Assessing Drip vs Micro-sprinkler Irrigation During Strawberry Establishment – 2nd Season

Andre Biscaro,
UC Cooperative Extension, Ventura County

Project collaborators:
Gina Ferrari, Oleg Daugovish, UCCE Ventura
Raul Coronado, GoodFarms

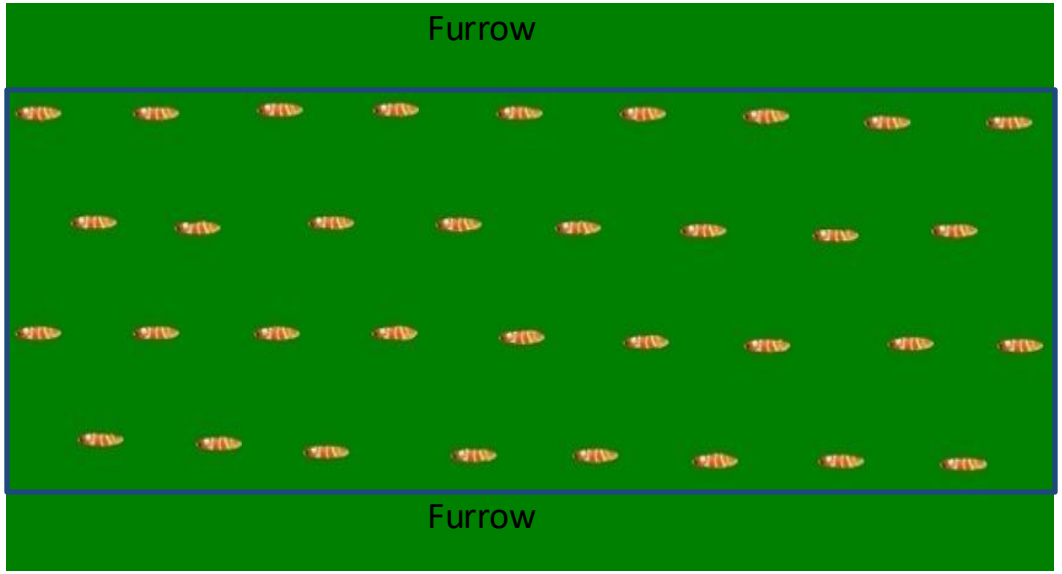
University of California
Agriculture and Natural Resources

Strawberry Establishment

- Lasts between 4 and 6 weeks after planting
- Crop water use is very low
- There is a lot of room to conserve water

Limited Efficiency of Overhead Irrigation

Aerial view of a strawberry bed section



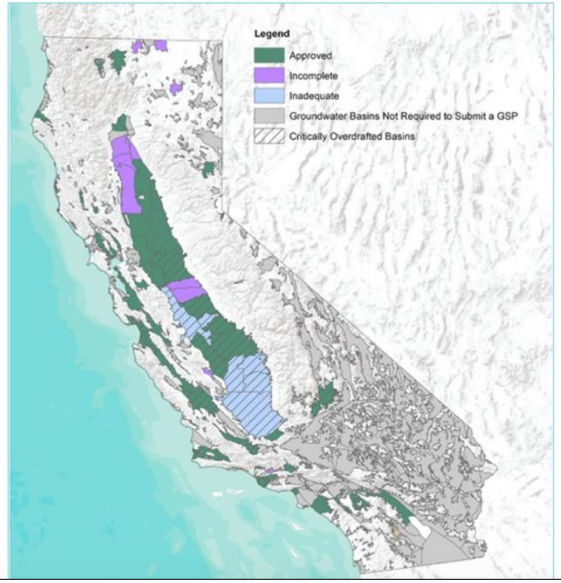
- The majority (~ 80-90%?) of the sprinkler-applied water is lost through runoff, deep percolation and evaporation.

- Planting holes (elliptical orange shapes) represent 2.3% of the total area of this image
- Five images from the same field resulted on an average of 2.4% of planting hole area

CALIFORNIA DEPARTMENT OF
WATER RESOURCES

Water Basics | What We Do | Programs | Work with Us | News | Library | Search

Groundwater Sustainability Plans



The Sustainable Groundwater Management Act (SGMA) requires local Groundwater Sustainability Agencies (GSAs) in the state's high and medium priority basins to develop and implement Groundwater Sustainability Plans (GSPs) or Alternatives to GSPs. These GSPs and Alternatives provide roadmaps for how groundwater basins will reach long-term sustainability.

On January 18, 2024, the Department completed the initial GSP reviews for all basins that were required to submit plans by January 31, 2022. The Department's determinations can be viewed on the SGMA Portal. The current status of California's groundwater basins is:

- 71 approved basins
- 13 incomplete basins
- 6 inadequate basins

GSAs are required to begin implementing their GSPs upon their submittal to the Department. If a basin's GSP is

GSP

GSP Reporting System

Contact Us

General Inquiries:
sgmps@water.ca.gov

Regional Inquiries:
sgmp_rc@water.ca.gov

Basin Points of Contact:
Northern Region
North Central Region
South Central Region
Southern Region

University of California
Agriculture and Natural Resources

Previous study results and other regions

- A series of field trials conducted in Oxnard, Santa Maria and Watsonville between 2009 and 2014 (Daugovish et al., 2016):

- ✓ Water use reduction of 24 to 78% with the use of drip tape compared to overhead sprinklers during strawberry establishment

- ✓ Plant size, root biomass and yield were similar between the two irrigation systems, suggesting great suitability for adoption of such method

- Many operations in Baja and other regions in California don't use sprinklers/microsprinklers

Objective:

Quantify differences in yield, water use and plant growth between drip tape and micro-sprinkler irrigation methods during crop establishment

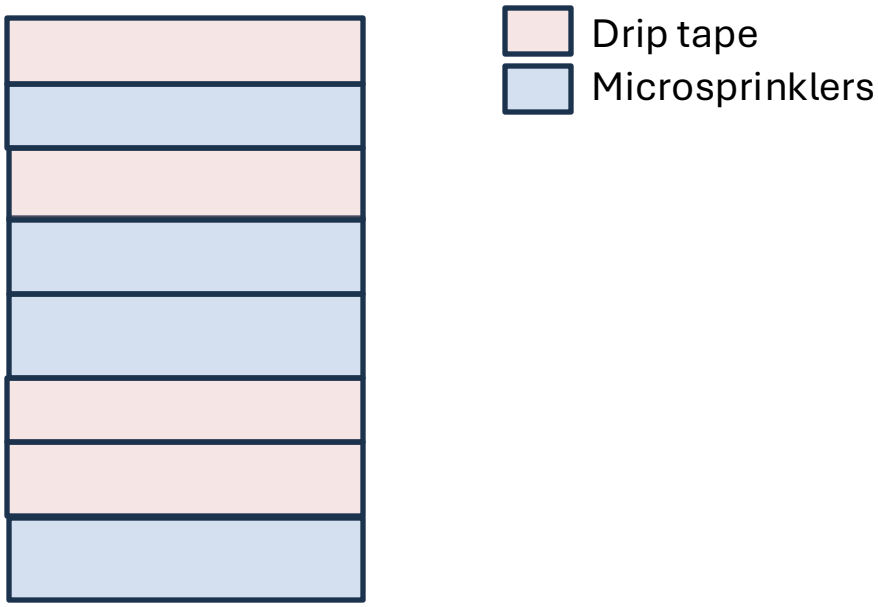
Treatments (42 DAP):

1. Drip tape
2. Micro-sprinkler (grower standard)

Parameters assessed:

Yield, water use, canopy coverage and root depth

Experimental Design



Each plot: 7 beds wide (37.3ft) x 175ft long

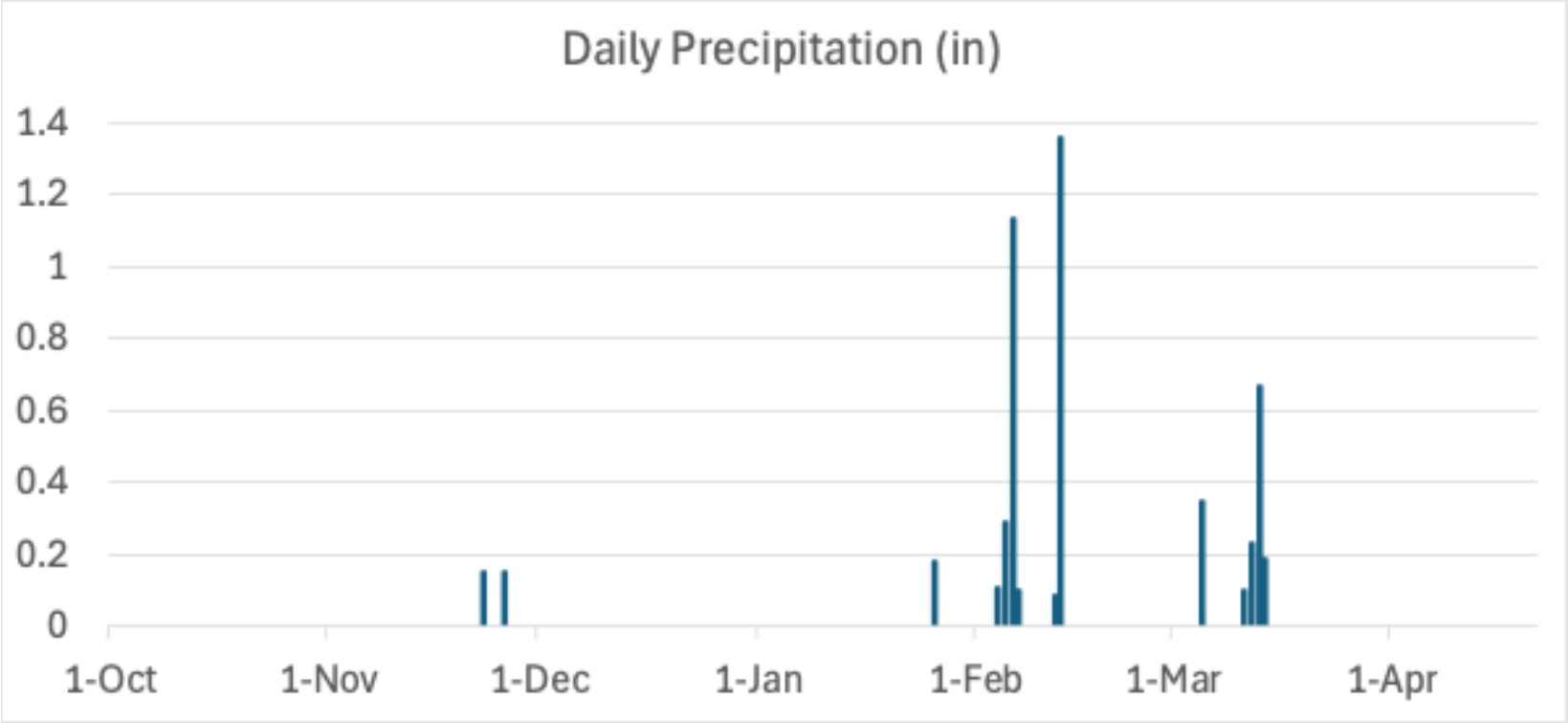
Details

- Treatments were applied during the first 6 weeks after planting, after which drip irrigation became the only irrigation method. All other cultural practices remained the same.
- Experimental design: randomized complete block, replicated four times (0.15-acre plots).
- 64-in bed, three medium flow tapes, Plant Sciences cultivar planted on Oct 1.
- Soil: Hueneme sandy loam.
- 800 lb/acre of 22-8-13 pre-plant fertilizer banded in plant row.

Details (cont.)

- Irrigation of the drip tape treatment was guided by soil moisture measured with Hortau® tensiometers installed at 4-in depth under the plants, in addition to field observations.
- The irrigation of the micro-sprinkler treatment was determined by the irrigator as usual.
- Total precipitation: 5.1 inches total, with no precipitation during establishment.

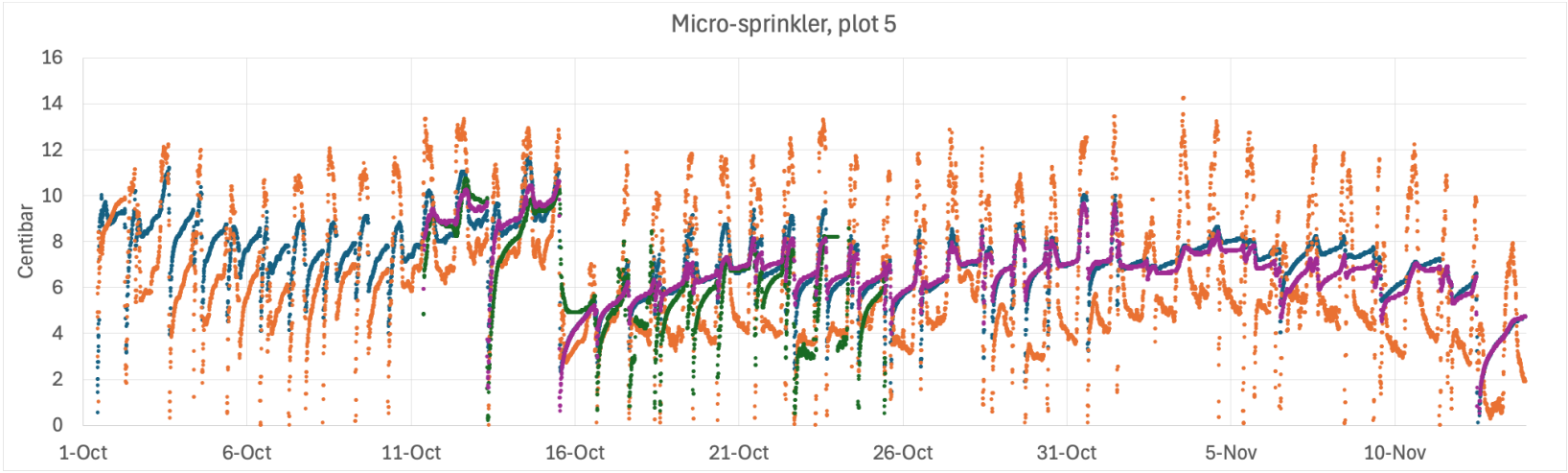
Tensiometer installed at 4in depth

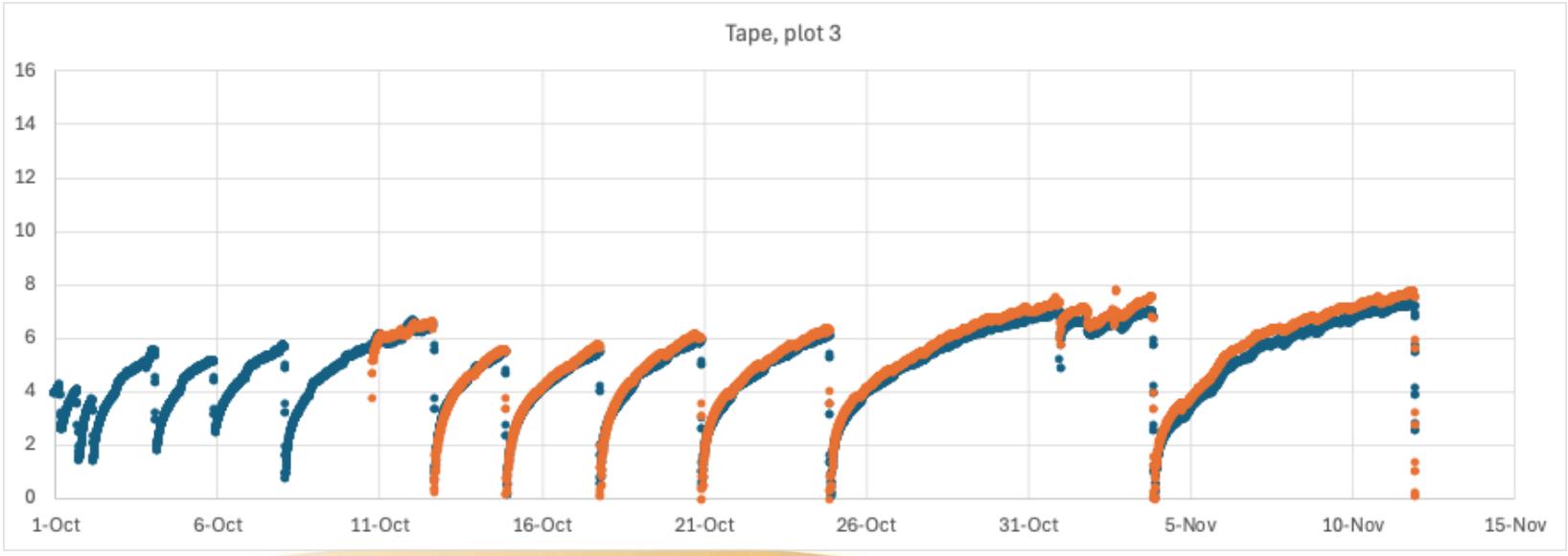


Establishment (42 days)

Results Summary Table

Treatments	Yield (boxes/acre) Jan 14-Mar 31	Water use during crop establishment (acre-in)	Canopy Size (% of ground cover) measured at: 1mo – 6mo after planting	Root depth (in) at 5 weeks after planting	Soil salinity (ECe) at 0-6in, 1 mo after planting	Avg soil moisture at 4-in depth during establishment (centibars)
Drip tape	2,408	3.3	10.7 – 56.0	6.9	4.1	5.9
Micro-sprk	2,427	5.8	11.6 – 62.1	7.0	4.0	7.1
p-value	0.9517	NA	0.5504 and 0.1223	0.9496	0.7158	NA

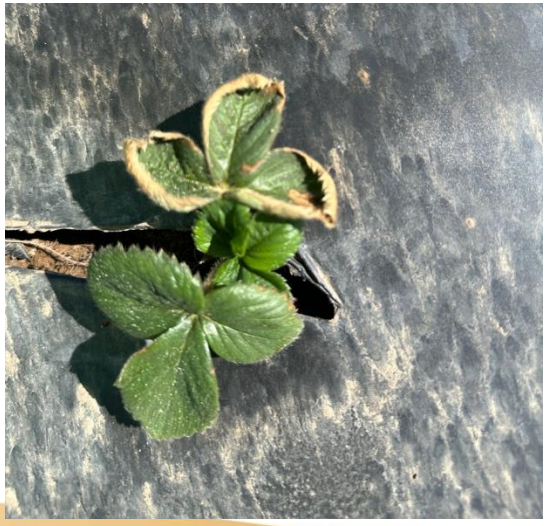

Micro-sprinkler, plot 5
Centibar
16
14
12
10
8
6
4
2
0
1-Oct
6-Oct
11-Oct
16-Oct
21-Oct
26-Oct
31-Oct
5-Nov
10-Nov


Tape, plot 3
16
14
12
10
8
6
4
2
0
1-Oct
6-Oct
11-Oct
16-Oct
21-Oct
26-Oct
31-Oct
5-Nov
10-Nov
15-Nov

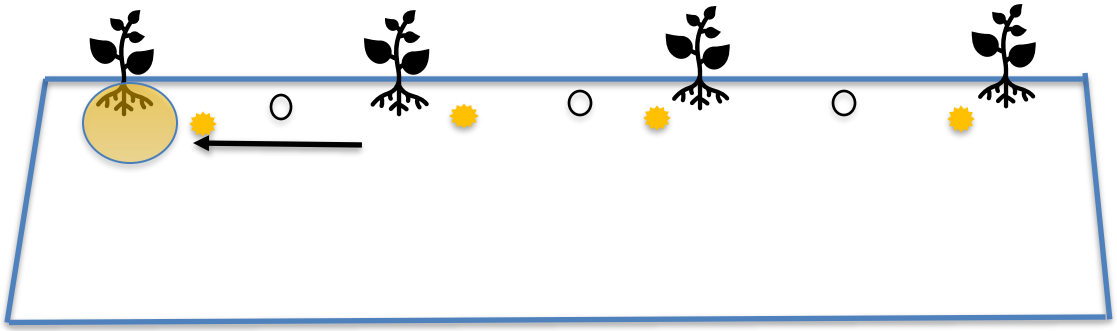
40 days after planting








Root Depth



‘Perfect storm’:

- Crop sensitive to salinity
- High amount of pre-plant placed right next to the bare roots
- Sandy soil
- Warm days during establishment = higher soil temperature at 2in depth = much sooner release of the controlled-release fertilizer
- High N in NH_4^+ form
- Irrigation water from drip tape pushing high ECw water directly to the plant rows.

Soil Chemical Analysis

	Calcium, Sol	Chloride	Salinity (ECe)	Magnesium, Sol	Sodium, Sol	pH
	meq/l	meq/l	dS/m	meq/l	meq/l	units
Soil around healthy plants	44.4	9.30	5.03	15.4	15.7	6.3
Soil around stunted plants	67.0	14.6	9.92	31.7	18.6	5.4

Summary

- ✓ The results of this trial were significantly affected by the high salinity and low pH environment around the transplant resulted from the pre-plant fertilizer application method; the quantification of the treatments' impact on yield was also influenced by the replanting of poorly established plants.
- ✓ Water use was 74% greater with micro-sprinklers compared to drip tape.
- ✓ While canopy size at 1 and 6 months after planting was greater for the micro-sprinkler treatment, the differences were mostly caused by poor crop establishment in plot #8 (drip tape).
- ✓ This study will continue for at least one more season (with additional treatments).

Thank you!

Questions/comments?

asbicaro@ucanr.edu
(805)645-1465

Acknowledgements:

- Crisalida Berry Farms
- Thelma Hansen Funds
- Hortau®