Efficient Irrigation Management of Strawberries

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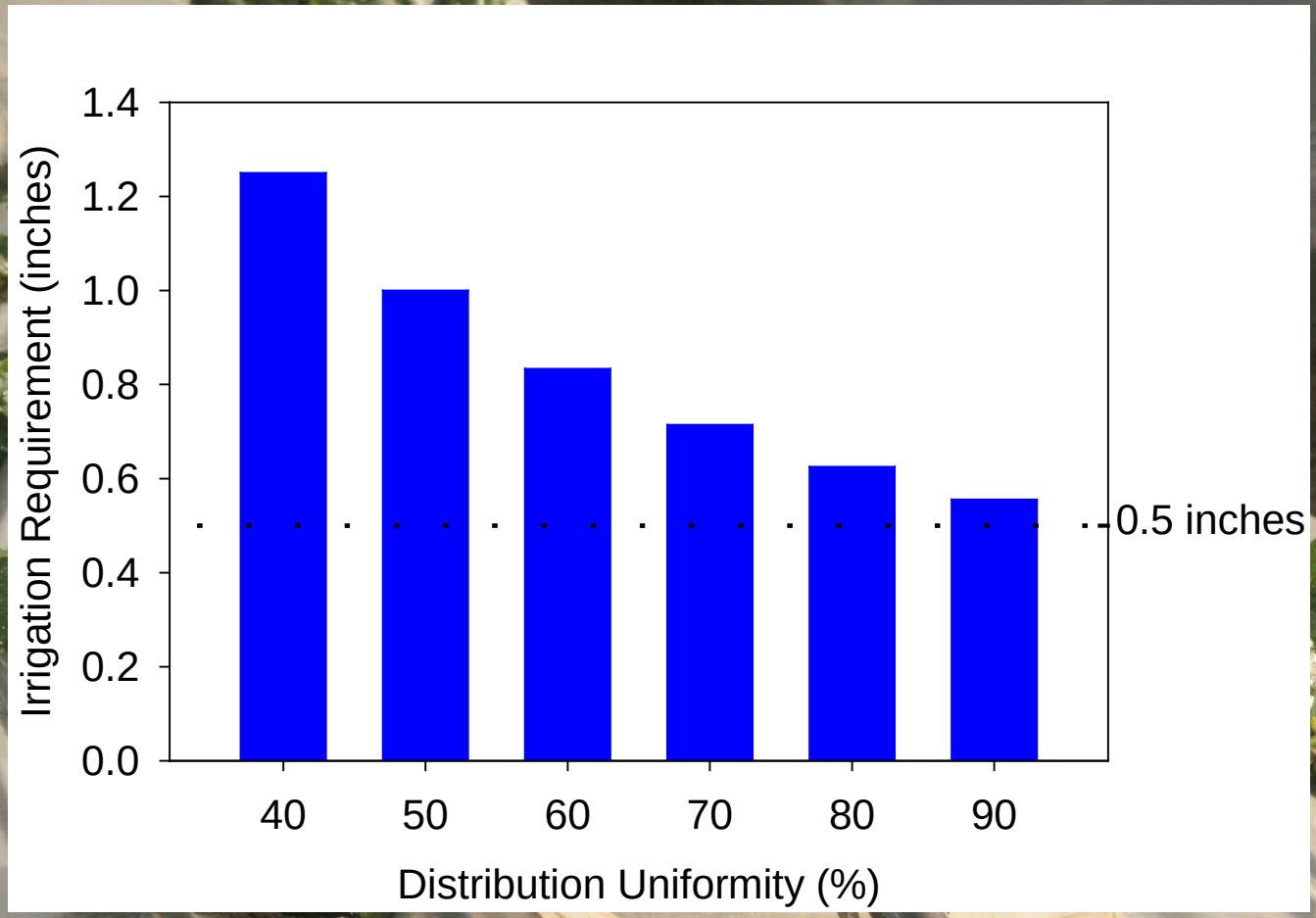
SUPPORT LOCAL GROWERS AND CATTLEMEN

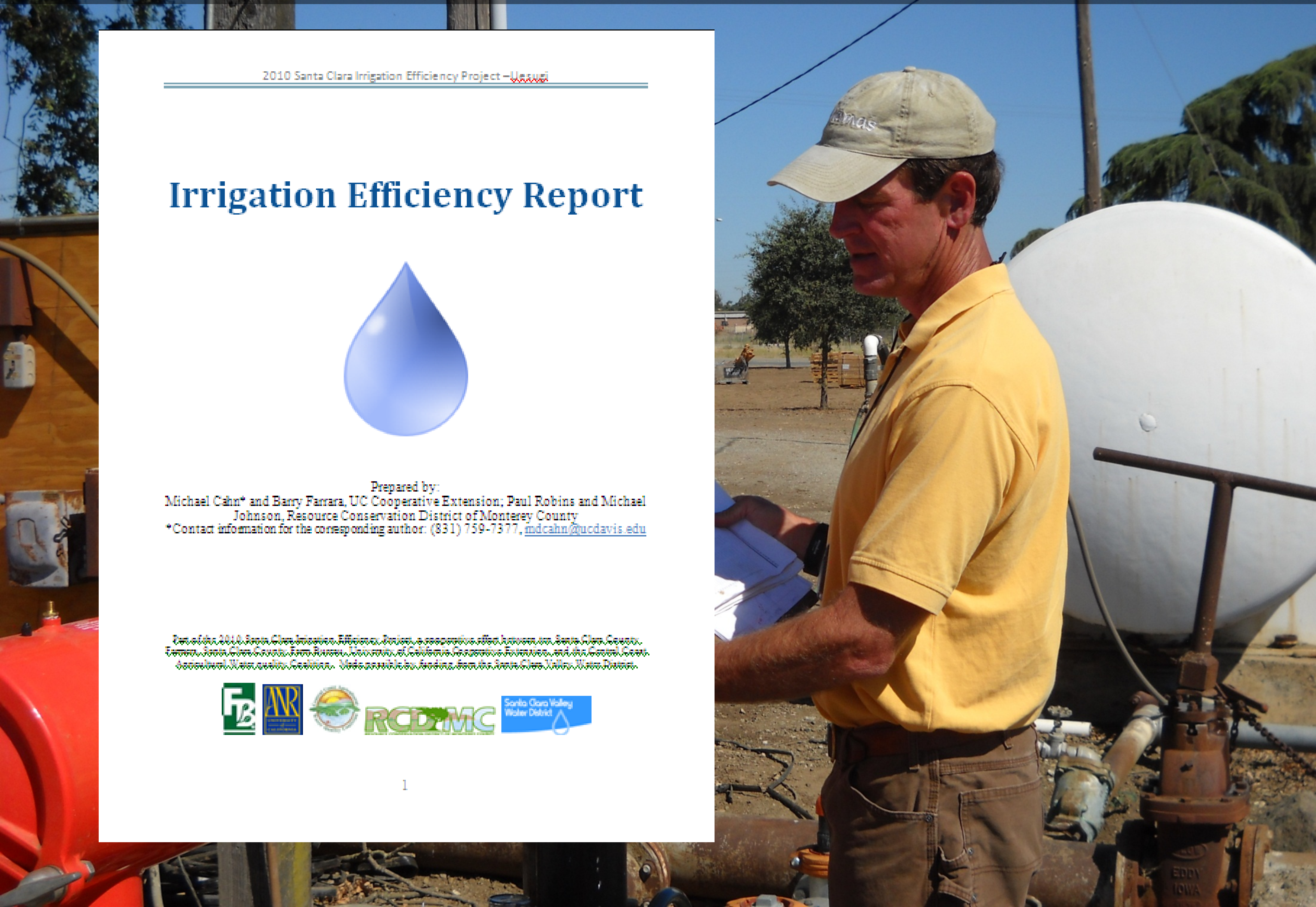
PRAY FOR RAIN

CENTRAL COAST YOUNG FARMERS AND RANCHERS

How uniformly is water applied?



Evaluation of irrigation system performance



Irrigation Efficiency Report

Prepared by:
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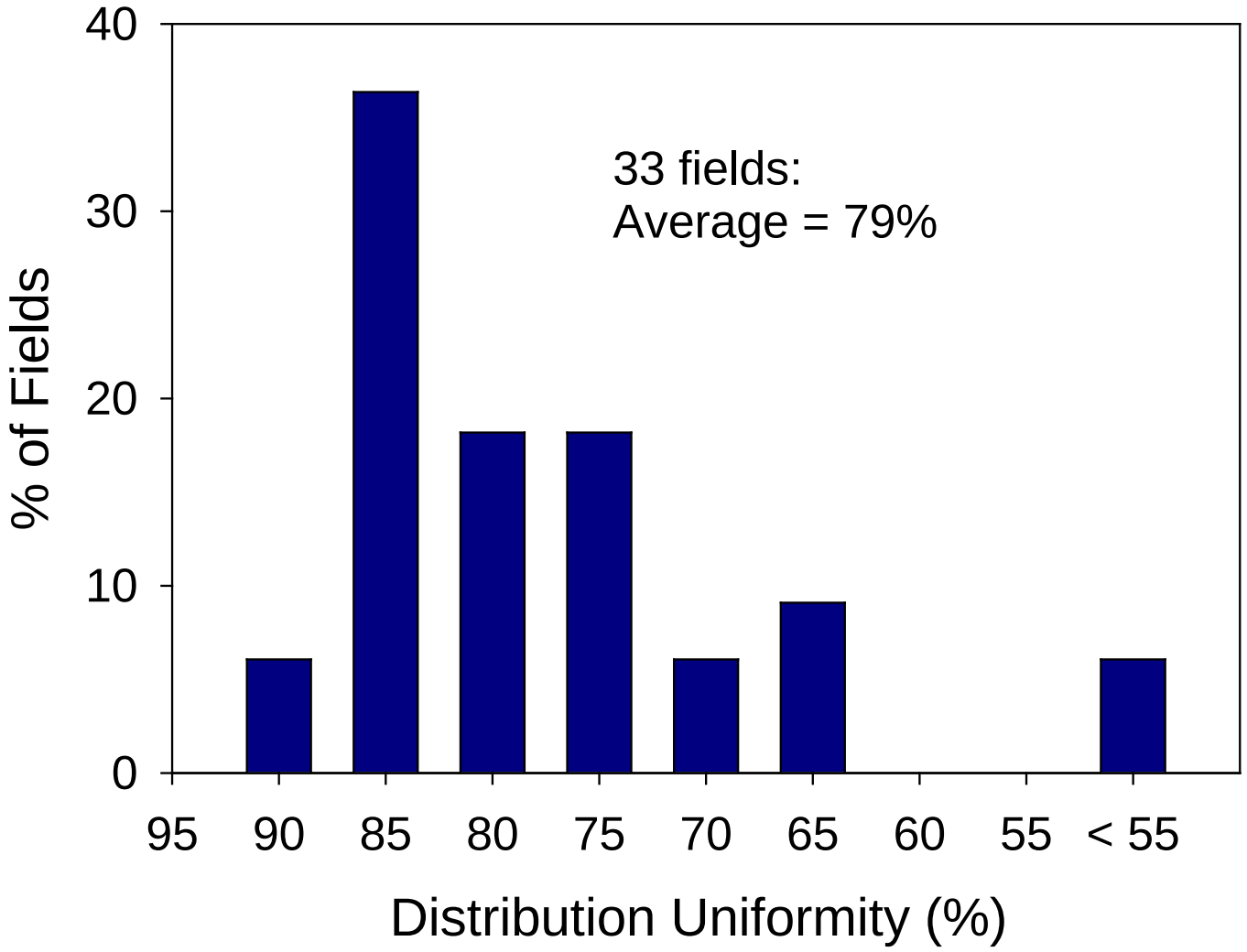
Part of the 2010 Santa Clara Irrigation Efficiency Project, a cooperative effort between the Santa Clara County Farmers, Santa Clara County Farm Bureau, University of California Cooperative Extension, and the Central Coast Agricultural Water quality Coalition. Made possible by funding from the Santa Clara Valley Water District.

Distribution Uniformity of strawberry drip systems (2011-2013)



Main challenges that limited drip uniformity (CA Strawberry Commission Survey)

Pressure

- Maintaining similar pressures among submains
- Low pressure
- Managing pressure on slopes

Design

- Submain diameter *vs* flow rate
- Leads too narrow (caused excessive pressure loss)
- Managing drain down on slopes

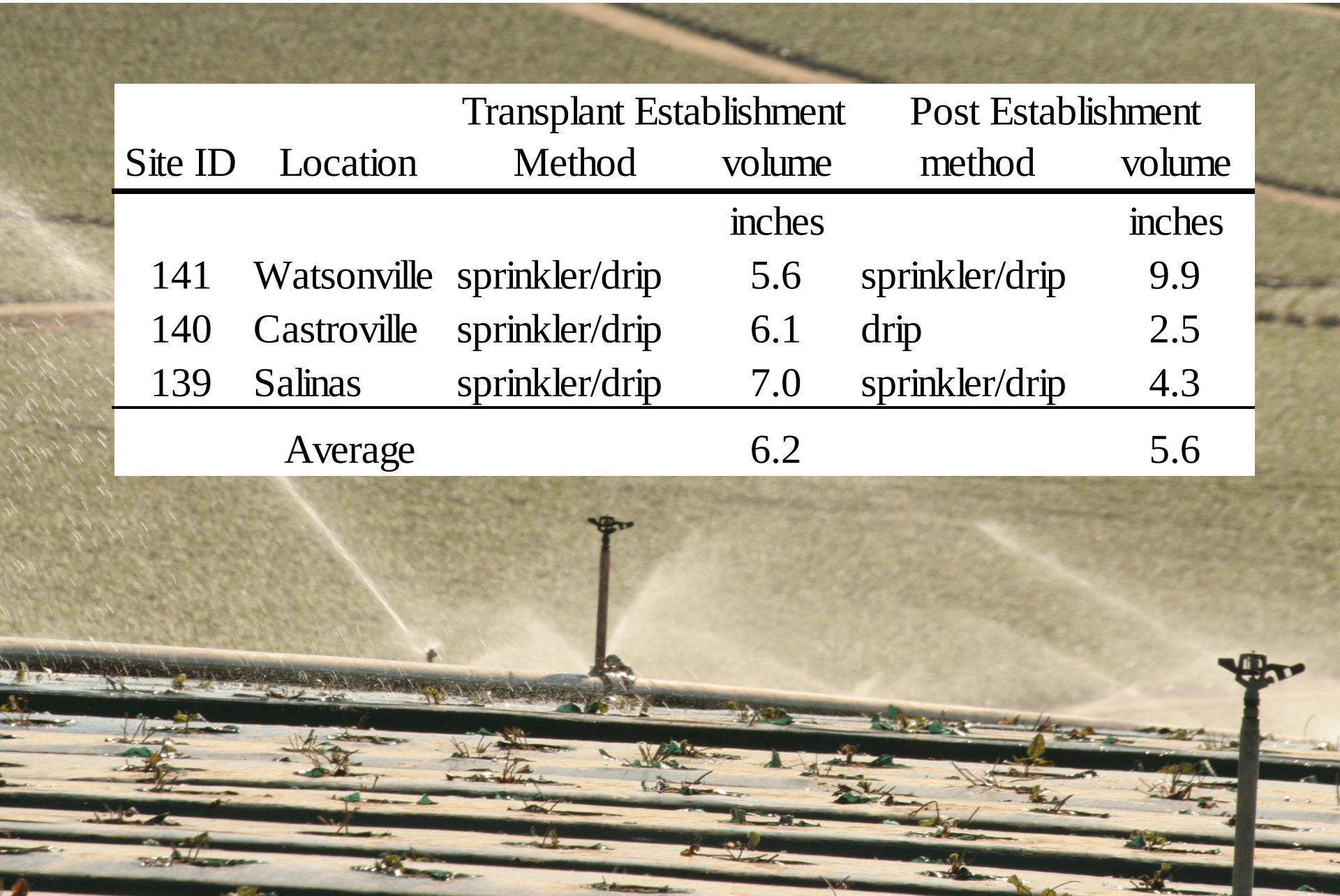
Maintenance

- Flushing drip lines
- Cleaning filter
- Leaks

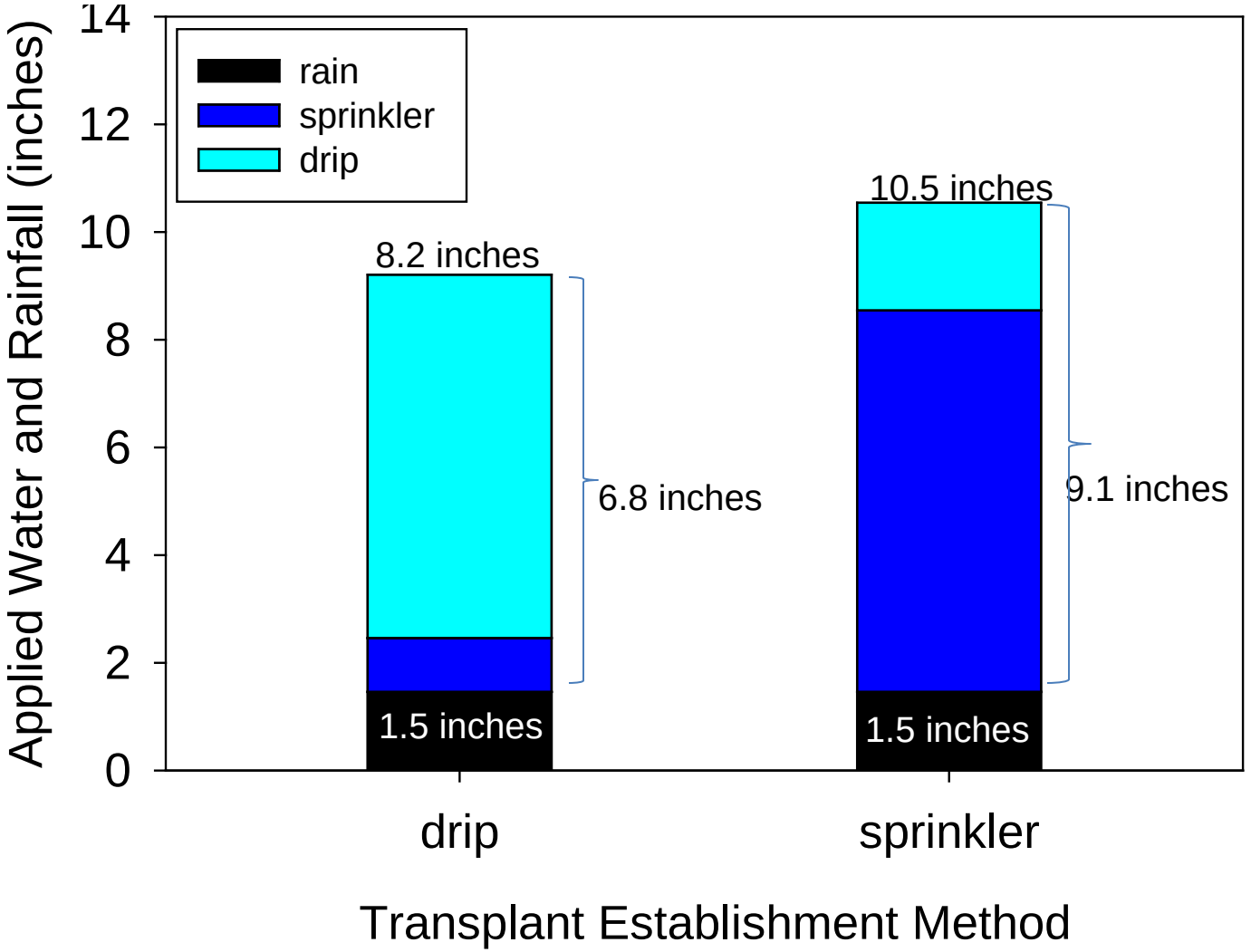
Getting the pressure right is critical for drip

Apply the right amount for transplant establishment

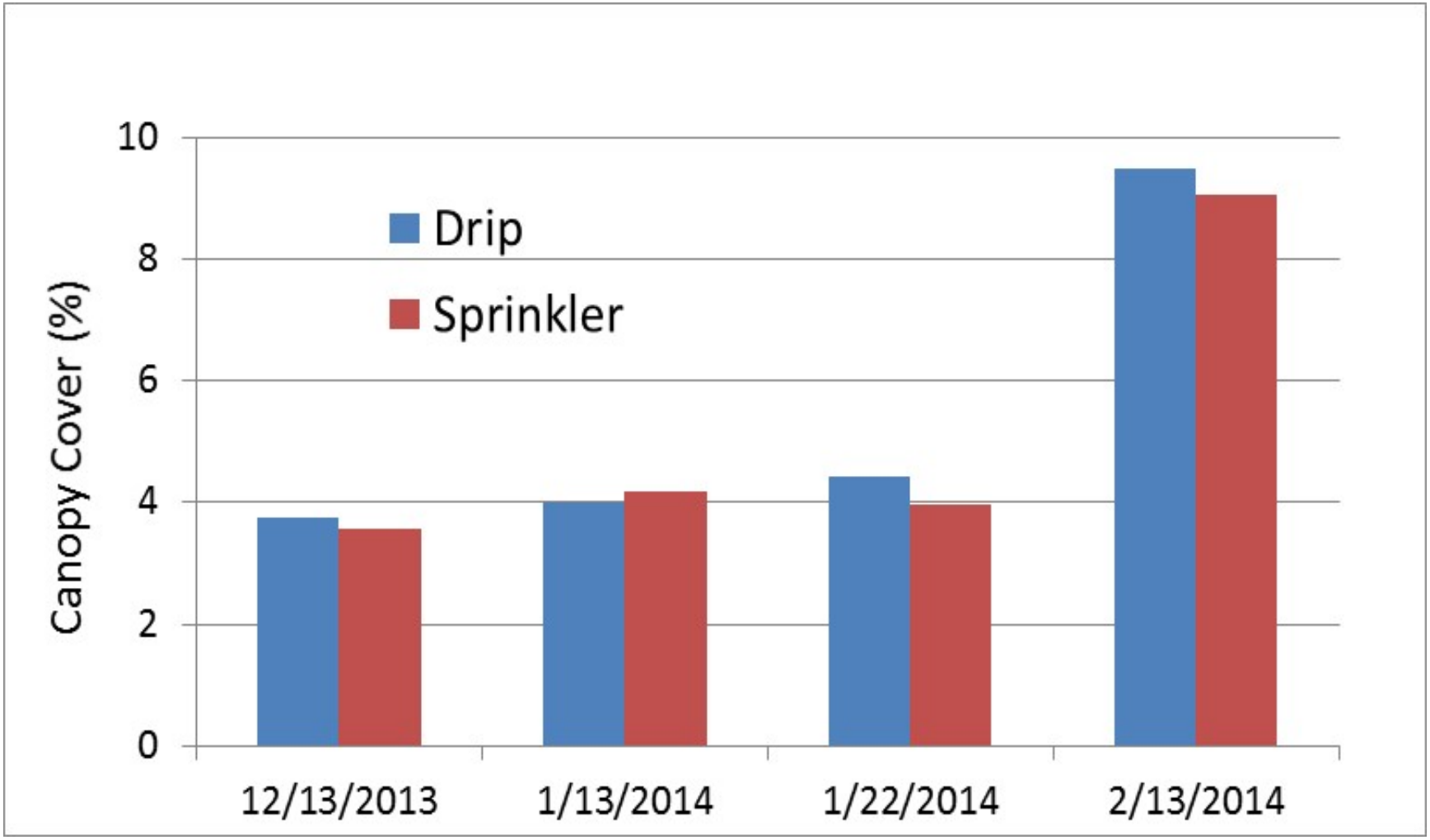
Site ID	Location	Transplant Establishment Method	Transplant Establishment volume	Post Establishment method	Post Establishment volume
			inches		inches
141	Watsonville	sprinkler/drip	5.6	sprinkler/drip	9.9
140	Castroville	sprinkler/drip	6.1	drip	2.5
139	Salinas	sprinkler/drip	7.0	sprinkler/drip	4.3
	Average		6.2		5.6



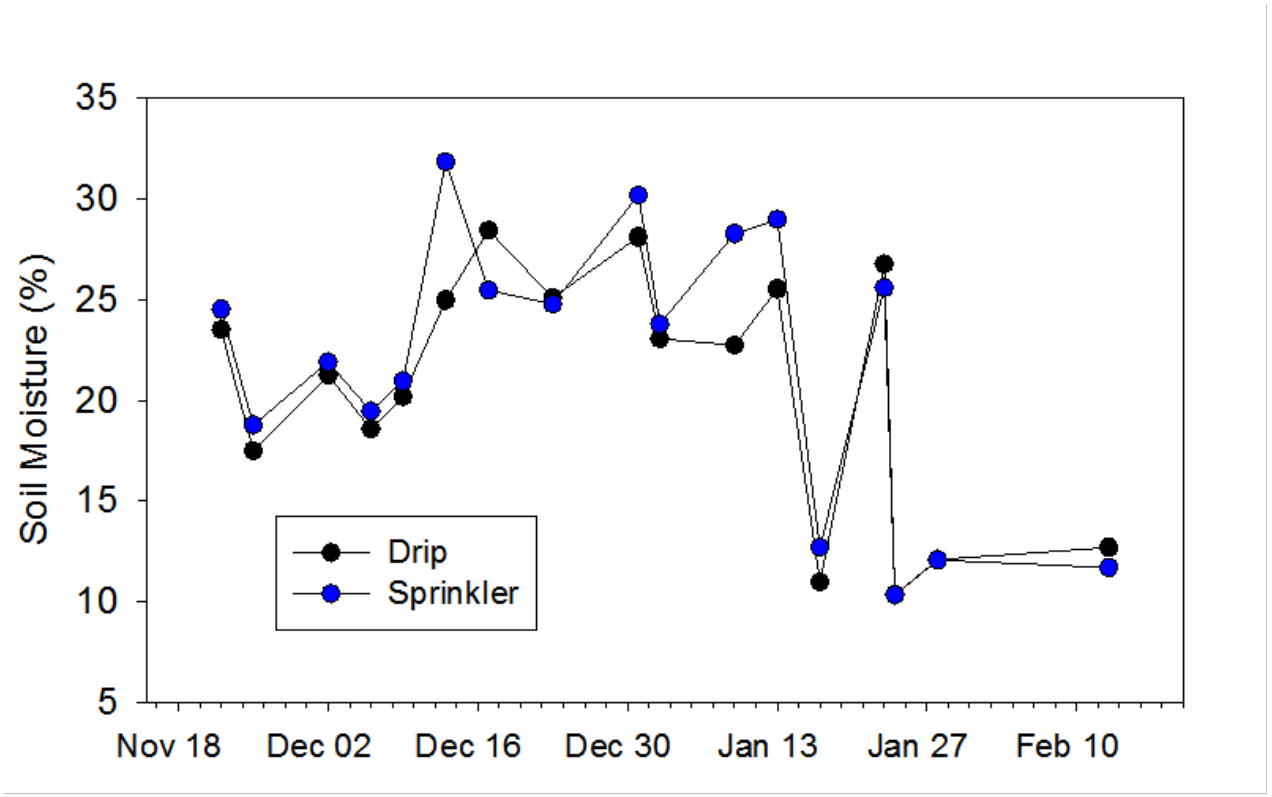
Is drip more efficient than sprinkler for establishment? (Nov 13, 2013 – Feb 20, 2014)



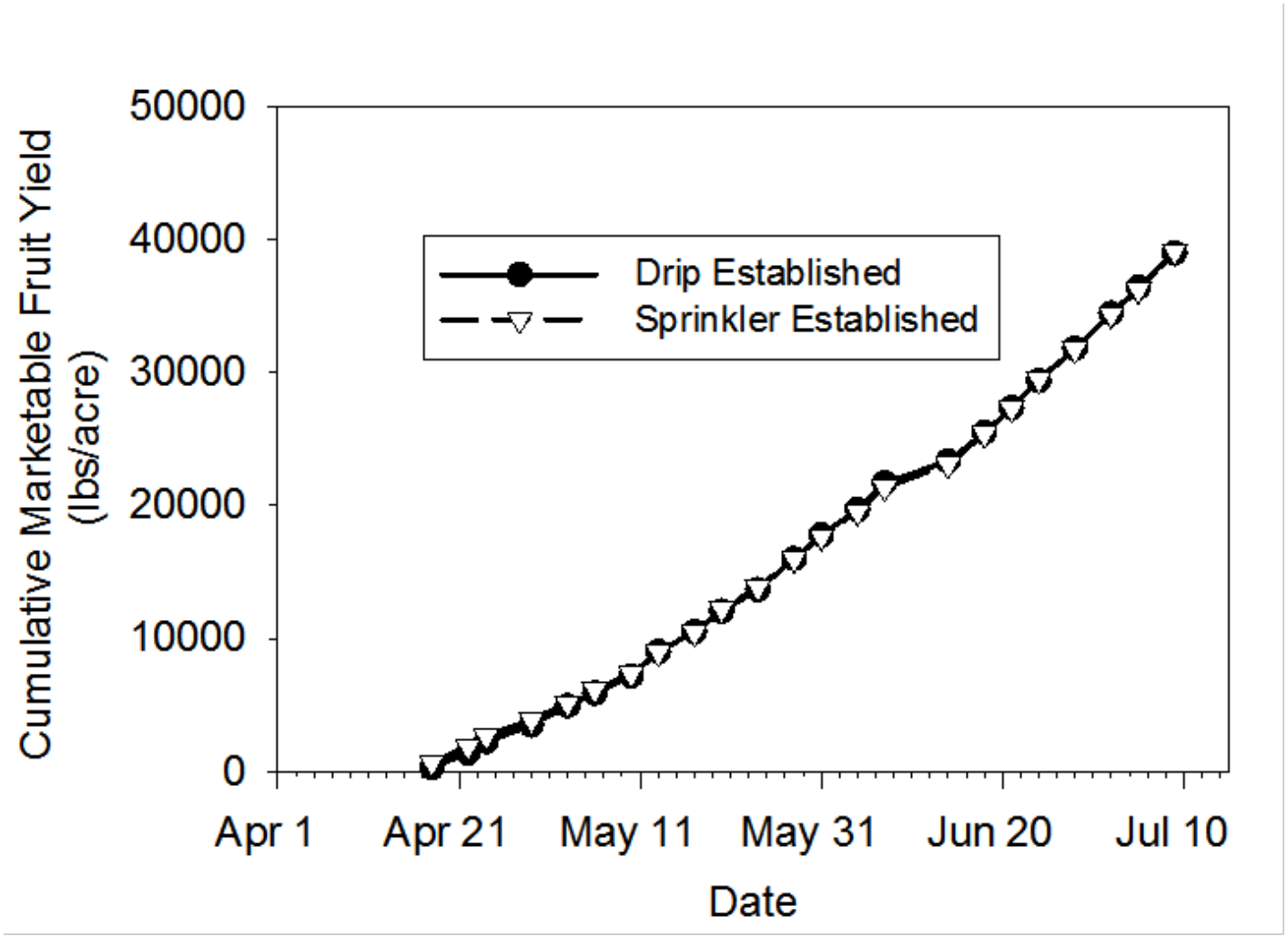
Canopy size was similar among drip and sprinkler established plots



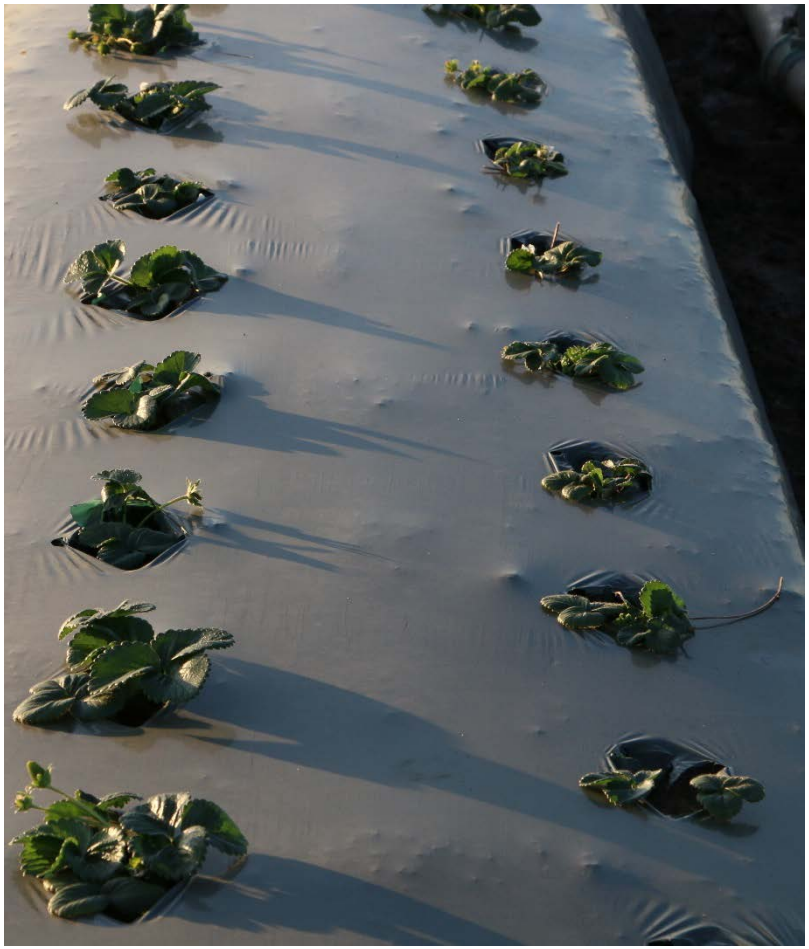
Soil moisture was similar among drip and sprinkler established plots



Marketable yield was the same among drip and sprinkler established plots



Post establishment: avoid exceeding water holding capacity of the soil



- Crop ET is low
- Soil nitrate levels are often high
- Roots are concentrated in upper foot
- Irrigations amounts are often in excess of water holding capacity of soil
- Monitor soil moisture to determine when to irrigate
- Apply small amounts of water

Tune up irrigation scheduling

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

What is the best approach for strawberries?

Soil moisture: when?

Weather-based: how much?

Flowmeters can help

- Measure volume of water applied
- Record time, date, and flow rate of irrigations (using a datalogger)
- Troubleshoot problems in irrigation system (plugging/leaks)
- Troubleshoot operation problems (low pressure, over or under irrigating)

Soil Moisture Monitoring

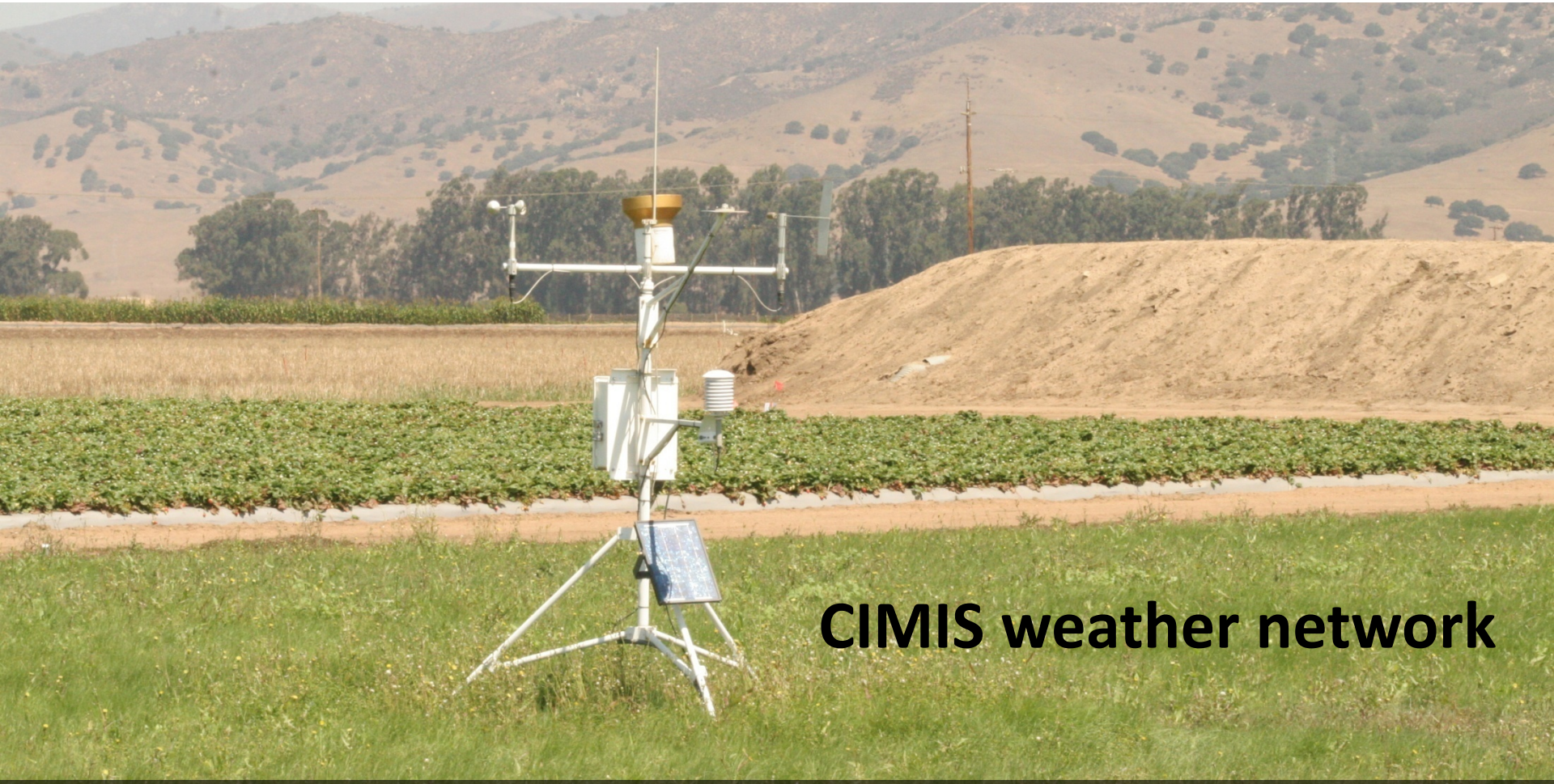
Tension

Volumetric

Tensiometers monitor the matric potential (tension) of the soil

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

Can crop water needs be estimated using weather data?



Evapotranspiration (ET) = Solar Radiation + Relative Humidity + Air Temperature + Wind Speed

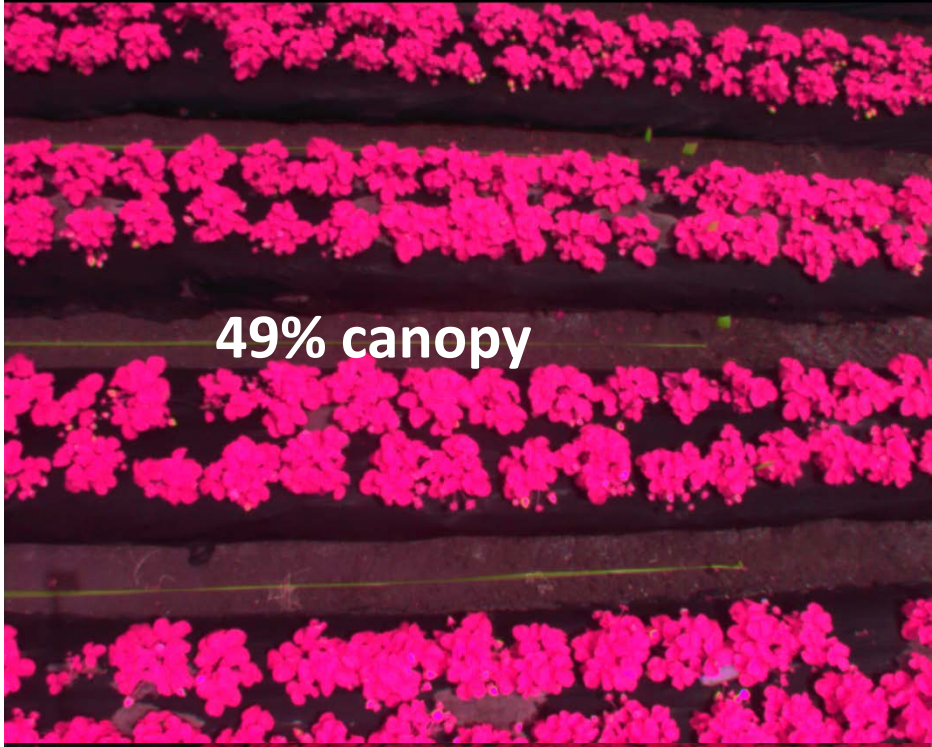
What is Evapotranspiration?

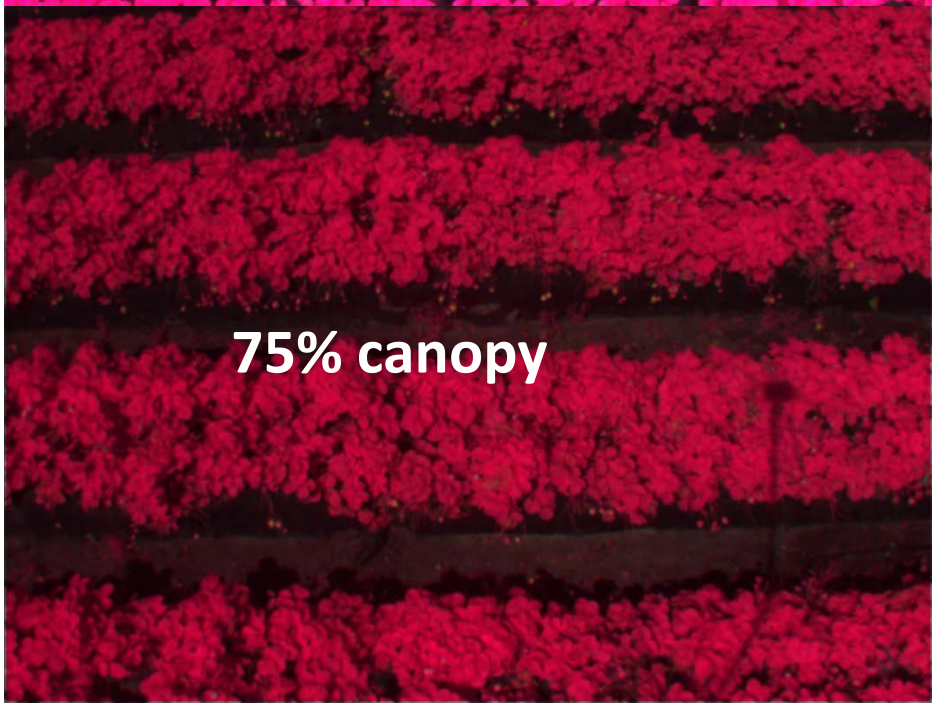
Evaporation + Transpiration

Crop coefficients are needed to calculate crop ET

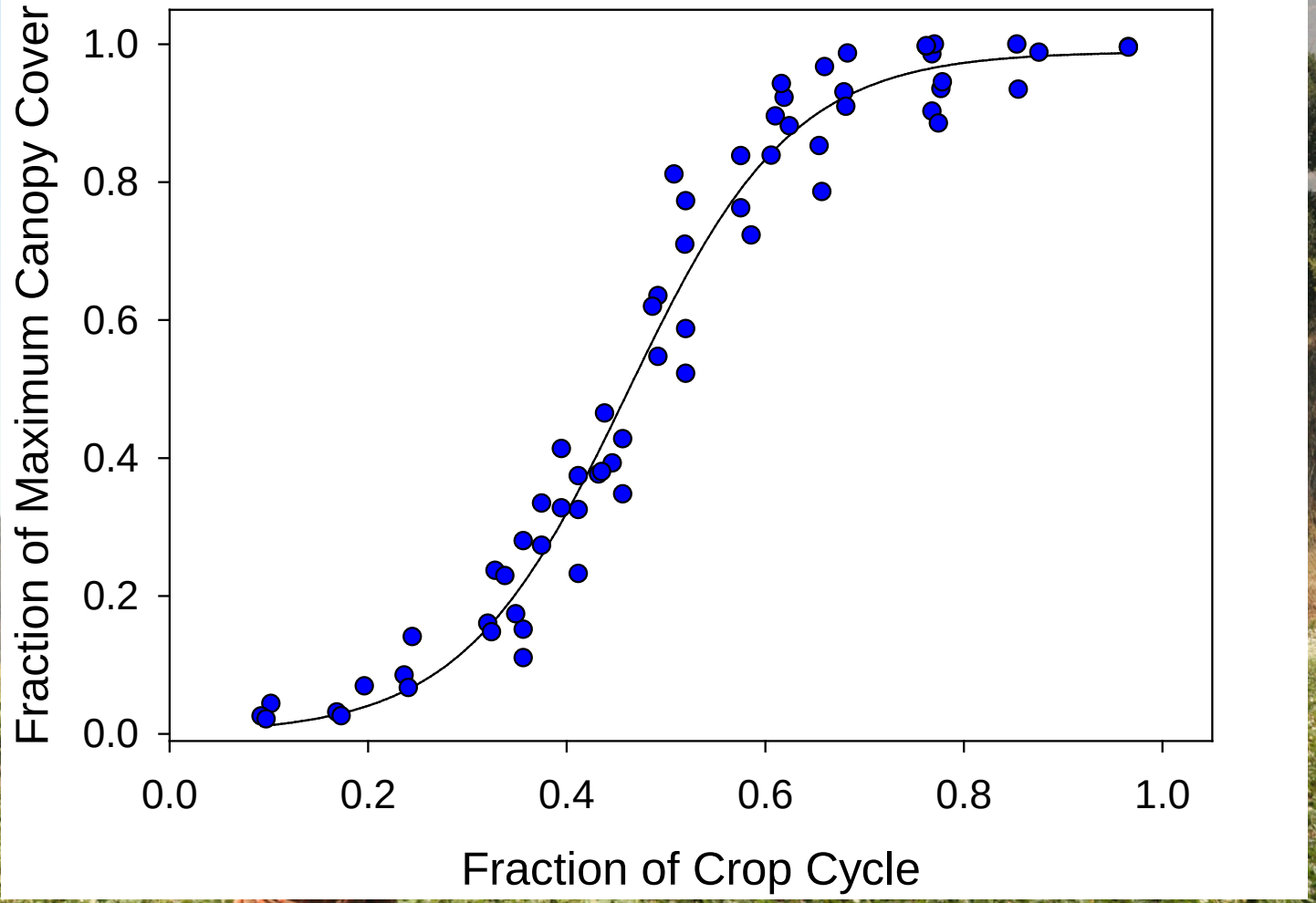
$$ET_{crop} = ET_{ref} \times K_{crop}$$

K_c varied from 0.05 to 0.95

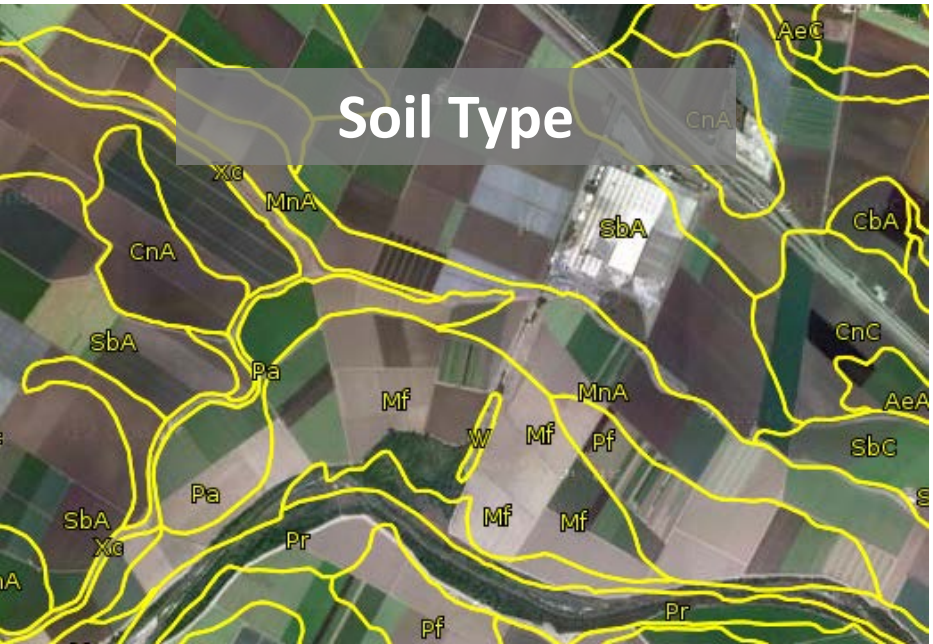




Albion, 52-inch wide beds

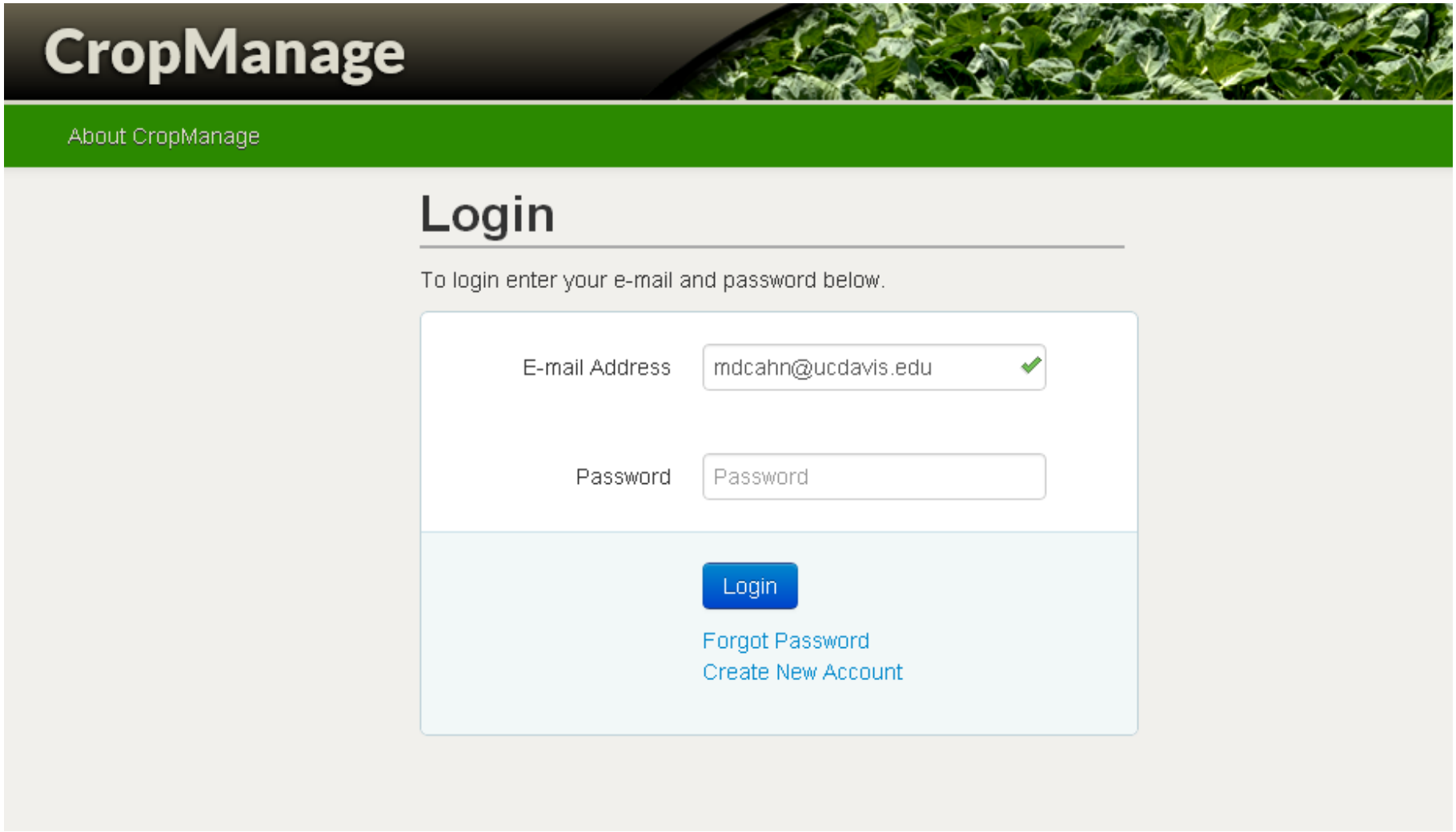


Other information needs to be considered



Web-based Irrigation and N management software for coastal crops

https://ucanr.edu/cropmanage

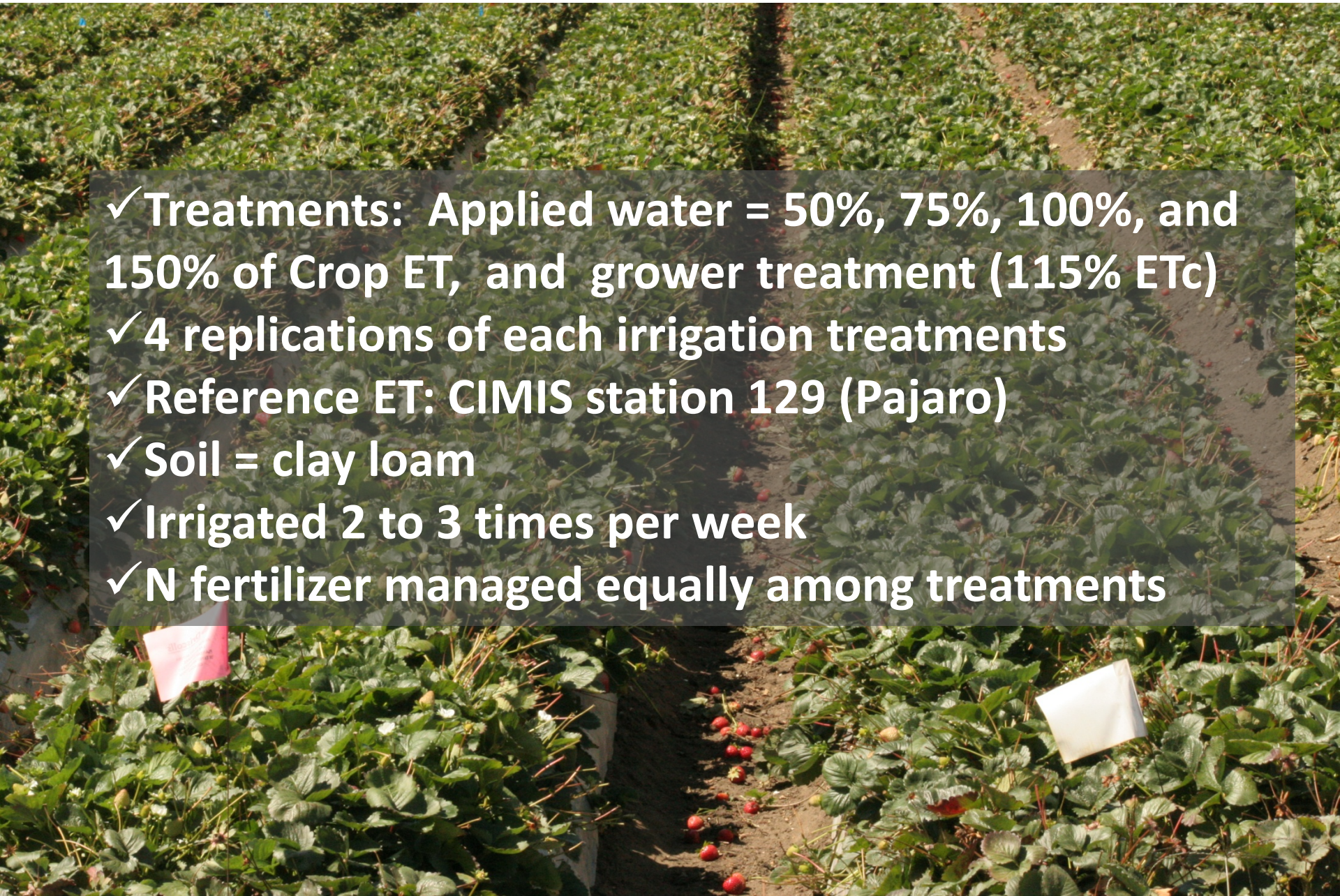


Irrigation Summary

Show / Hide Columns

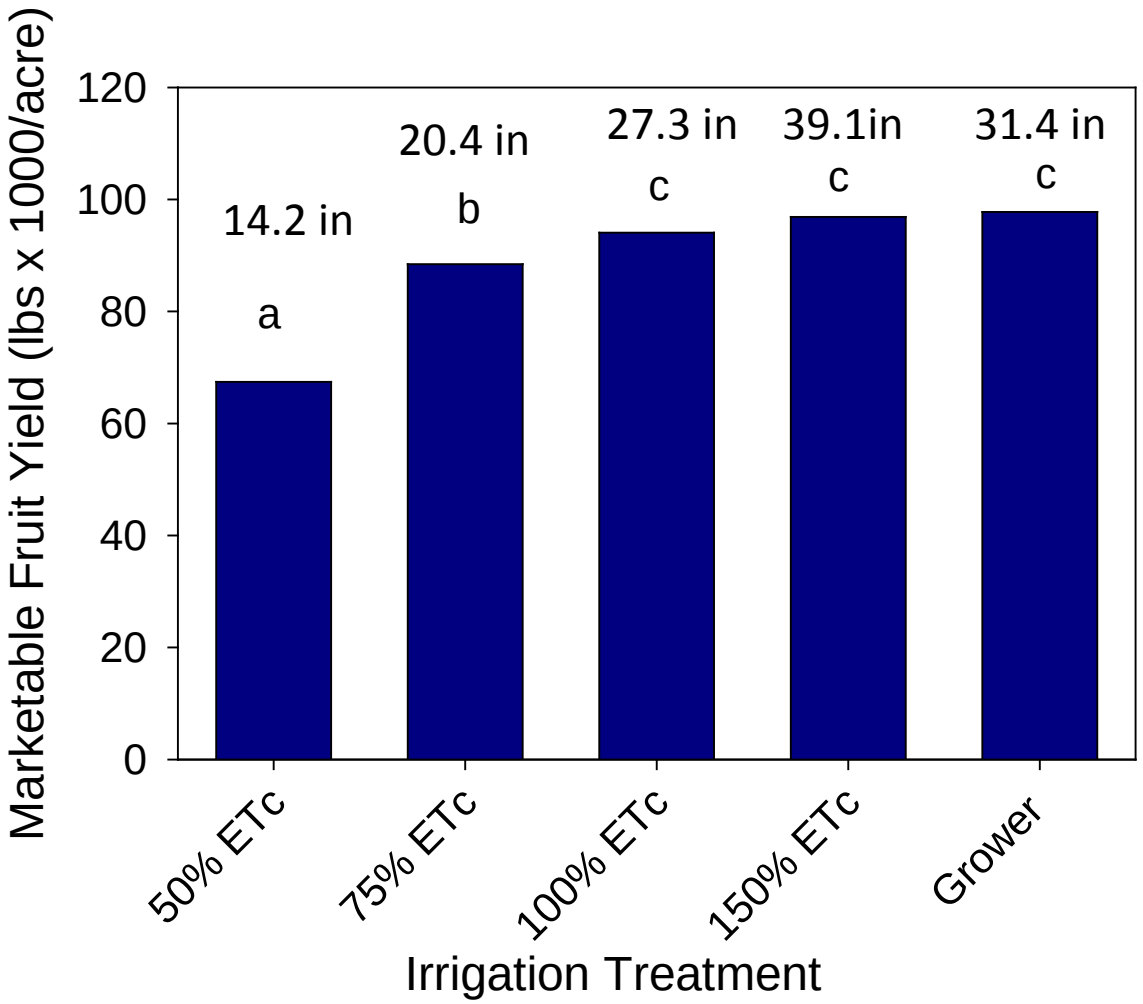
Water Date	Irrigation Method	Recommended Irrigation Interval (days)	Recommended Irrigation Amount (inches)	Recommended Irrigation Time (hours)	Irrigation Water Applied (inches)
8/19/13	Drip	6.0	0.45 in	2.05 hrs	0.44 in
8/21/13	Drip	7.6	0.24 in	1.08 hrs	0.23 in
8/23/13	Drip	6.0	0.30 in	1.37 hrs	0.29 in
8/26/13	Drip	5.7	0.47 in	2.16 hrs	0.47 in
8/28/13	Drip	5.8	0.31 in	1.42 hrs	0.32 in
8/30/13	Drip	5.4	0.32 in	1.47 hrs	0.35 in
9/3/13	Drip	5.1	0.70 in	3.19 hrs	0.61 in
9/5/13	Drip	4.1	0.44 in	2.01 hrs	0.14 in
9/6/13	Drip	4.4	0.21 in	0.93 hrs	0.42 in

Replicated Irrigation Trial

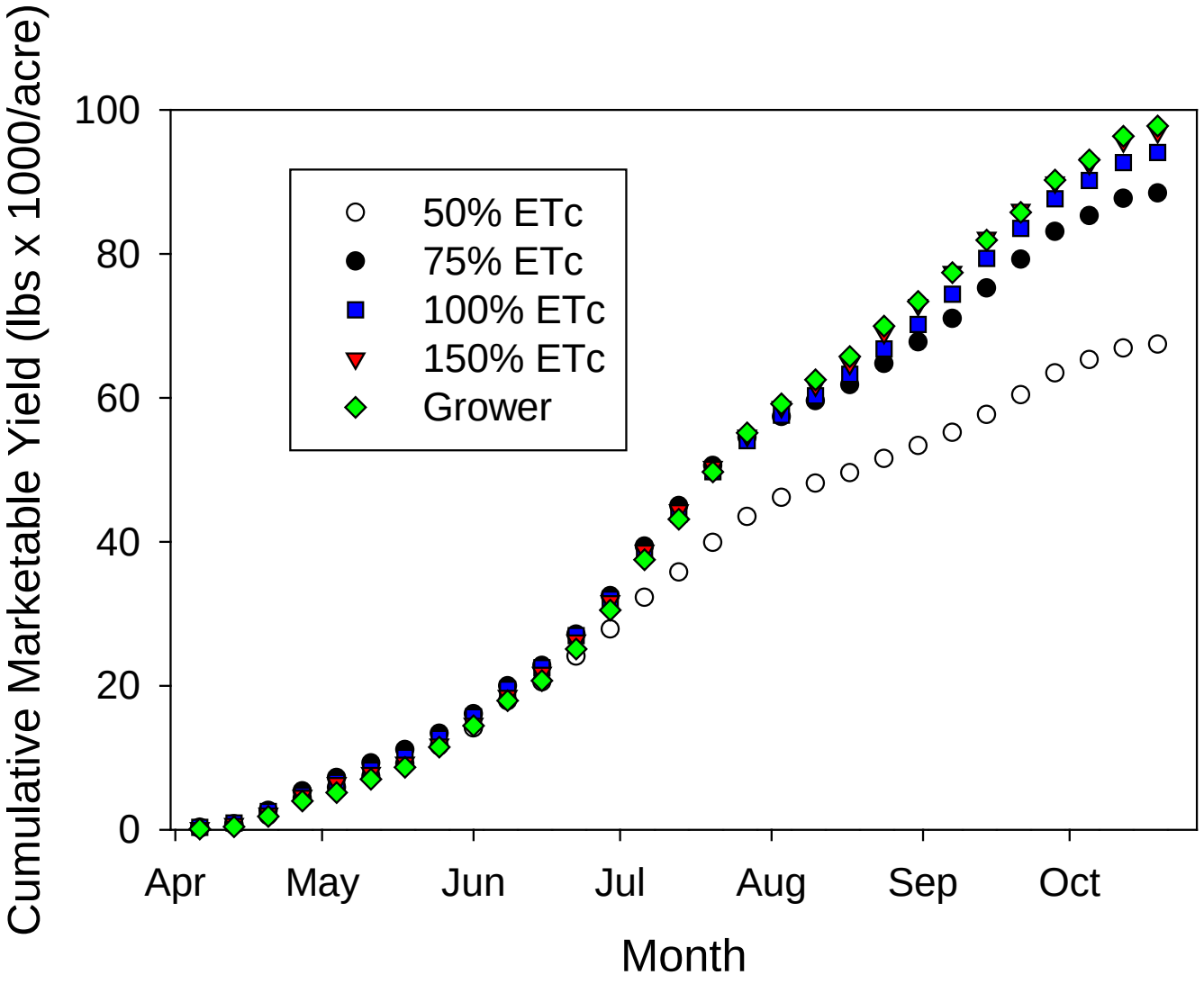


- ✓Treatments: Applied water = 50%, 75%, 100%, and 150% of Crop ET, and grower treatment (115% ETc)
- ✓4 replications of each irrigation treatments
- ✓Reference ET: CIMIS station 129 (Pajaro)
- ✓Soil = clay loam
- ✓Irrigated 2 to 3 times per week
- ✓N fertilizer managed equally among treatments

Irrigation Effects on Marketable Fruit Yields

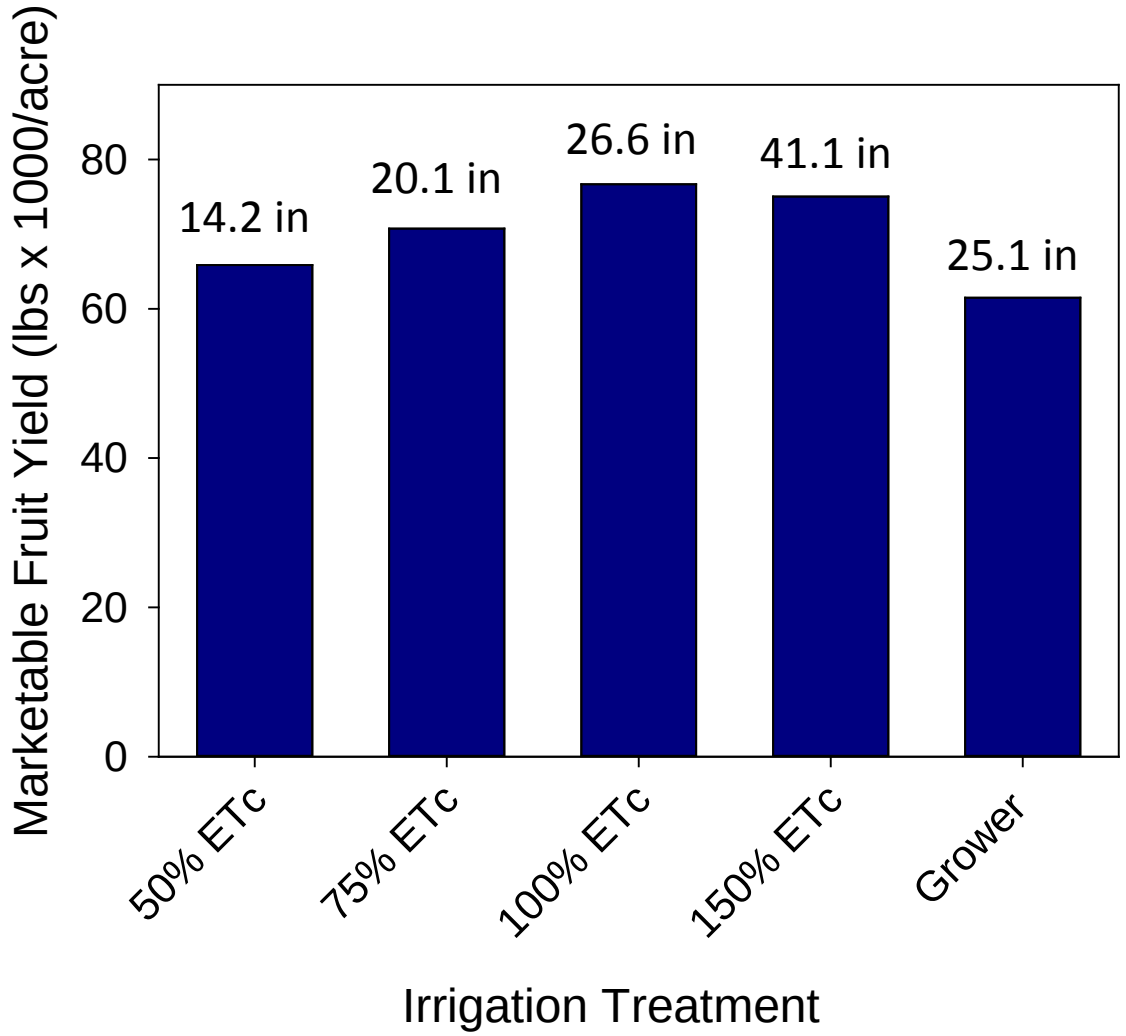


Cumulative Fruit Yields (Marketable)



Difficult to identify water stress early

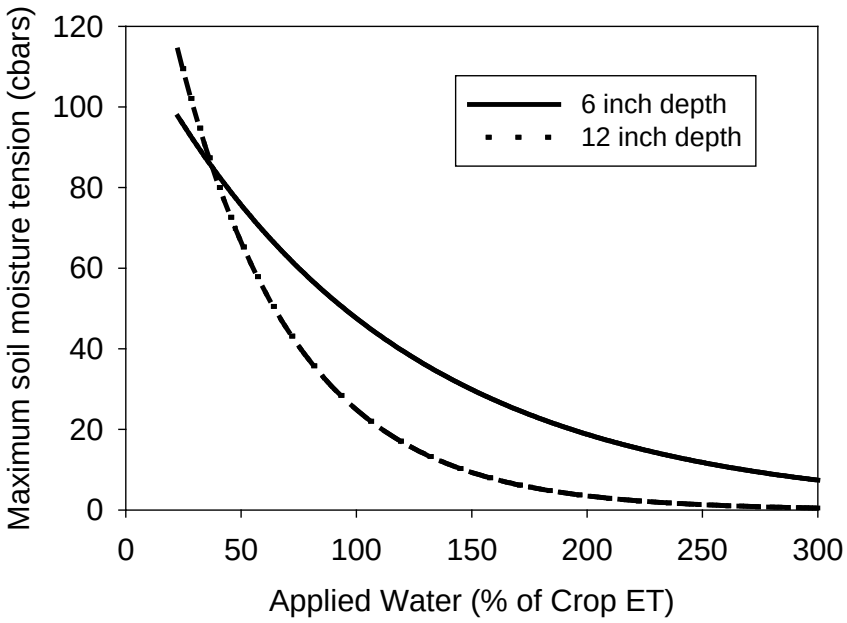
Irrigation Effects on Marketable Fruit Yields (2014)



How does soil moisture monitoring fit in?

Soil Moisture and ET go hand-in-hand

Soil moisture tension lowest when applied water was > 100% Crop ET



Soil moisture monitoring is good to let you know **WHEN** you need to water

Evapotranspiration is a good measure of **HOW MUCH** you need to water

Summary

There are opportunities to use water more efficiently in strawberry production

- ✓ **Optimize application uniformity**
- ✓ **Use water carefully during establishment and post-establishment**
- ✓ **Use a combination of weather-based and soil based scheduling during the production period**