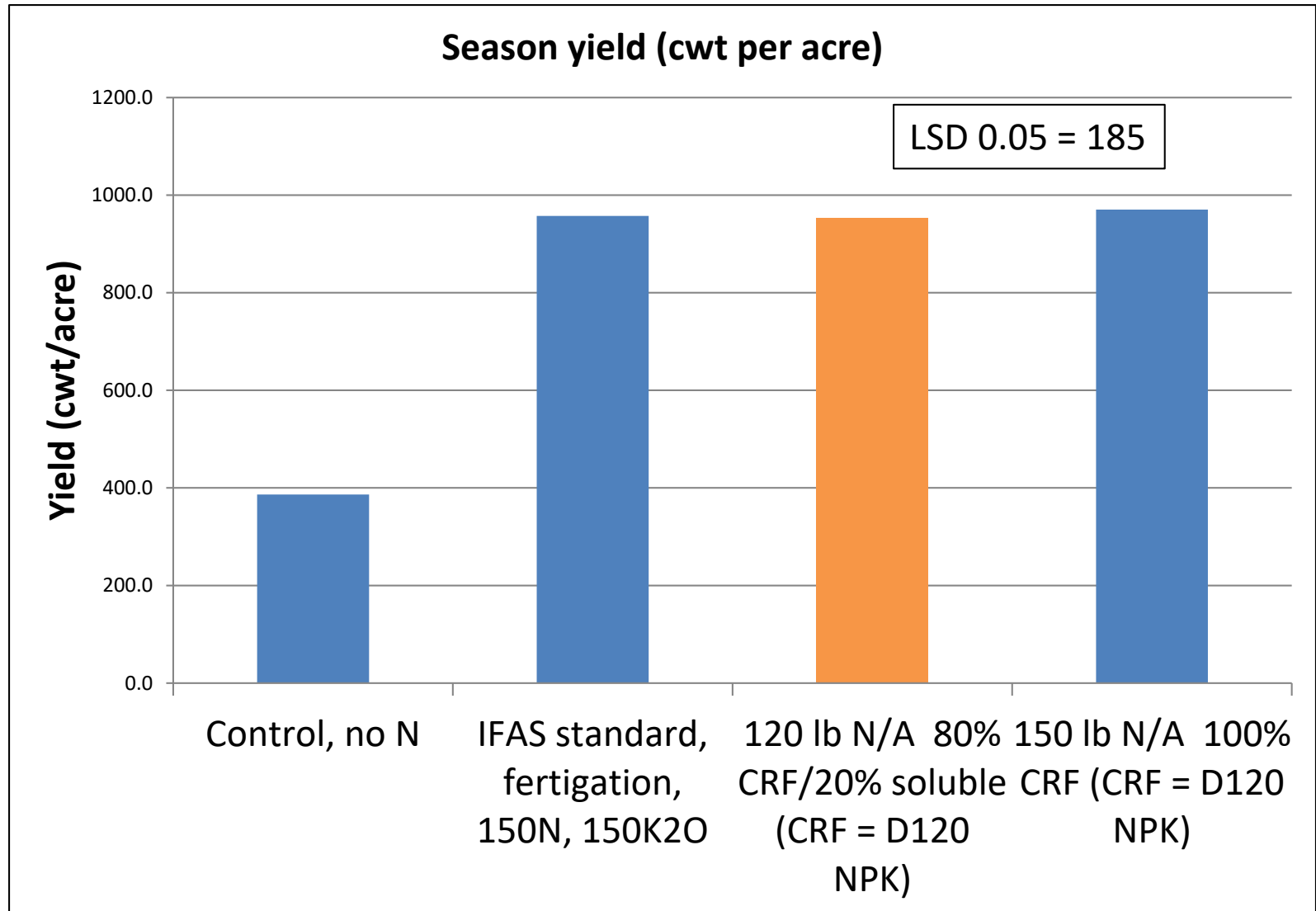
- *** denotes farmers with highest yields**



Current research with controlled-release fertilizers



Troubadour Watermelon, 2013, Citra, FL



Irrigation management

- Conservation of water
- Control movement of soluble nutrients like N and K

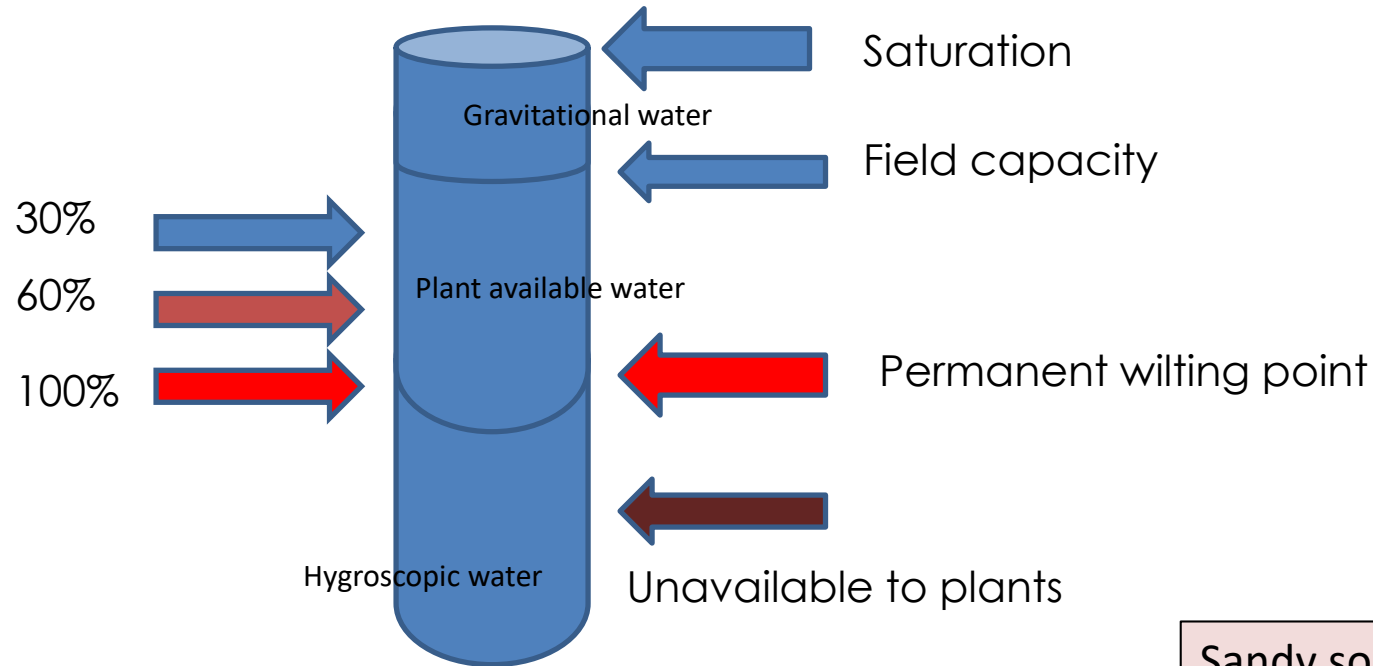


Water management BMP

- Know root zone
- Know water-holding capacity
- Know stage of growth
- Know crop ET
- Know irrigation delivery
- Answer: when to start the irrigation system
- Answer: how long to run the irrigation system

Root Zone – the water bank

Soil Water Components



Make a decision to irrigate
When 30 to 60% of AWHC is used
Sometimes called “management allowable depletion”

Sandy soil holds about
0.7 inch per foot

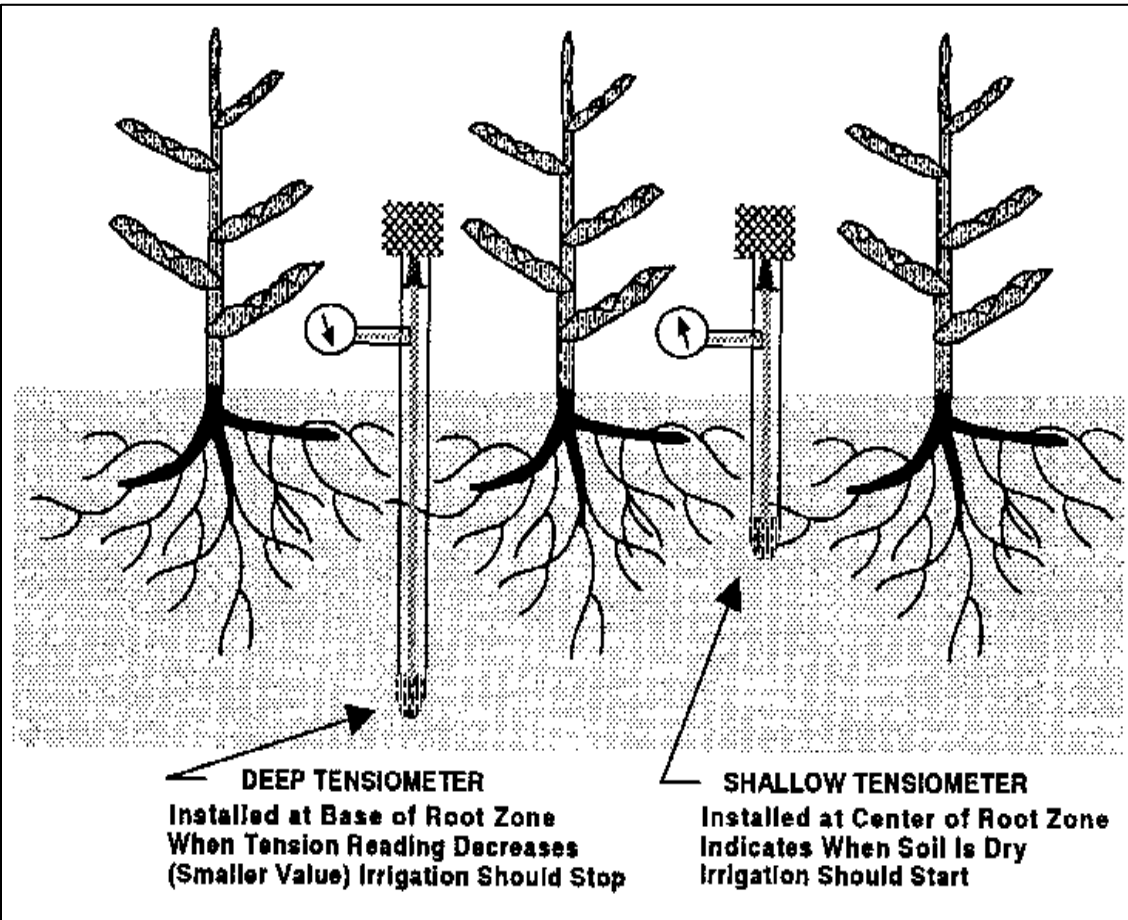


Soil Moisture Monitoring Sensors



Tensiometers

-8 to -12 centibars



Early-season- can help
Reduce amounts of water

Mid-Season – can help
Determine changes in
water demand

Late-season – Water
demand is high –
hard to over-irrigate



Irrigation Management

- Use automated switching valves
- Start with moist bed, keep beds moist
- Use a hand held TDR Probe, 8-12%



- Daily readings, middle of day
- Before zone comes on, driest time of day
- 4" from drip, middle of bed



Soil Moisture Sensors





Drip Irrigation Schools





Chapin Turbulent
Twin Wall
12" spacing
30 gal/100' /hr
4 hrs

Blue Dye "Don't" Lie



6"

10"

12"



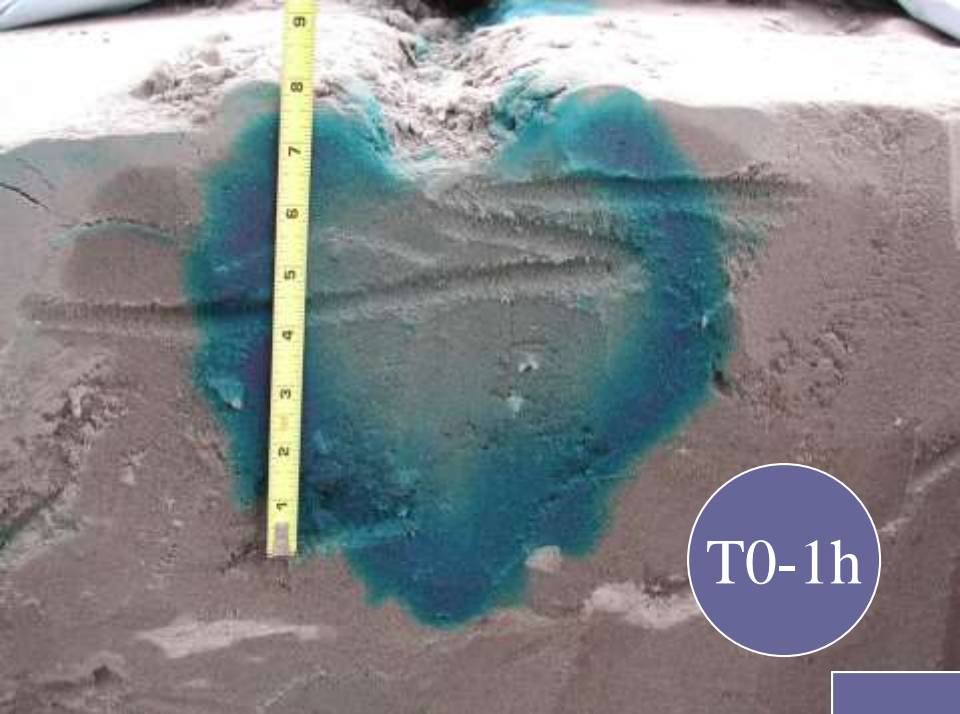
Tomato Roots – 88% top 10" soil (loam soil)

6"

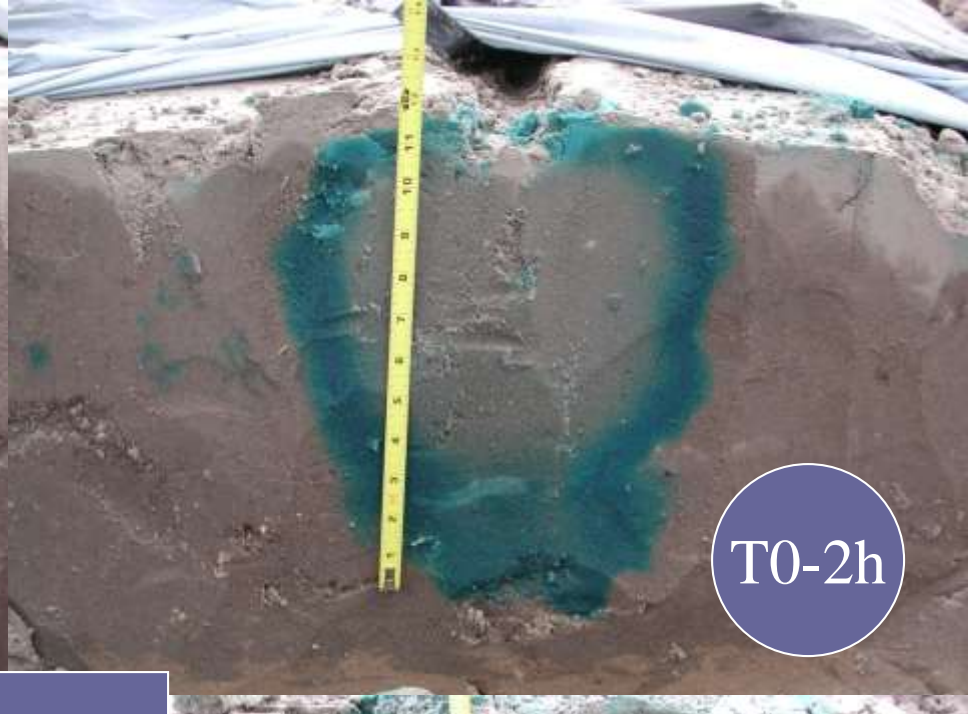
12"



Watermelon roots – 76% top 12" soil

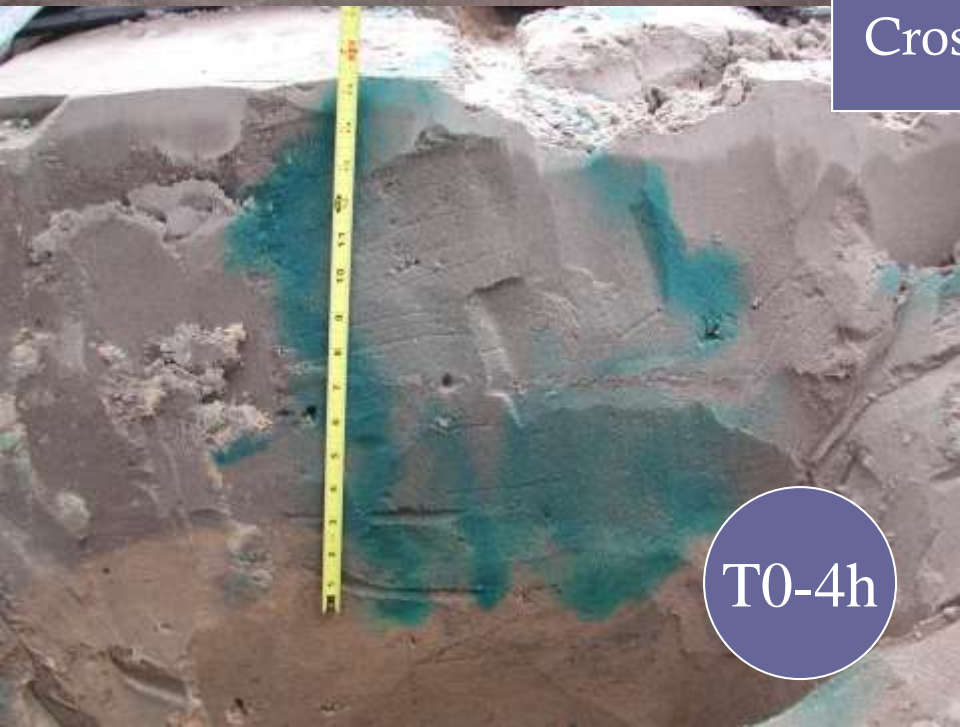


T0-1h

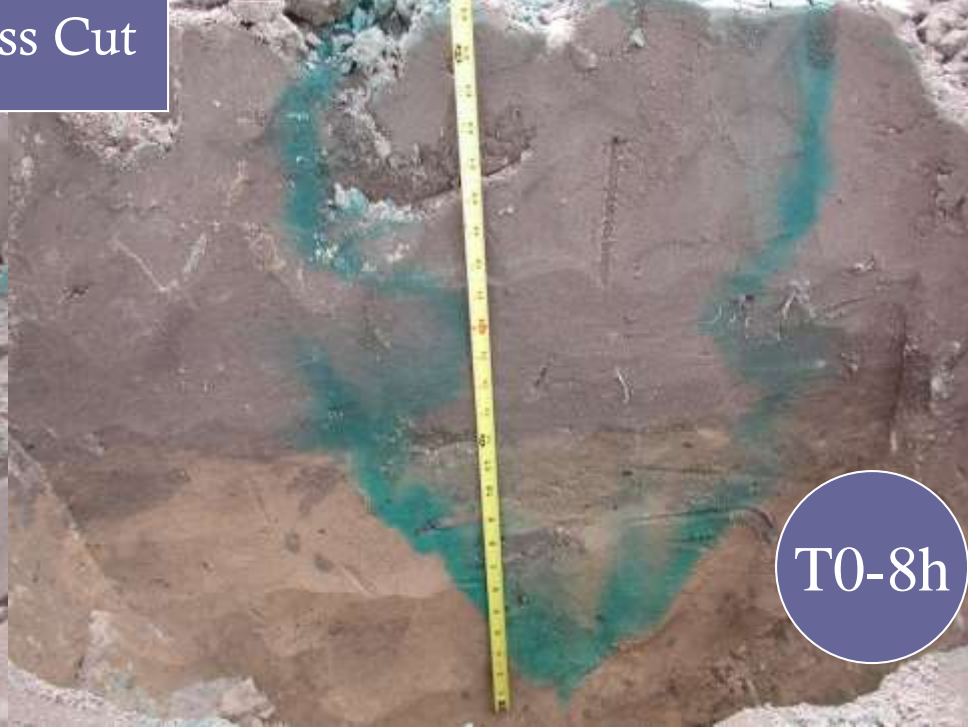


T0-2h

Cross Cut



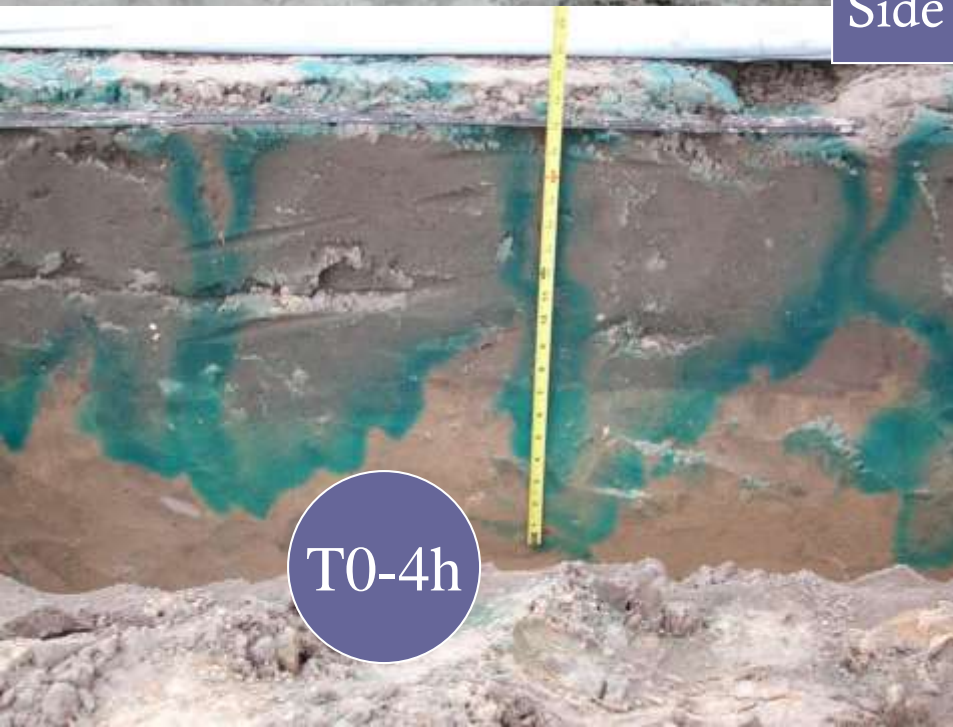
T0-4h



T0-8h



Side View



How much water can my bucket hold?

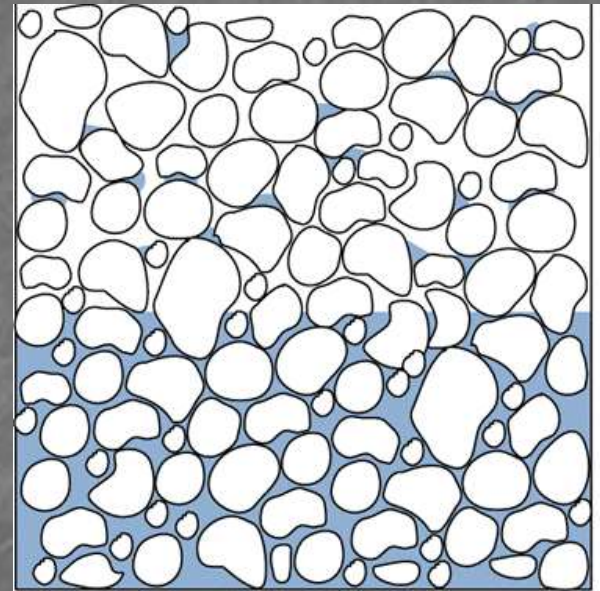
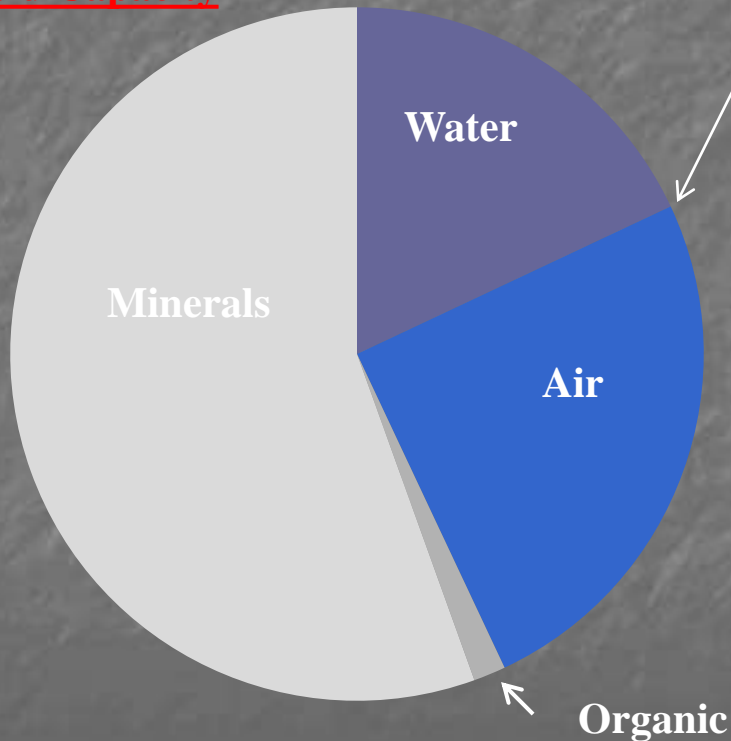


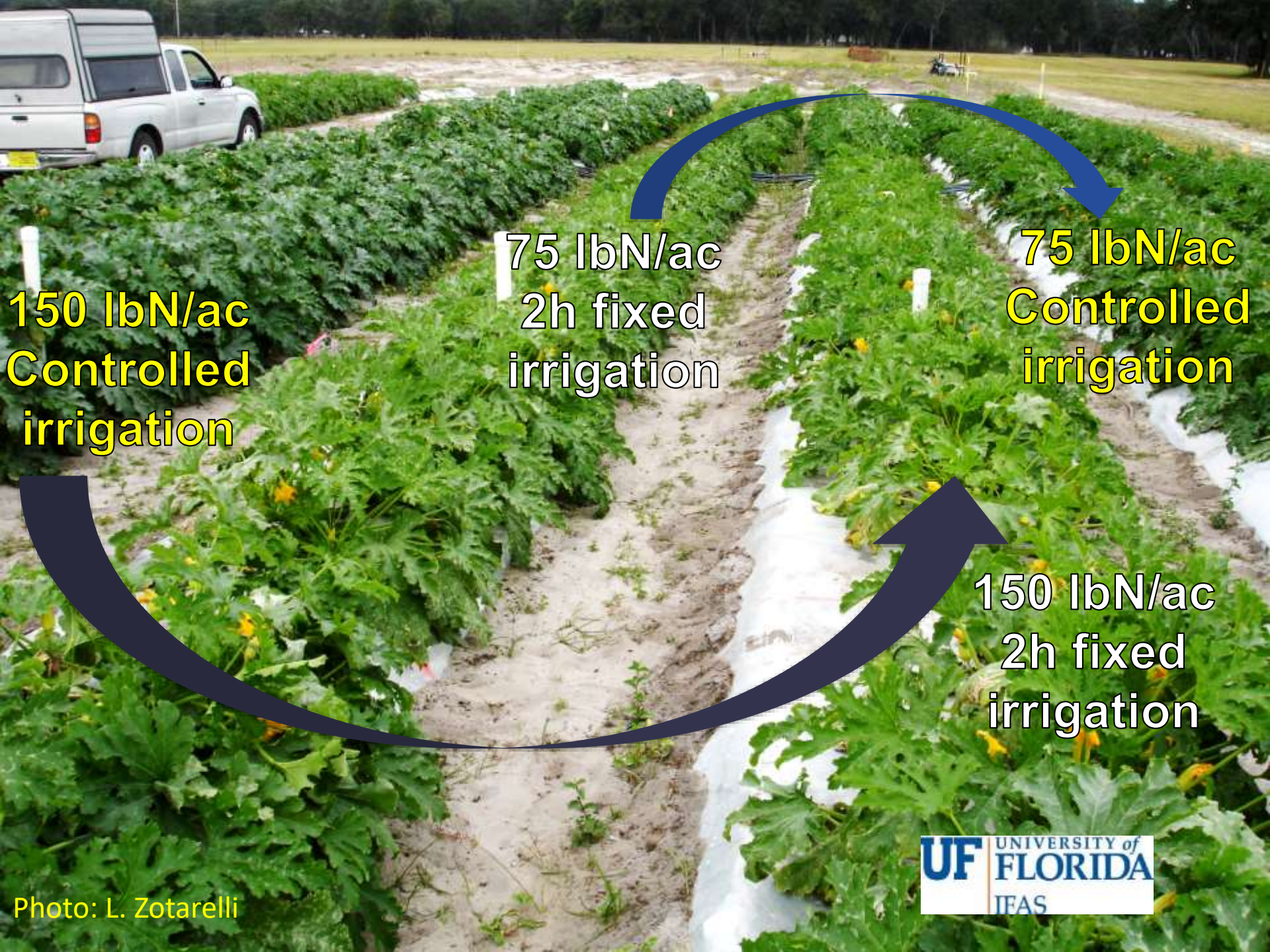
Varies with soil type – Volumetric Moisture Content (VMC)

- Sand – 6-10%
- Loam – 11-21%
- Clay – 22+%

Field Capacity (FC)

Soil Matrix at
Field Capacity





**150 lbN/ac
Controlled
irrigation**

**75 lbN/ac
2h fixed
irrigation**

**75 lbN/ac
Controlled
irrigation**

**150 lbN/ac
2h fixed
irrigation**



Blue Dye Demo Methods Overhead and Microjet Irrigation





Rain Gauge – 2 Inches





On-Farm Blue Dye Demonstrations





Lessons Learned from Irrigation and Blue Dye Trials

- **Early Season (first 4 wks)**
 - greatest risk of leaching
 - irrigation was generally reduced by 50%
- **Mid Season**
 - Irrigation sensors “caught” rapid increase in water demand (late April – early May)
- **Late Season**
 - Very difficult to over irrigate
 - Lowest risk of leaching
- **Single irrigation events should be no longer than 1½ hours**
- **“Blue Dye Don’t Lie”**
- **Videos available at <http://vfd.ifas.ufl.edu>**

Two On-Farm Cooperator Examples



Gwinn Brothers Farm Irrigation Focus



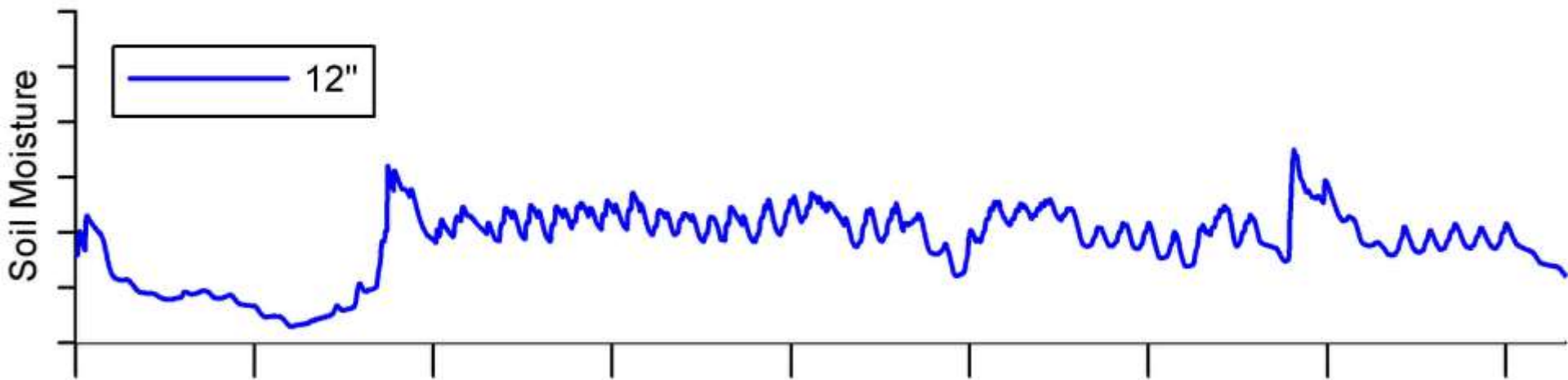
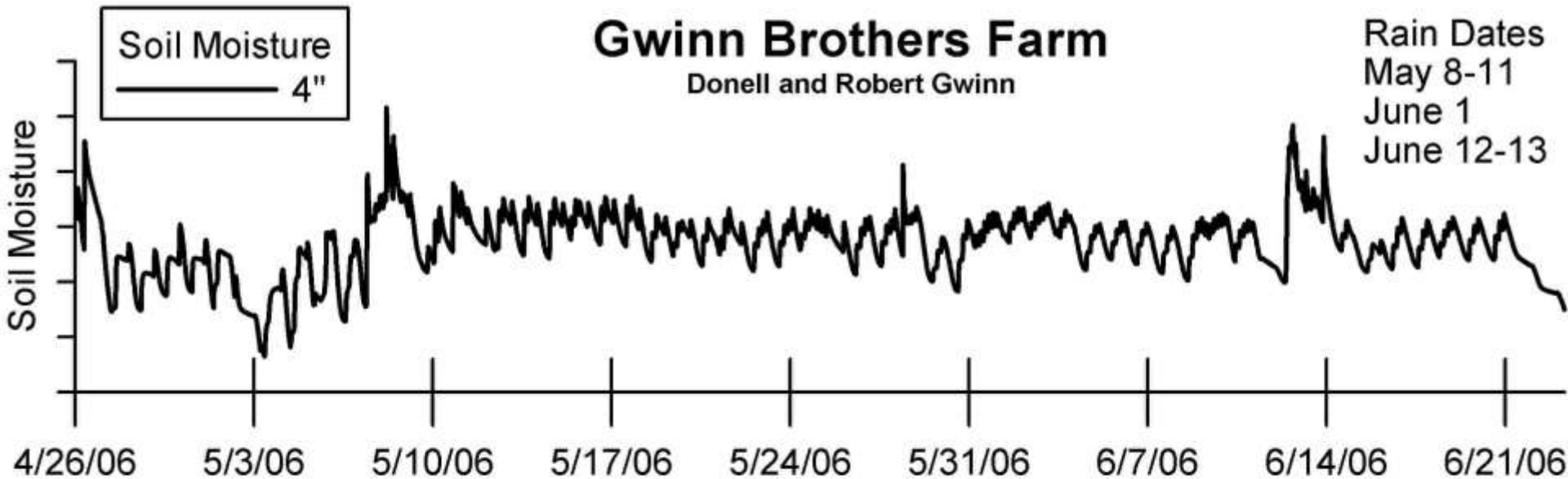
- Donell and Robert Gwinn
- Located in Suwannee County, McAlpin
- BMP Demonstration Farm
- Plastic mulch and drip irrigation
- 125 acres watermelon



Gwinn Brothers Farm

Donell and Robert Gwinn

Rain Dates
May 8-11
June 1
June 12-13





Putnal Farm-Nutrient Focus

- Jack and Riley Putnal
- Located in Suwannee County
- Raise cattle, peanuts, iron-clay peas, corn, sorghum
- Plastic mulch and drip irrigation
- 300+ acres watermelon





Typical Fertigation

Weeks

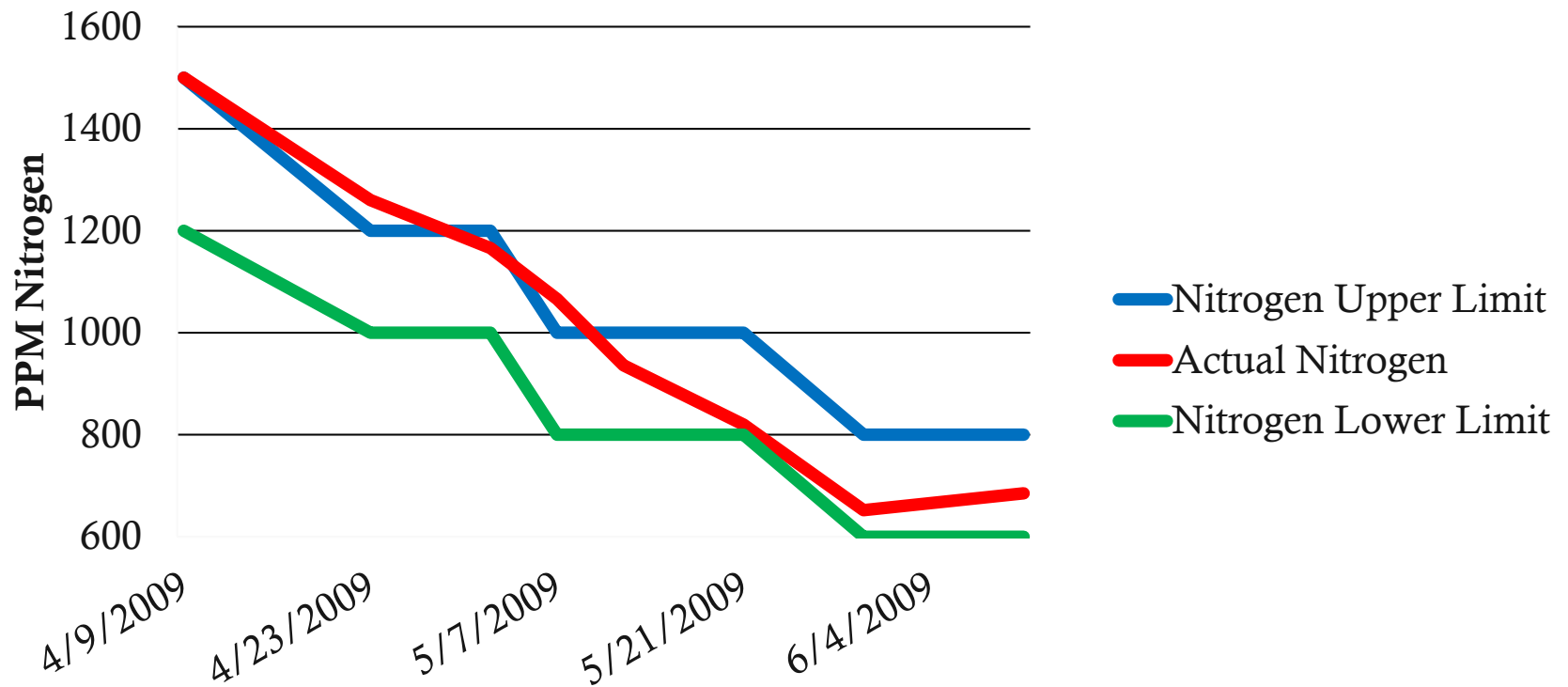
- 1-2. No injection.
- 3-4. 1 lb/A/day. Nitrogen only.
- 5-8. 1.5- 2.0 lb/A/day. N and Potash
- 9-12. 2.0 -2.5 lb/A/day. N and Potash
- 13+ 1.0-1.5 lb/A/day. Depends on harvest
- Timing and rates coincide with sap test.





Putnal Farms Sap Testing Results

Sap test Nitrogen



Samples collected every 7 days.



Overall Extension Program Summary

- Connection of Specific Demonstrations
 - Sap Testing or Leaf Tissue Analysis
 - Soil Moisture Sensors
 - Blue Dye
- Combination of Methods
 - UF Center Trials & Field Days
 - Drip Irrigation Schools
 - On-Farm Demonstrations
- Irrigation Management more Important than Specific Nutrient Amount

Thank You

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