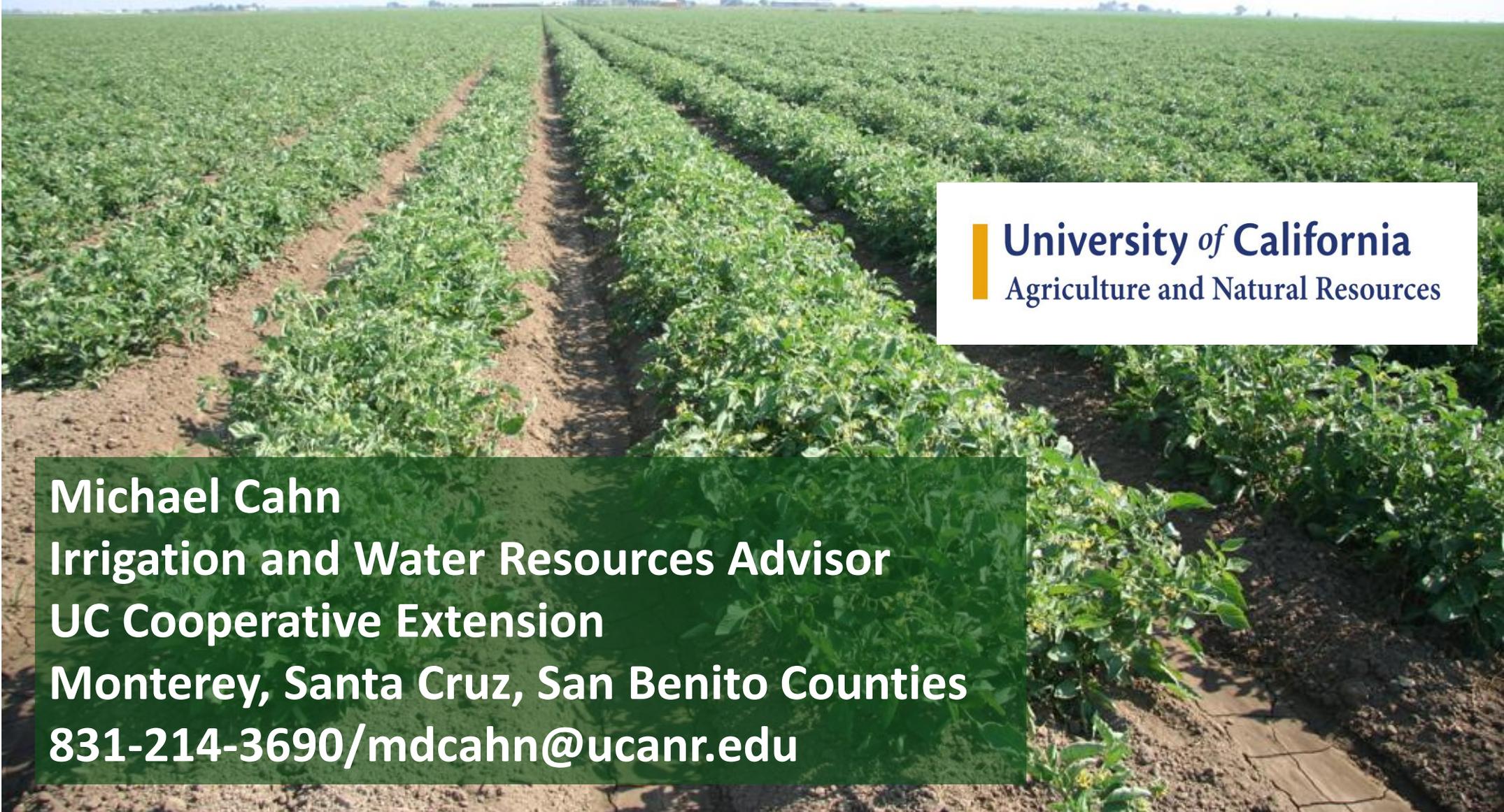


Tools and approaches for preparing for the Irrigated lands Regulatory Program and SGMA



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Drivers for better management of water and nitrogen



OPTIMIZING YIELD AND
QUALITY



WATER QUALITY
REGULATIONS



SUSTAINABLE GROUND
WATER MANAGEMENT
ACT



SUSTAINABILITY
METRICS

Nitrate impacts on groundwater has become a public and environmental concern

Irrigated Lands Regulatory Program requires growers to develop and implement irrigation and nutrient management plans (INMPs)



Public and environmental groups provided testimony on impacts of nitrate in drinking water on human health and the environment

Part of the INMP requires reporting applied (A) and removed (R) Nitrogen

A-R is a simple metric to estimate potential nitrogen loading to ground and surface water

A/R is a metric to estimate N use efficiency

What is A and R?

A_{fer} (Applied N from fertilizer)

Amount of nitrogen applied in fertilizers, compost, and other organic amendments

A_{irr} (Applied N from irrigation water)

Amount of nitrogen applied through the irrigation water based on the groundwater nitrate concentration

$A_{\text{fer}} + A_{\text{irr}}$

Total amount of nitrogen applied

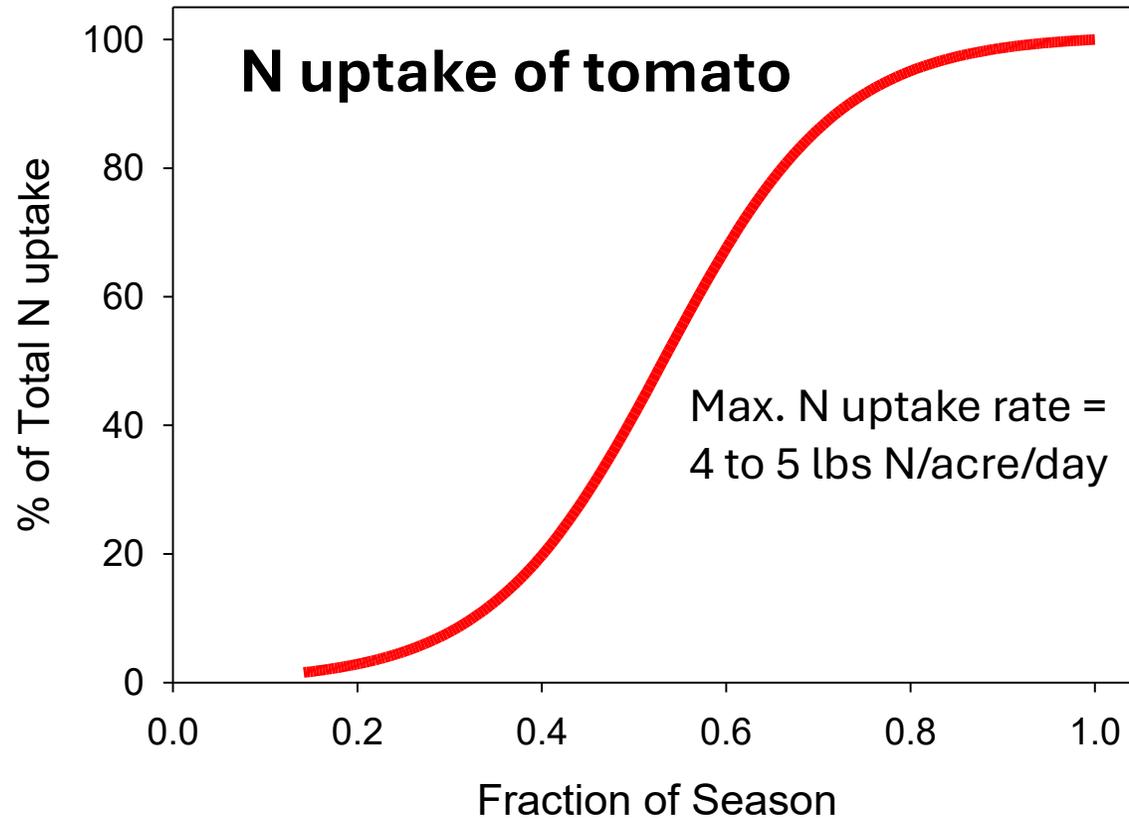
R (Removal)

Amount of nitrogen removed through harvest, pruning, or other methods, and the nitrogen sequestered in permanent wood of perennial crops

What are strategies to better match fertilizer applications with crop needs?



Know the N needs of your crop



Seasonal N uptake = expected yield (t/ac) × 4.5

Seasonal N uptake = 70 tons/acre × 4.5

= 315 lbs N/acre

Account for all sources of plant available nitrogen

- Residual mineral N in soil (Nitrate and ammonium)
- Nitrogen mineralization from soil organic matter, organic amendments, and previous crop residues
- N in irrigation water

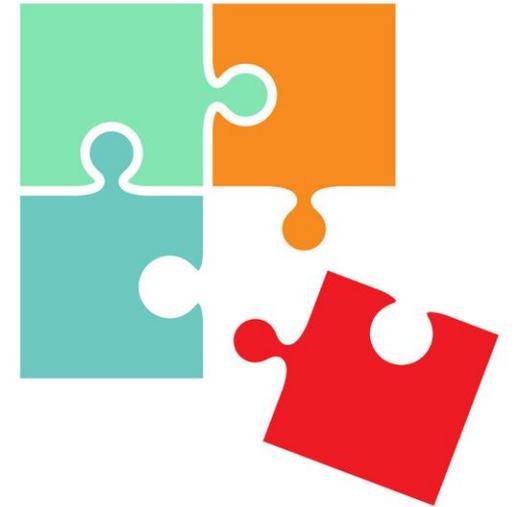
soil



water



crop residue

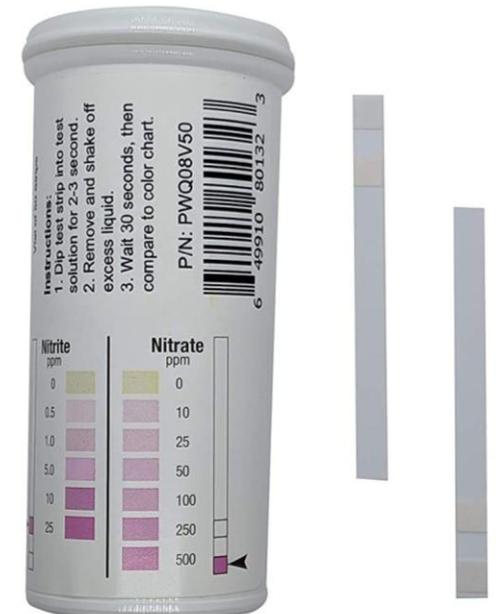


Use the Soil Nitrate Quick Test before fertilizing



Materials

1. 50 ml polyethylene centrifuge test tubes
2. Test tube rack
3. Nitrate test strips (Mquant, Bartovation)
4. 0.01 M Calcium Chloride dihydrate extractant (5.6 g CaCl to 1 gal distilled water)
5. Soil probe
6. 1-gallon buckets
7. Cooler and blue ice

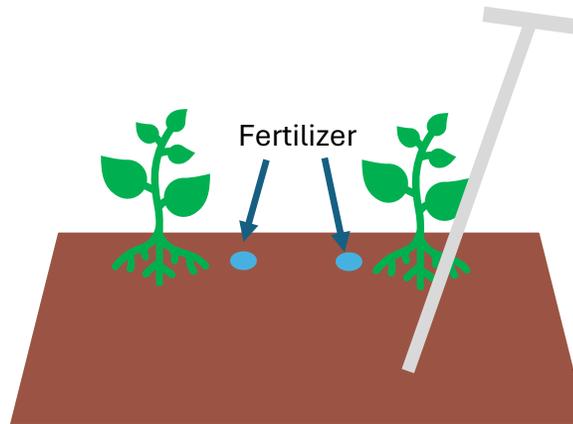
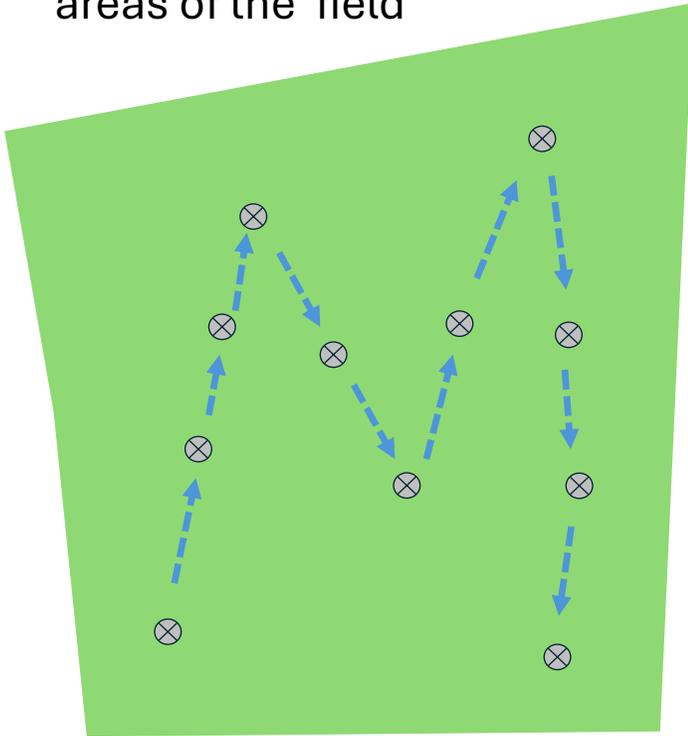


Use a soil probe and a bucket for each depth

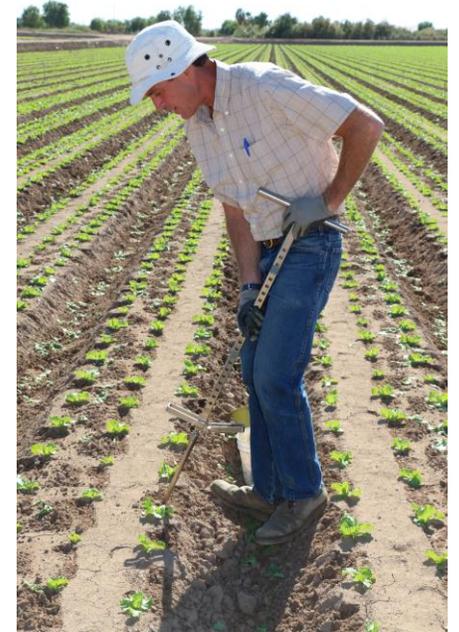


Collecting a representative soil sample for the nitrate quick test

Collect a minimum of 10 to 20 cores representing all areas of the field



Soil probe inserted next to seedline, but angled to under the placement of fertilizer



Nitrogen is often available in irrigation water



Well water
(2 to 70 ppm Nitrate-N)



Recycled water
(15 to 30 ppm N as Ammonium + Nitrate)

Calculating N applied from irrigation water:

Applied water (inches) x NO₃-N conc. (ppm) x 0.227

= lbs N/acre

Example:

- ✓ Applied water = 2 inches
- ✓ Nitrate-N concentration = 30 ppm

2 inches x 30 ppm NO₃-N x 0.23

= 13.8 lbs N/acre

Evaluated N concentration of irrigation water after every irrigation:



Determine average nitrate concentration in irrigation water



Crediting for N in water and residual soil N

Soil Nitrate



Current N status of Soil

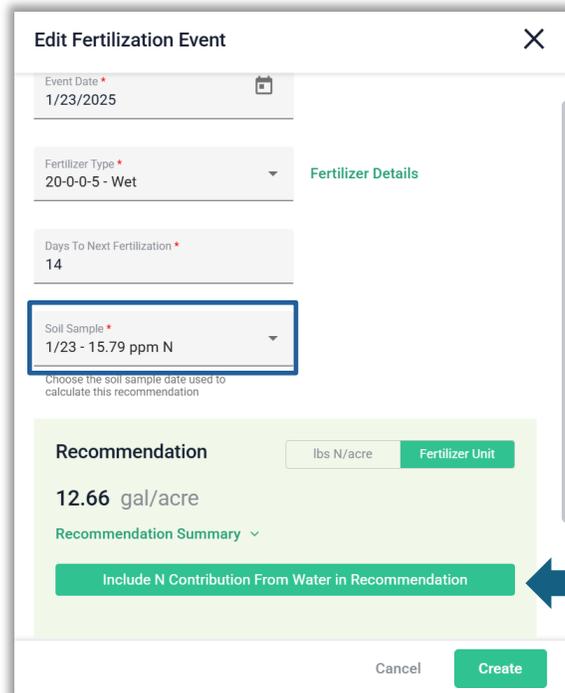
N in water



+

Future N contribution

CropManage can help with nitrogen fertilizer decisions



Edit Fertilization Event

Event Date * 1/23/2025

Fertilizer Type * 20-0-0-5 - Wet **Fertilizer Details**

Days To Next Fertilization * 14

Soil Sample * 1/23 - 15.79 ppm N

Choose the soil sample date used to calculate this recommendation

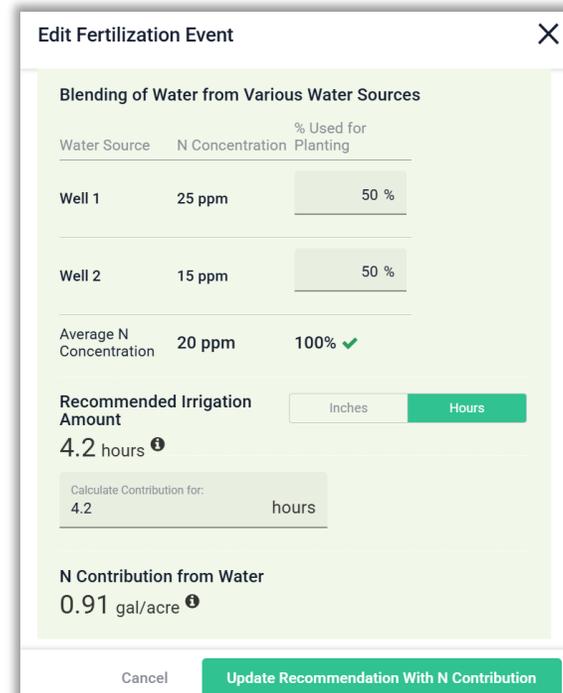
Recommendation lbs N/acre **Fertilizer Unit**

12.66 gal/acre

Recommendation Summary ▾

Include N Contribution From Water in Recommendation

Cancel **Create**



Edit Fertilization Event

Blending of Water from Various Water Sources

Water Source	N Concentration	% Used for Planting
Well 1	25 ppm	50 %
Well 2	15 ppm	50 %

Average N Concentration 20 ppm 100% ✓

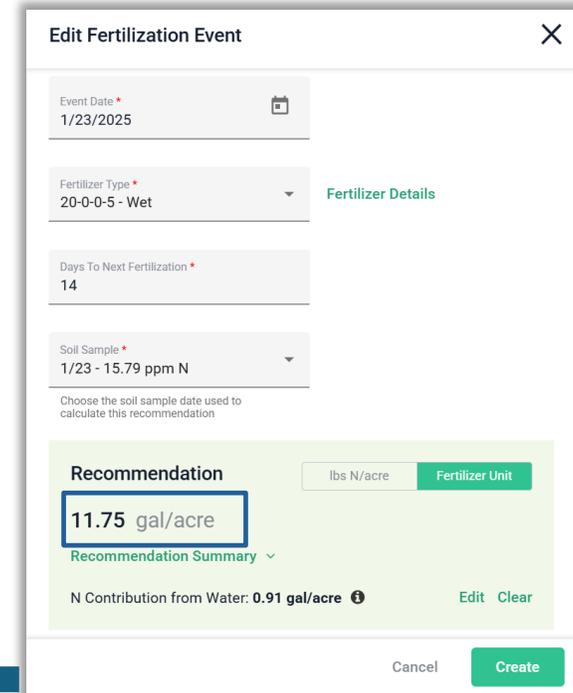
Recommended Irrigation Amount Inches **Hours**

4.2 hours ⓘ

Calculate Contribution for: 4.2 hours

N Contribution from Water 0.91 gal/acre ⓘ

Cancel **Update Recommendation With N Contribution**



Edit Fertilization Event

Event Date * 1/23/2025

Fertilizer Type * 20-0-0-5 - Wet **Fertilizer Details**

Days To Next Fertilization * 14

Soil Sample * 1/23 - 15.79 ppm N

Choose the soil sample date used to calculate this recommendation

Recommendation lbs N/acre **Fertilizer Unit**

11.75 gal/acre

Recommendation Summary ▾

N Contribution from Water: 0.91 gal/acre ⓘ **Edit Clear**

Cancel **Create**

Good water management is a prerequisite for efficient use of nitrogen

- Nitrate form of N is easily leached
- Rooting depth of many vegetable crops is shallow, especially in the early season
- Nitrogen fertilizers are often applied through the irrigation system
- Irrigation water often contains background levels of nitrogen



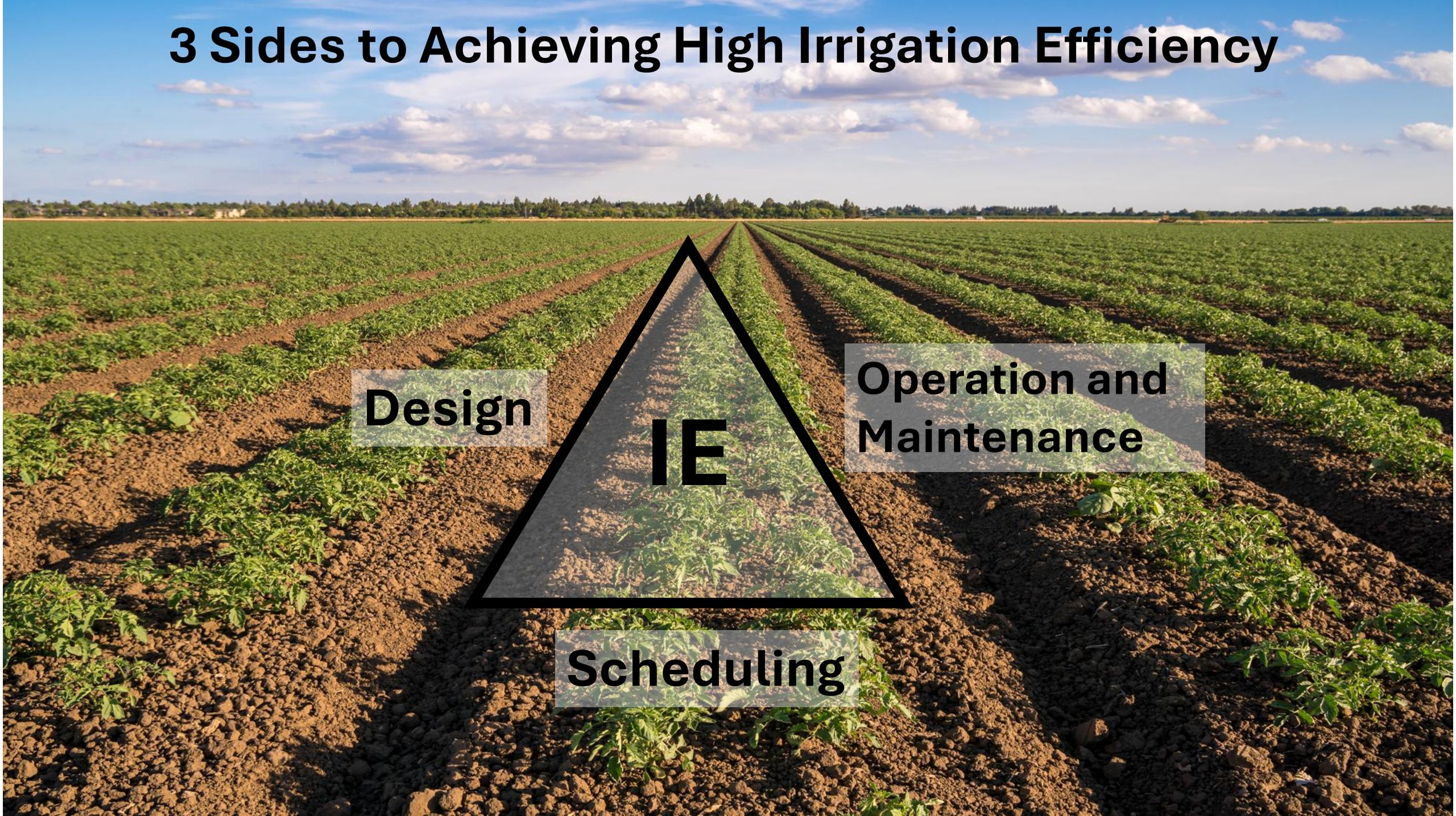
3 Sides to Achieving High Irrigation Efficiency

Design

**Operation and
Maintenance**

Scheduling

IE



Distribution Uniformity Evaluation

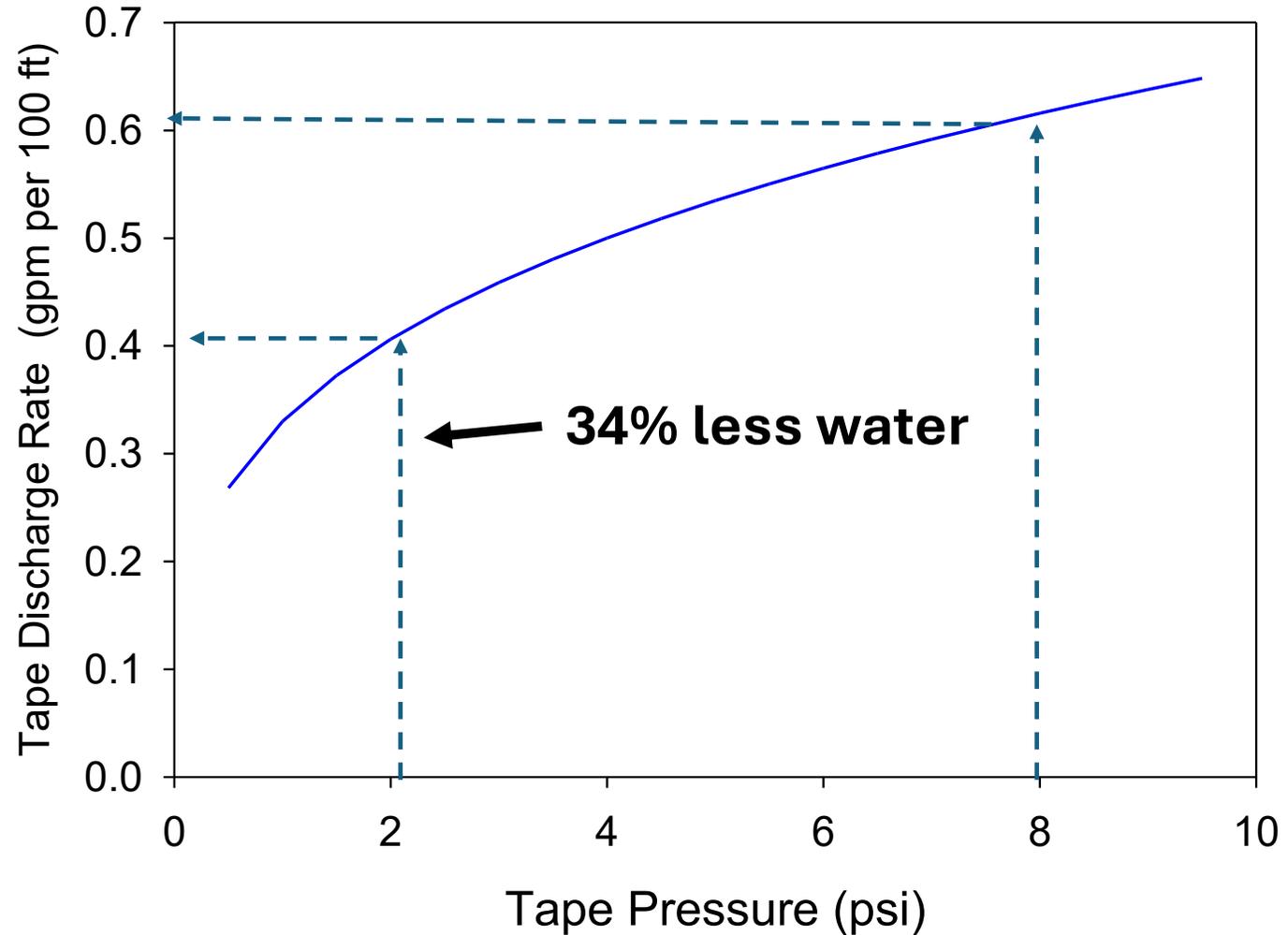


Pressure is the key to drip irrigation

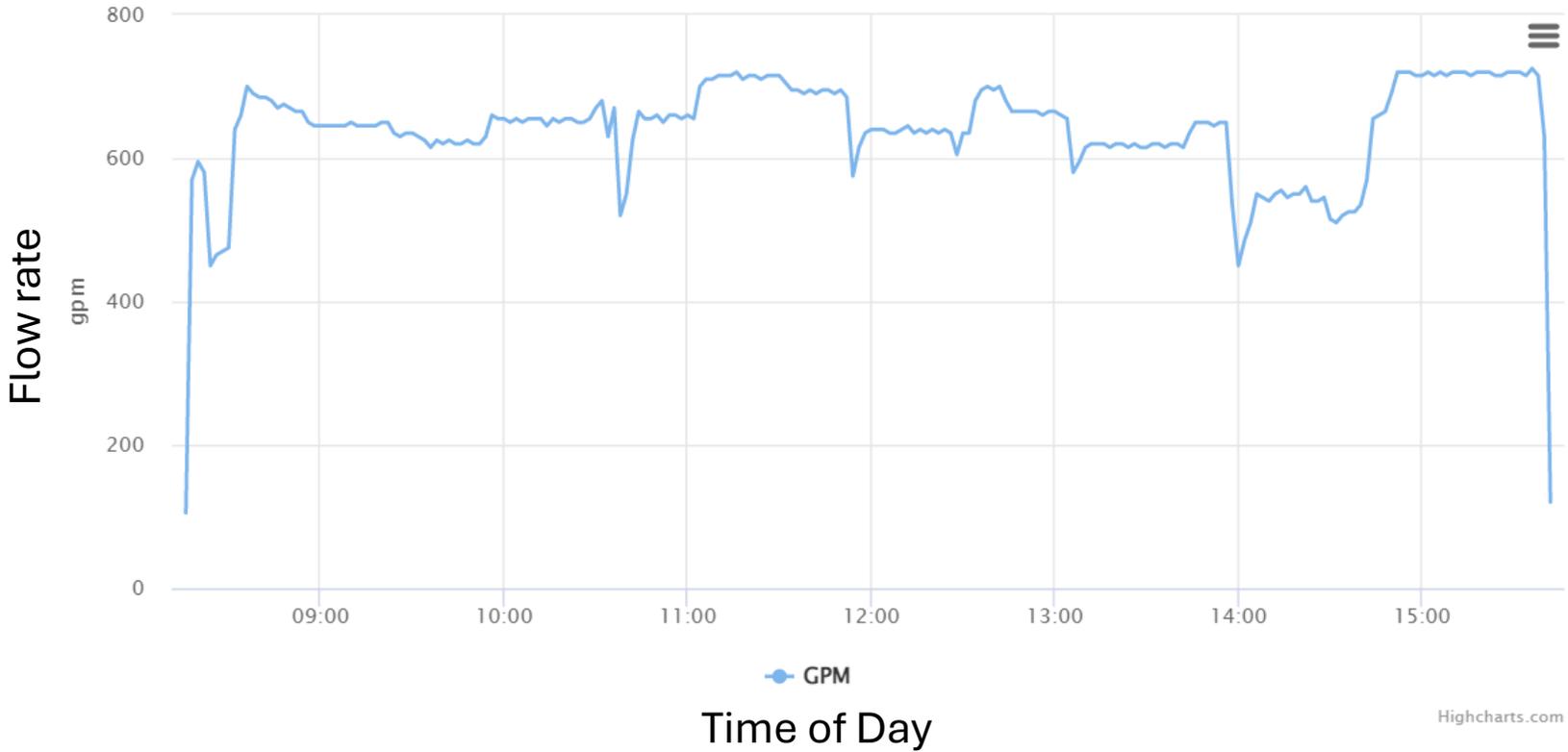
- ✓ Right pressure
- ✓ Consistent pressure



Discharge rate of drip tape varies with pressure



If pressure varies, then the flow rate of the irrigation system will vary



Pressure reducing valves/regulators can maintain a consistent pressure in the lateral lines

- Need to be selected for flow rate and pressure range of the drip system
- Prerequisite for accurate irrigation scheduling



What is Irrigation Scheduling?

- **WHEN** to irrigate?
- **HOW MUCH** to irrigate?



Various Approaches to Irrigation Scheduling

Weather (ET)-based



Plant-based



Soil-based



Soil Moisture Monitoring

Tension



Volumetric



**Tensiometers
measure the energy
that plants require
to pull water from
the soil pores
(tension)**



DIY tensiometer



Measurement of soil moisture
that is most related to water
status in a plant



Don't throw away your soil probe!



Weather-based irrigation scheduling

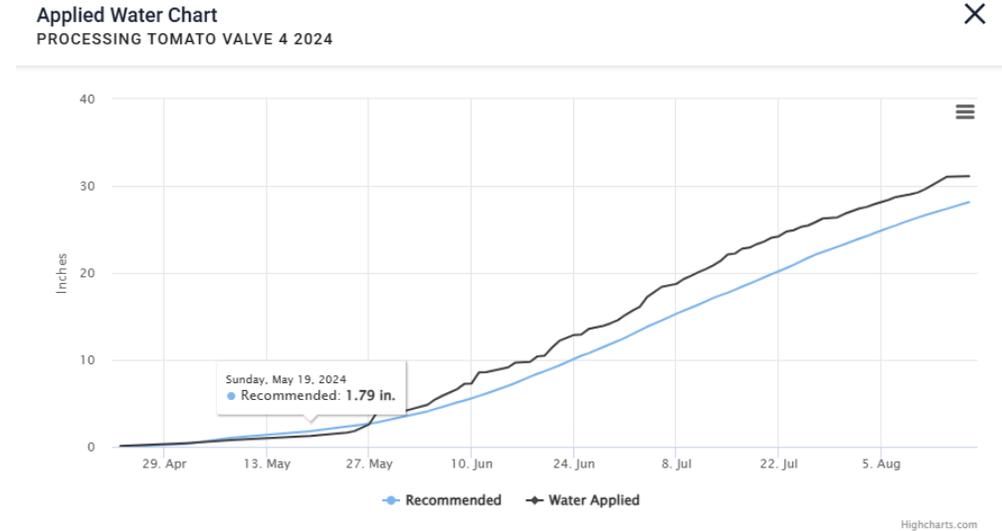
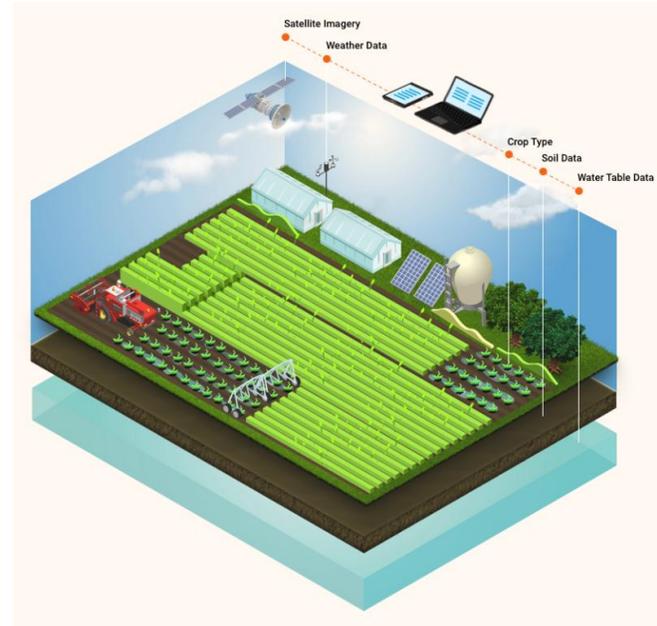
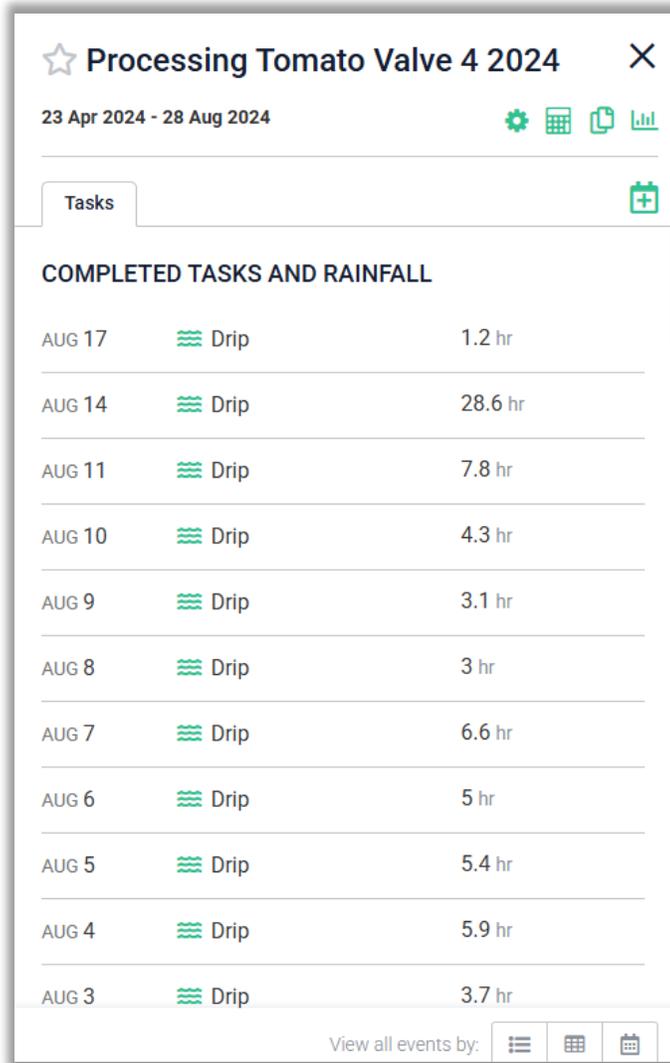


Converting Reference ET to
Crop ET:

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

K_c can vary from 0.1 to 1.2

CropManage: Online irrigation and nitrogen management decision support



cropmanage.ucanr.edu

We offer CropManage training workshops to get users familiar with sustainable irrigation and nutrient management.

Next training: March 11, 2026 – Modesto. Sign up today!



CropManage Training Workshop 2026

All are welcome to learn and use CropManage, an Irrigation & Nutrient Management Decision Tool

Date: Wednesday, March 11, 2026

Time: 12:30 pm – 5:00 pm

Location: UCCE-Stanislaus County, Harvest Hall, Room A-C, 3800 Cornucopia way, Modesto, CA 95358

SIGN UP TODAY!

<https://surveys.ucanr.edu/survey.cfm?surveynumber=48669>



- *Learn the function of CropManage to support irrigation and nutrient management decisions via hands-on, step-by-step operations.*
- *Introduce recent updates on new features and functions.*
- *Participate in discussions on using CropManage to support your irrigation and nutrient management.*
- *Review your past use and share experience as current users.*

CropManage is a free online decision-support tool for water and nutrient management of vegetables, berry, agronomic, and tree crops. CropManage provides real-time recommendations for efficient and timely irrigation and fertilization applications while maintaining or improving overall yield.

This workshop is designed to train participants on how to effectively use CropManage for irrigation and nutrient management decisions. The workshop will focus on gaining proficiency in setting up ranches, plantings, and crops as well as using the platform for decision support. At the end of this workshop, participants should gain a much better understanding of how to start using CropManage for improved irrigation and nitrogen management efficiency.

What to Bring? This is a participatory workshop. Please bring a tablet or laptop so that you can follow along and participate in the exercises. Each participant will need a user account for CropManage. Please set up a free user account at <https://cropmanage.ucanr.edu/> before the workshop.

Questions: Contact Dr. Zheng Wang at zzwwang@ucanr.edu or 209-525-6822.

Summary

- **Growers will need to become more efficient managing nitrogen and water in the upcoming years.**
- **Need to credit all sources of N (residual soil N, soil organic matter, organic amendments, irrigation water) which can supply much of the N requirements of a crop.**
- **Irrigation management is key to optimizing water use and nitrogen use efficiency.**
- **There are many tools available that can help growers improve N and water management (Soil nitrate quick test, soil moisture sensors, pressure regulators, CropManage).**

An aerial photograph of a large agricultural operation. In the foreground, a dark, tilled field is visible. A long line of farm equipment, including a large barn with a green roof, several tractors, and various trailers, is parked in a row. The middle ground is dominated by a vast expanse of agricultural fields, some of which are planted in neat rows of crops, likely corn or soybeans. A dirt road or path runs through the center of the fields. In the background, rolling hills and mountains are visible under a clear blue sky. The text "Thank You!" is overlaid in the center of the image.

Thank You!