Applying Sensor-Based Irrigation for Tree Fruit Orchards

Long He

2020 Automated Irrigation Webinar

Penn State Extension

May 19th, 2020

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Water Levels in Soil

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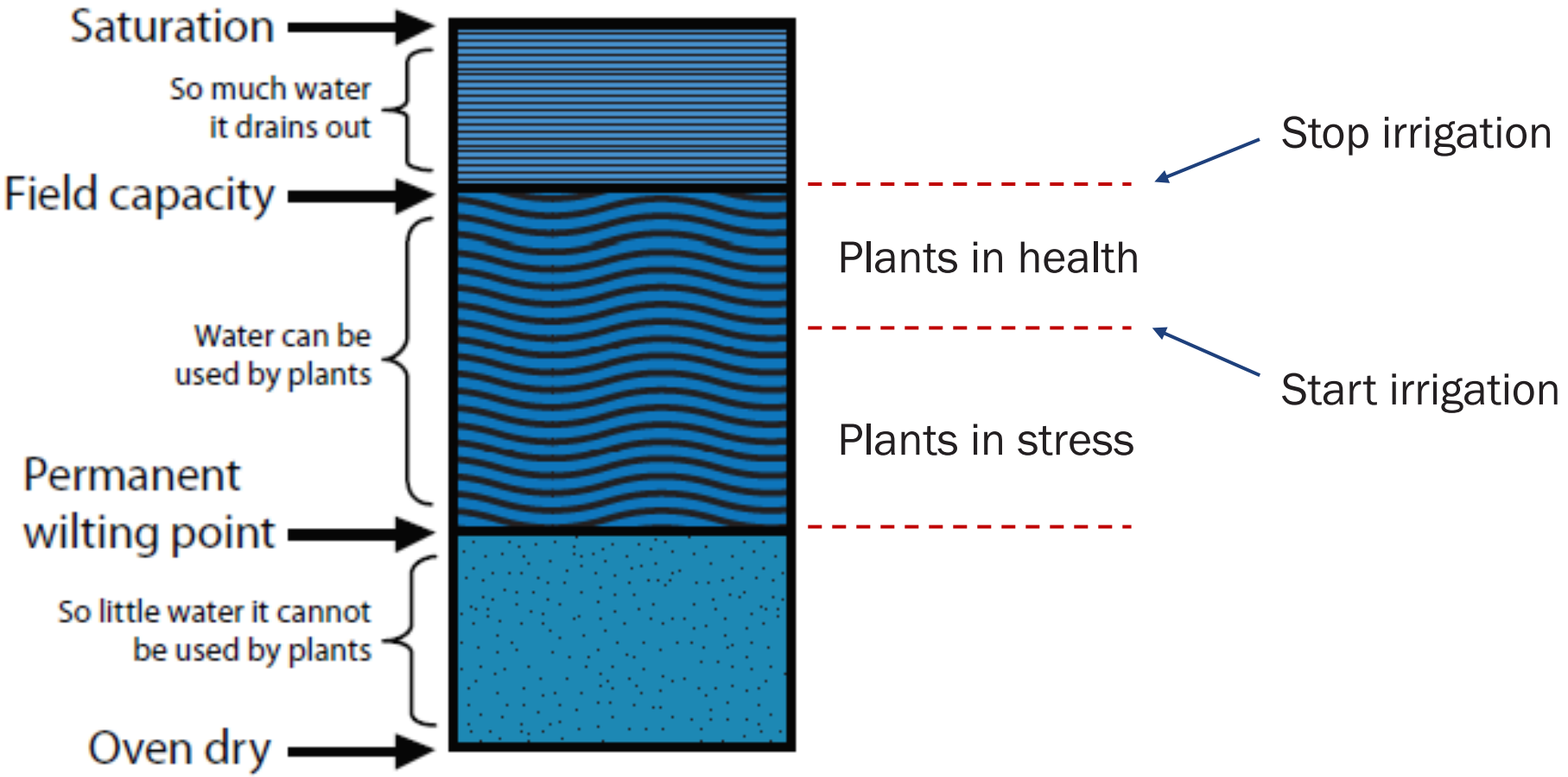

What We Have Done

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FREC Research Block (2018-2019)

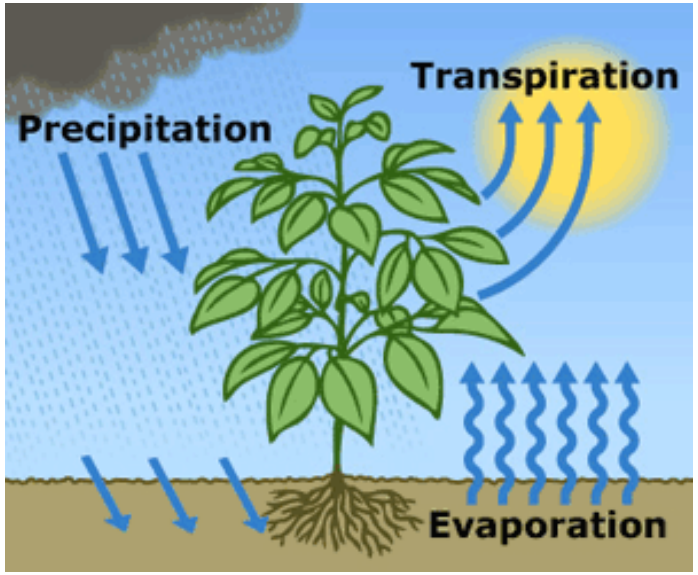
Soil Moisture Irrigation

- Soil water content
- Soil water potential
- Data recording and monitoring

Canopy Stress Irrigation

- Canopy temperature vs. Air temperature
- Crop water stress index

Evapotranspiration Irrigation



- Weather station
- Daily ET
- Accumulated water deficit

What We Have Done

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Commercial Orchards –Soil Moisture Monitoring (2019)

Hollabaugh Bro. Inc
(Honey Crisp)

Mt. Ridge Farms
(Fuji)

Twin Springs Fruit Farm
(Crimson Crisp)

El Vista Orchards
(Gala)

Soil Moisture Sensor System Setup

- Soil water content and Potential sensors
- Datalogger to record sensor data
- Cellular network for data communication (cloud server)

Sensor-Based Irrigation

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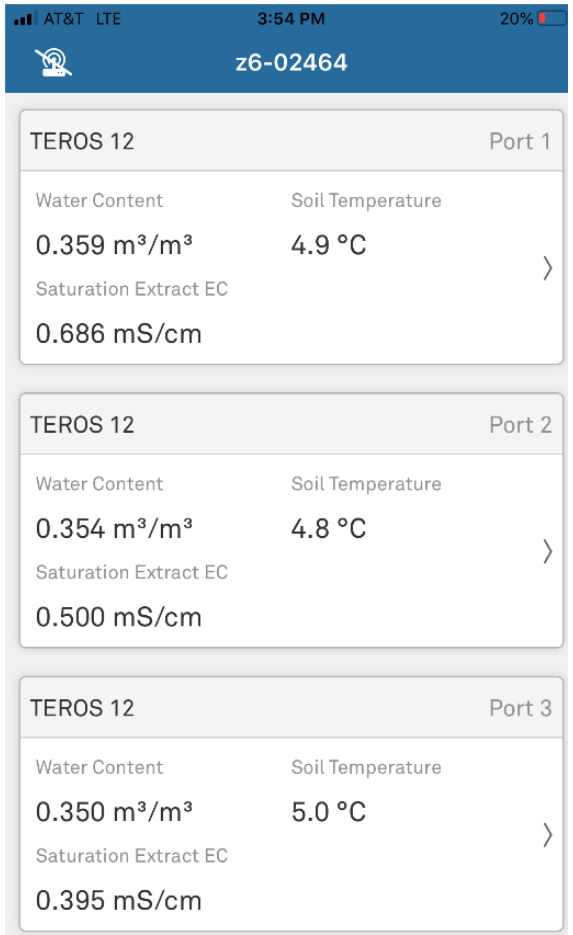
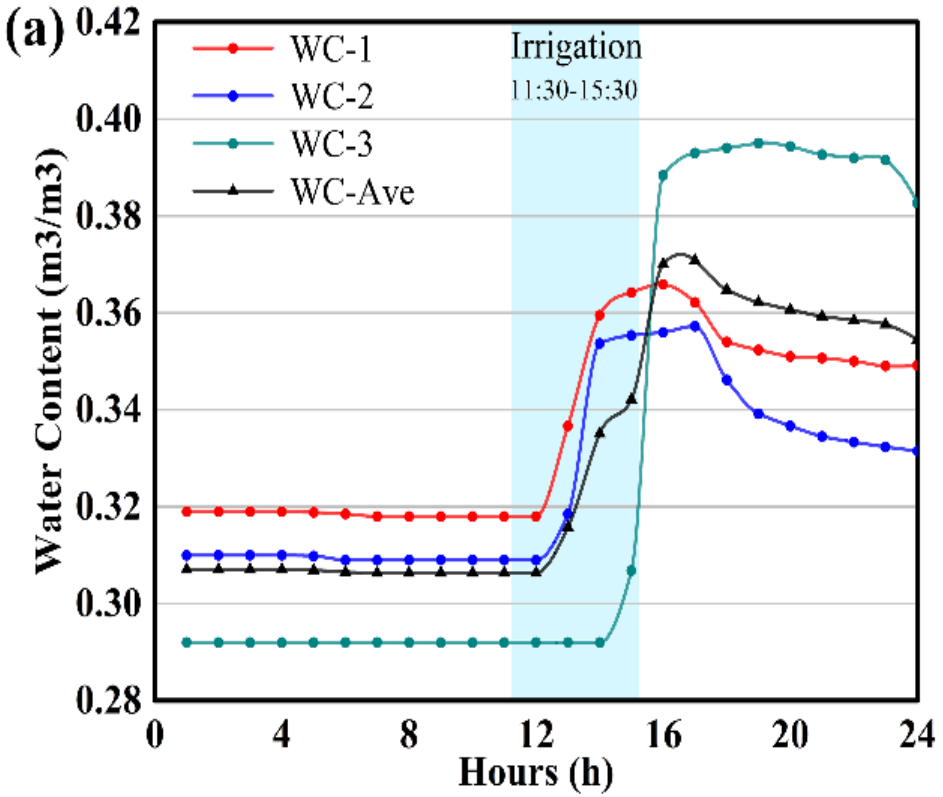
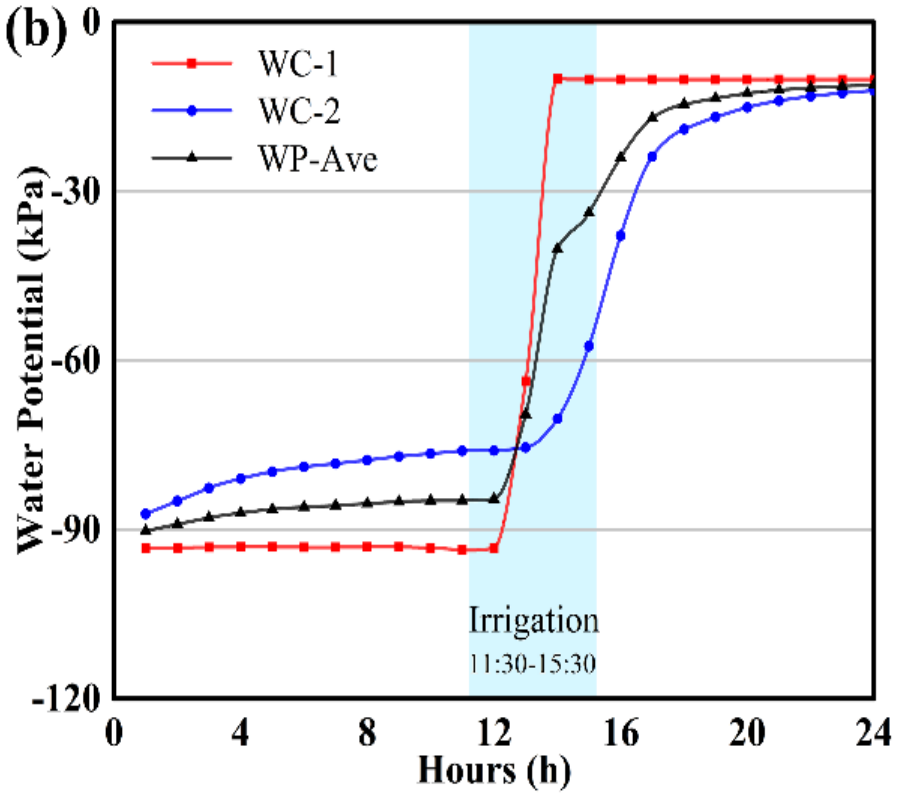
Data Monitoring and Using



Soil Moisture Change during an Irrigation Event



a) Soil water content at different depths



b) Soil water potential at different depths

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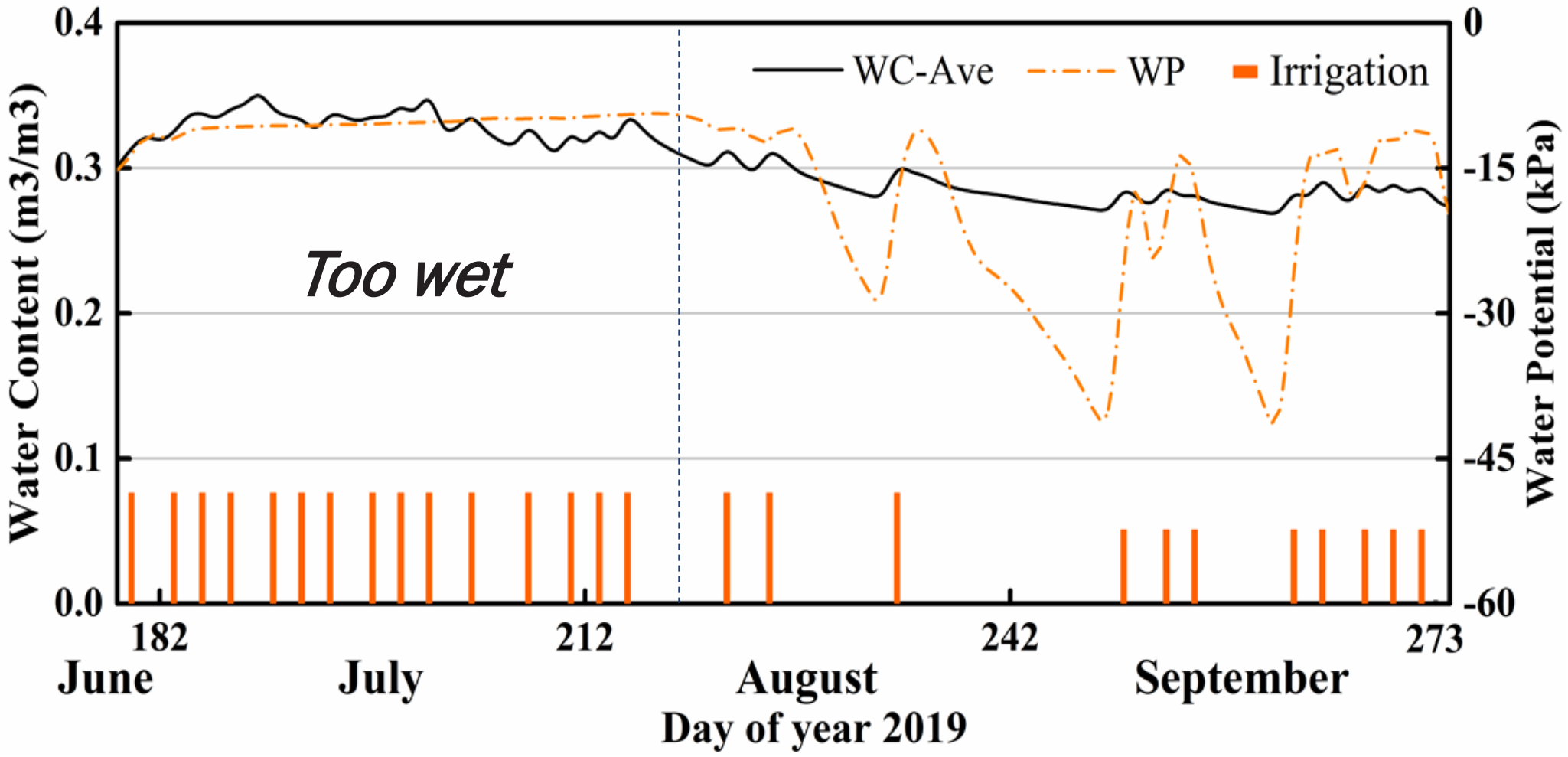
An Example from a Commercial Orchard



Automatic Irrigation System

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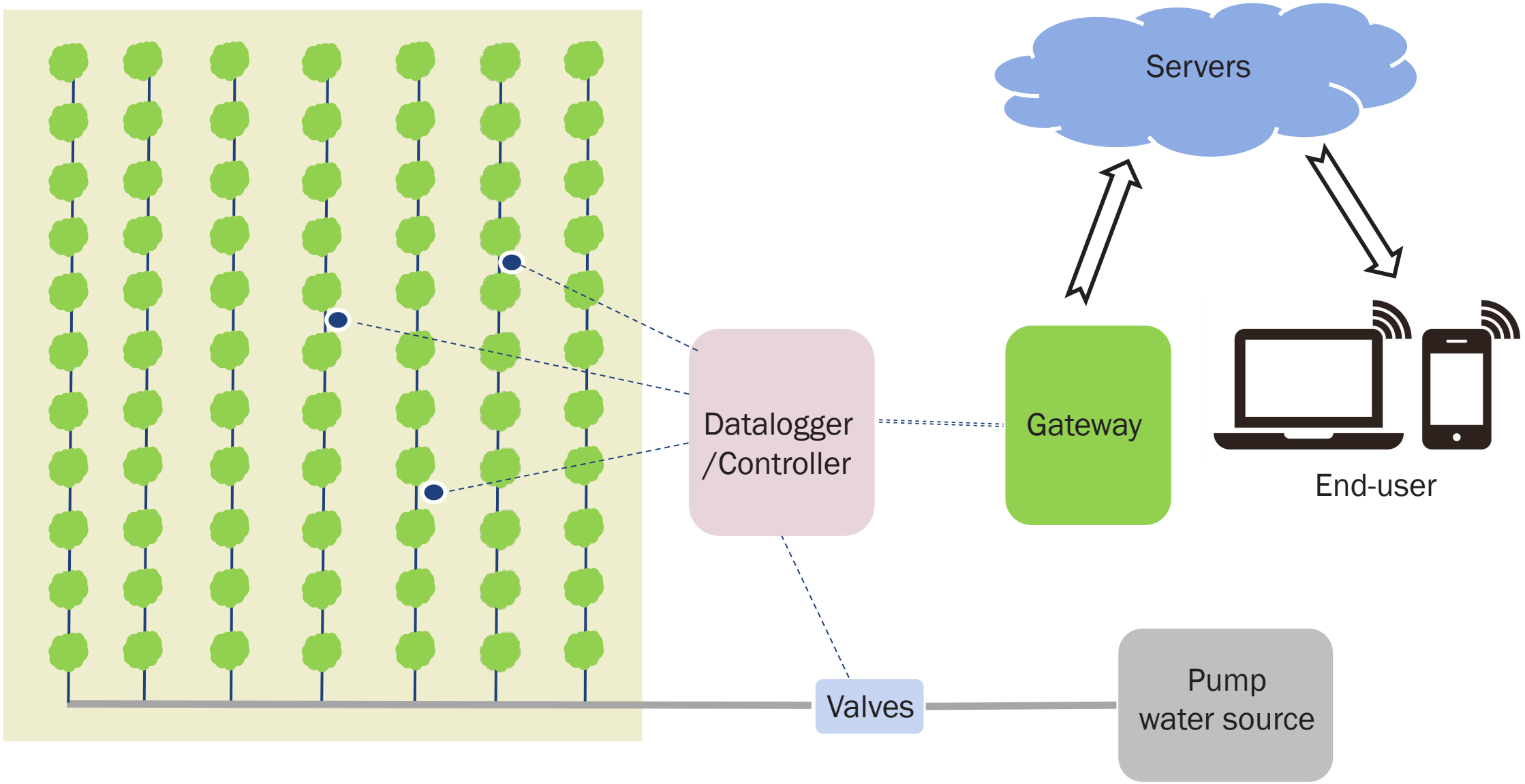

Automatic Irrigation System

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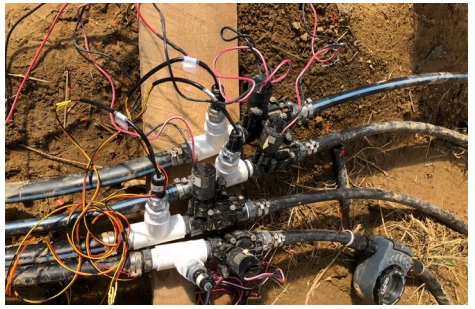

Solenoid valves

Soil moisture sensors (Watemark)

Sensor box (Vinduino)

LoRa Based IoT Irrigation

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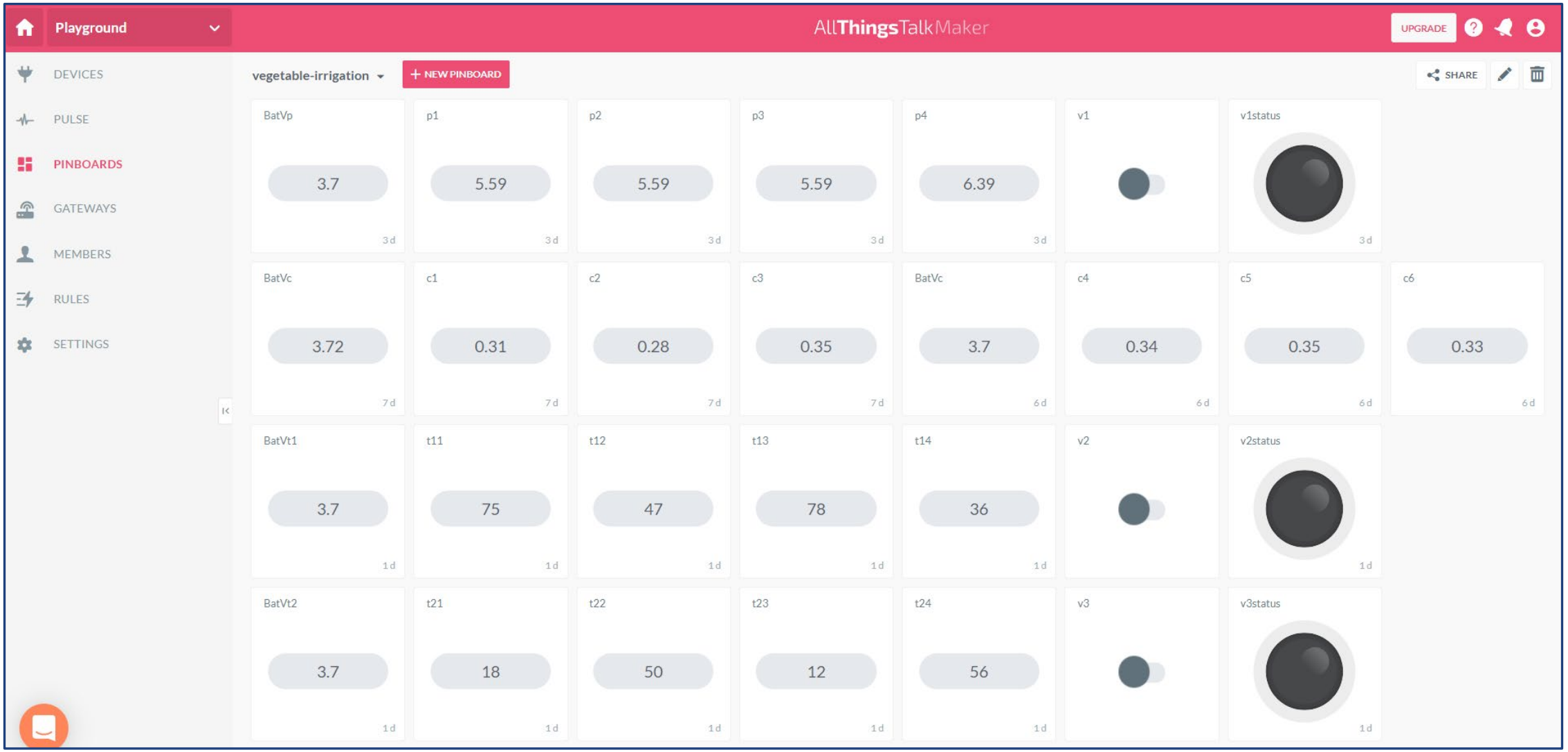
Interface of IoT irrigation System



Other Resources

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❖ Commercial services

smartirrigation apps

Apps for different crops, based on the ET calculation with weather data

IrriWatch

Web-based irrigation information, based on the ET calculation with remote sensing/satellite imagery

❖ Academic resources

http://irrigation.wsu.edu/

https://extension.psu.edu (keyword: irrigation)

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Thank you!

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