21st Century Mist Control
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Previous Work
- Survey of mist practices & facilities
- Optimal soil moisture content for root initiation
- PAWS: Propagation Weather Station

Current Directions
- Evaporation Model for Plug Irrigation
- Leaf Wetness Sensors for Mist Control
- SmartBoom…
  > Boom-to-Bench Communication

Evaporation Model for Plug Irrigation
- What environmental factors are most important for predicting evaporation from a plug tray?
  
  Scenario
  > Begonia
  > Day 7-21 after sowing
  > Irrigate at Moisture Level #3
  > Wet media to Moisture Level #5

Lysimeters (Scales) to measure evaporation

Sensors
- Temp/Humidity
- Solar Radiation
- Leaf Wetness
For Example:

The most important environmental data for predicting evaporation....

In other words...what measurements are most strongly correlated with evaporation from a 105 tray

The order of importance...

1. Solar Radiation  
2. Air Velocity  
3. VPD

A simple mathematical model using Light Intensity, Air Velocity and VPD measurements

\[ \text{Evaporation} = 0.1037 + 0.0004 \times \text{LI} + 1.0266 \times \text{AV} \times \text{VPD} \]

can predict evaporation quite well...
Advantages
- Automatically adapts to environment (like current VPD control systems), but more accurate under a wider range of conditions.
- Potential to reduce human error and oversight
- Potential increase repeatability and consistency.
- Booms/irrigation can be integrated into the climate control system

Disadvantages
- Sensor dependent
- Stability, longevity, wires, cost??

Moving from an evaporation model to predict irrigation of plug trays...

Can leaf wetness sensors improve mist control for URCs?
Advantages

- Excellent for identifying mist events
- Can serve as an alarm for a malfunctioning boom
- Provide interesting data to observe frequency of misting (how much water is evaporating from leaves between mist events)

Disadvantages

- Sensors located on benches can be difficult to maintain
- Number of sensors needed to provide a useful network (cost)
- Wires
- Current technology probably limited to potential use in small, fixed bench prop situations

So...

Ideally...

- Mist/Irrigation adapts to the environment
- Wireless sensors
- Low cost sensors
- Sensor network
- Works with moveable benches
- Communication between boom and bench
- Recognizes and communicates boom malfunctioning to the grower
- Communicates run status to the grower

RFID Technology

(radio frequency identification)
Microprocessor
Antennae
Solar power (optional)
Sensors
  - Temp
  - Humidity
  - Solar Radiation
  - Leaf Wetness
  - (not Air Speed)
<$10/unit

Powering RFIDs
Continual data generation during sunlight (climate sensors).
Scanner provides power via radio waves. Data generated only at the moment a signal is received (crop identification).

Horticultural Applications...

SmartBoom™
- Wireless sensors
- Low cost sensors
- Networked sensors
- Works with moveable benches
- Communication between boom and bench
- Communicates boom malfunctioning to grower

Directions
- Test robustness of our evaporation model
- Evapotranspiration of water from URC leaves...mist programming
- RFID-Sensor development