## Using CropManage for ET-based irrigation scheduling of Tree Crops


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**Acknowledgements:**

- UCCE Advisors and Specialists
- UC ANR programming staff
- Breyta Inc.
- CDFA-Fertilizer Research Education Program
- CA Dept of Water Resources
- UC Division of Agriculture and Natural Resources
- Growers and Shippers

University of California
Agriculture and Natural Resources

## Why is irrigation management important?

### Regulations and water availability

- Periodic droughts
- Sustainable Groundwater Management Act
- Irrigated Lands Regulatory Program
- Increased acres of permanent crops

**Micro-irrigation has improved application uniformity in trees**

## What is Irrigation Scheduling?

1. **WHEN** to irrigate?
2. **HOW MUCH** to irrigate?


## Various Approaches to Irrigation Scheduling

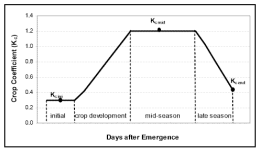
**Weather-based** **Plant-based** **Soil-based**

## Weather-based irrigation scheduling

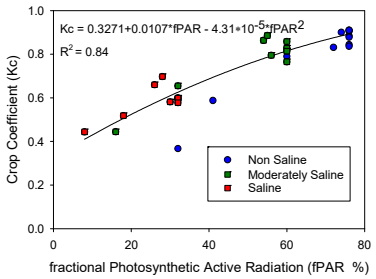
**Converting Reference ET to Crop ET:**

$$ET_{crop} = ET_{ref} \times K_{crop}$$

**$K_c$ can vary from 0.1 to 1.2**




## Crop coefficient (Kc) for pistachio can be related to canopy cover



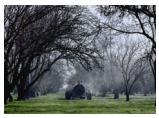

**Zaccaria et al. 2020**

## But getting from a crop coefficient to how long to irrigate requires a few steps:

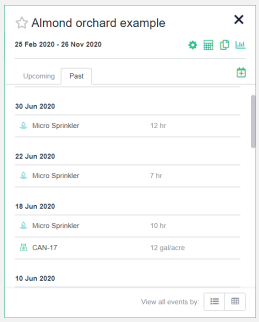
- **Calculate Crop ET since the last irrigation**
- **Adjust for application uniformity**
- **Adjust for leaching fraction and crop development stage**
- **Convert to hours based on system application rate**

## On-farm challenges to implementing field specific water recommendations

- ✓ Multiple fields and crops to manage and track
- ✓ Other decisions and activities to coordinate
- ✓ Calculations involved are time consuming



## CropManage: Online irrigation and nitrogen management decision support tool

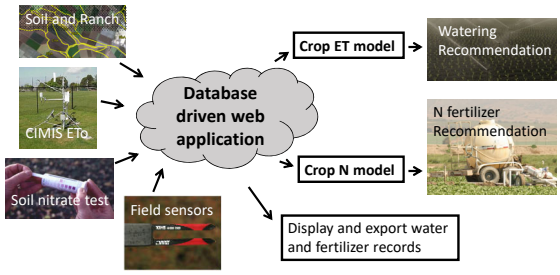



cropmanage.ucanr.edu

## What CropManage does:

- ✓ Provides site-specific recommendations for irrigation and nitrogen management based on soil type, climate, crop type, and crop development stage
- ✓ Uses science-based algorithms for developing recommendations
- ✓ Maintains records on water and nutrient management

## Integrate information from multiple sources




**Decision support using crop models**

## Steps to Using CropManage

1. Establish user login (free)
2. Set up a ranch (farm)
3. Add a planting (crop, orchard)
4. Enter soil and tissue tests, fertilizer, or irrigation events

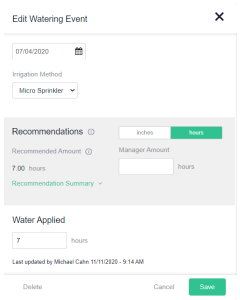
## Vegetable Crops Currently Supported

Broccoli
Brussels sprout
Cabbage (red and green)
Cauliflower
Celery
Cilantro
Lettuce (Romaine, iceberg, leaf, baby)
Mizuna
Pepper (Red bell pepper)
Spinach (baby, teen, bunch)
Tomato (processing tomato)

## Perennial Crops Currently Supported

Strawberry
Raspberry
Almonds
Walnut
Pistachio
Alfalfa

## Irrigation event demo



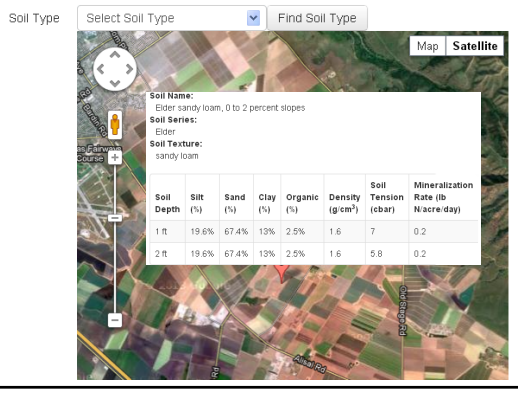

## CropManage Terms

- Ranch (Farm)
- Planting Area (block, lot, field, orchard)
- Event (soil sample, tissue sample, irrigation, etc)
- Commodity (tomato, walnut, etc)
- Crop Type (processing tomato, pistachio san joaquin)

## Privacy/data sharing

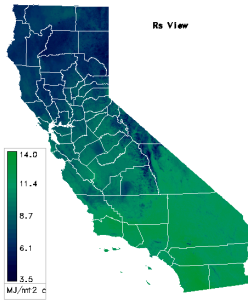
- Latest security and privacy protocols in place (Amazon Web Service)
- CropManage is designed to allow multiple users view and update information for a planting/crop
- Ranch “Owner” designates which users have access to data and sets level of access

## Interface with UCD SoilWeb Tool

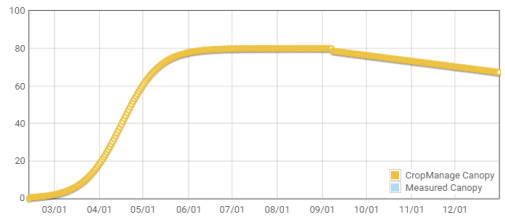



## CropManage reference ET data

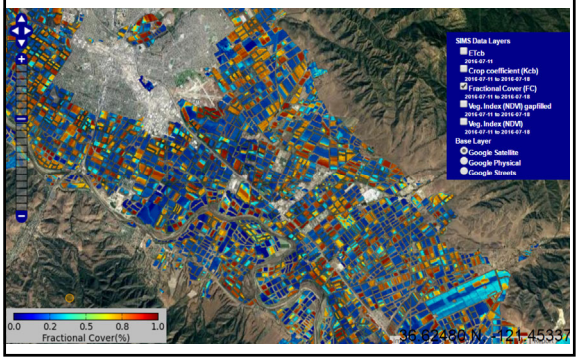
- **Includes ~150 CIMIS stations**
- **Option to use multiple stations**
- **Sequential and averaging mode**
- **Spatial CIMIS option**
- **Historical ETo data (for future irrigations)**



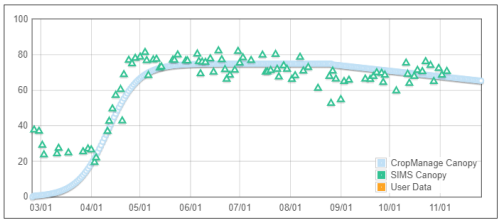
## Canopy development model for trees




## CropManage interfaces with Satellite Irrigation Management Support (SIMS)



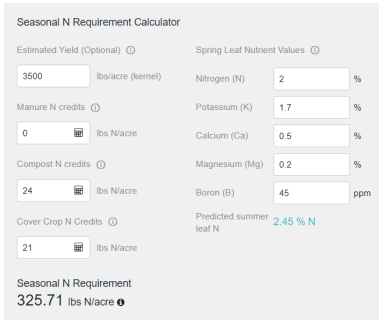

## SIMS satellite estimates of fraction cover can be used to customize the canopy curve



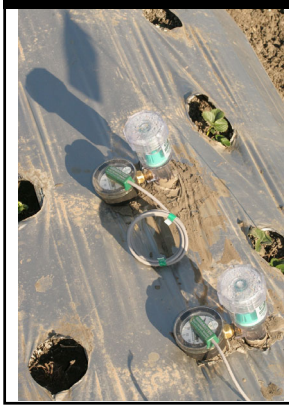

CropManage Canopy Parameters Reset to Default Parameters

| Max. Canopy | Max. Fraction | Canopy A | Canopy B | Canopy E | Canopy F |
|---|---|---|---|---|---|
| 75 | 0.47 | 4.95 | -13.87 | -0.37 | 1.24 |

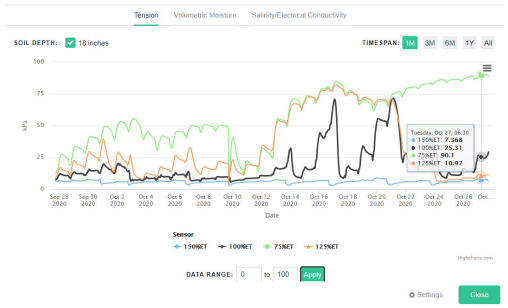
## CropManage also provides support for N management in trees



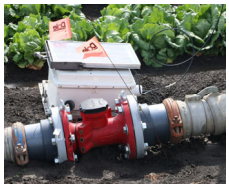

## Soil moisture monitoring

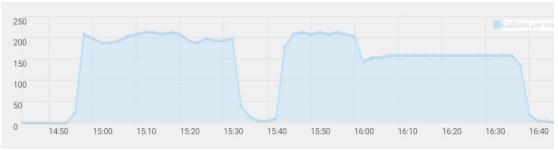



## Display for soil moisture sensors



## Tools for automating flow measurements






## Clientele interest

> 2000 Users
> 1600 Ranches
> 7,200 Plantings
>11,000 soil samples
> 70,000 Recommendations

## How are Clientele using CropManage?

- Irrigation scheduling
- Nitrogen fertilizer management
- Training farm staff on irrigation and N management
- Seasonal estimates of crop water use or needs
- Regulatory compliance (record keeping)
- Training students
- Research trials

## Looking Ahead


- Add reporting capability (regional board)
- Regionalize (other weather station networks)
- Develop native app version
- Increase API capacity to interface with other commercial software
- Add task management (irrigator, farm manager, fertilizer foreman)
- Increase user support capabilities

## Summary

- **CropManage repackages University research into simple to use decision support tools**
- ***CropManage* is designed to support growers and crop consultants in water and N management decisions.**
- **CropManage provides scientifically-based recommendations adapted for site-specific crop conditions (weather, soil, crop stage)**
- **UC is pursuing opportunities for expanding CM to additional commodities and add new features and data sources.**

## How to learn more:

- Attend a CropManage Workshop
- Targeted trainings
- Help links and comments
- CropManage hotline 831-759-7377