



# Assessing Drip Irrigation as an Alternative to Micro- sprinklers During Strawberry Establishment

Andre Biscaro,  
UCCE Ventura

*Project collaborators:*  
Oleg Daugovich, UCCE Ventura  
Raul Coronado, GoodFarms

# Outline

- Context of establishment irrigation in Ventura County
- Water availability in Ventura County
- Research trial results
- Summary



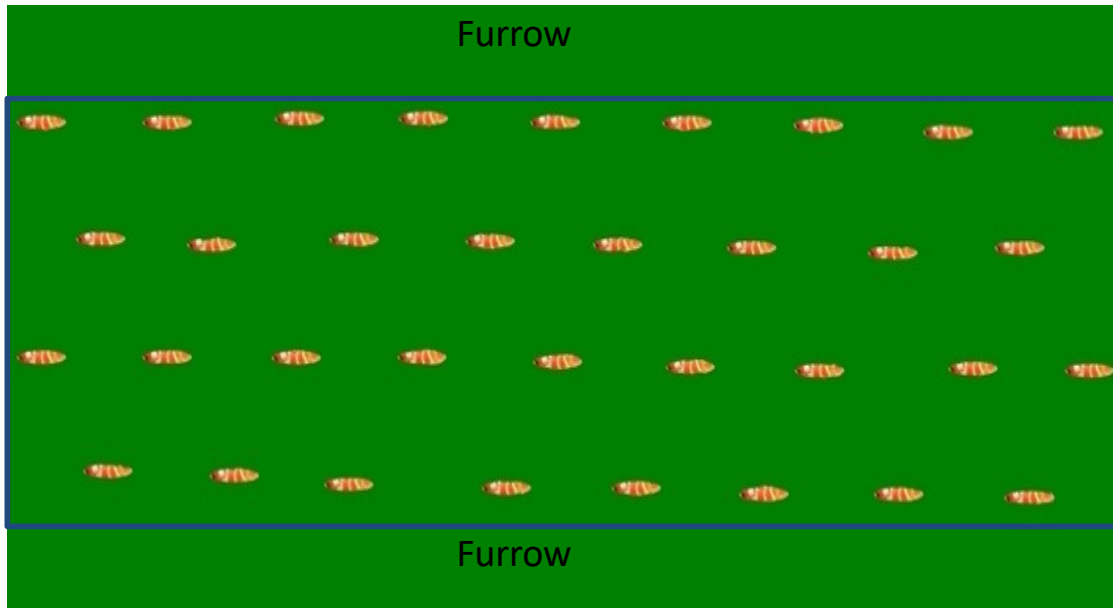
# Strawberry Establishment



- Lasts between 4 and 6 weeks after planting
- Crop water use is very low, so the contrast between sprinkler-applied water and crop water use is staggering
- Even though inefficiencies are expected since the bare-roots transplants present very little active roots, there is a lot of room for improving water conservation

# Limited Efficiency of Overhead Irrigation

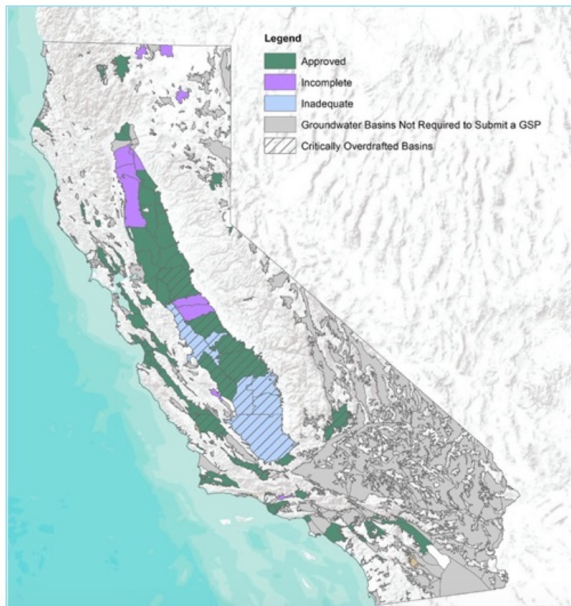
Aerial view of a strawberry bed section



- The majority (maybe 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



## 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 Reporting System

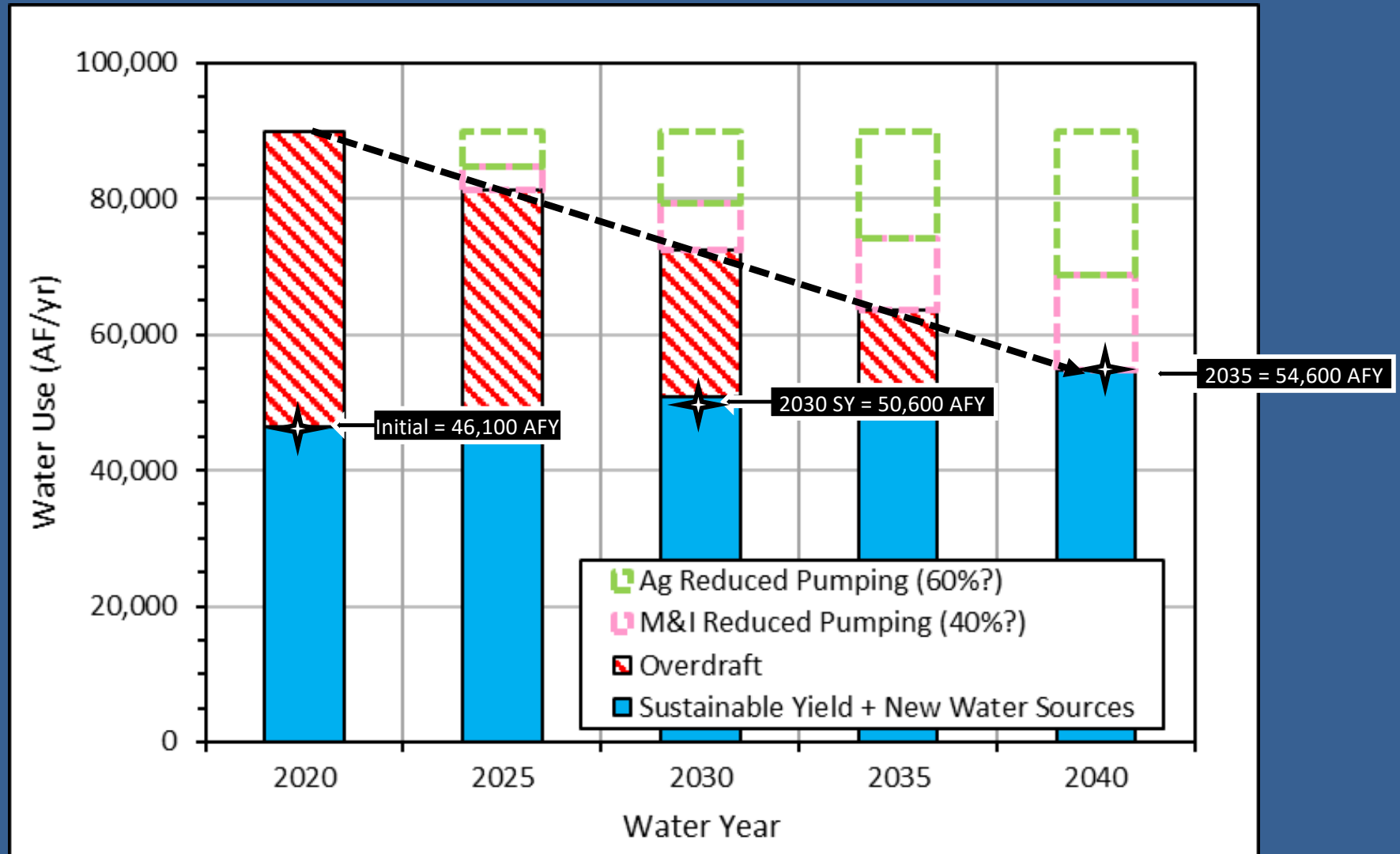
### Contact Us

General Inquiries:  
[sgmps@water.ca.gov](mailto:sgmps@water.ca.gov)

Regional Inquiries:  
[sgmp\\_rc@water.ca.gov](mailto:sgmp_rc@water.ca.gov)

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# Path to Sustainable Yield with Current GSP Projects



(Courtesy of Dan Detmer, 2021)

# Previous study 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 CA don't use sprinklers/microsprinklers

## Other uses of microsprinklers/sprinklers

- Increase viability of persimilis – no field trial data. Ongoing project to address this
- Required for bed fumigation + certain pesticides; currently seeking further clarification from the Ag Commissioners office



# Fast-forward to 2024

- Over 10 years have passed after those field trials and Ventura County growers are still using sprinklers or microsprinklers as their main irrigation method during crop establishment
- In October 2023 we decided to embark on a journey to better understand the challenges involved in establishing strawberries with drip tape
- Funds were secured for two seasons. One field trial currently ongoing

## Objective:

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



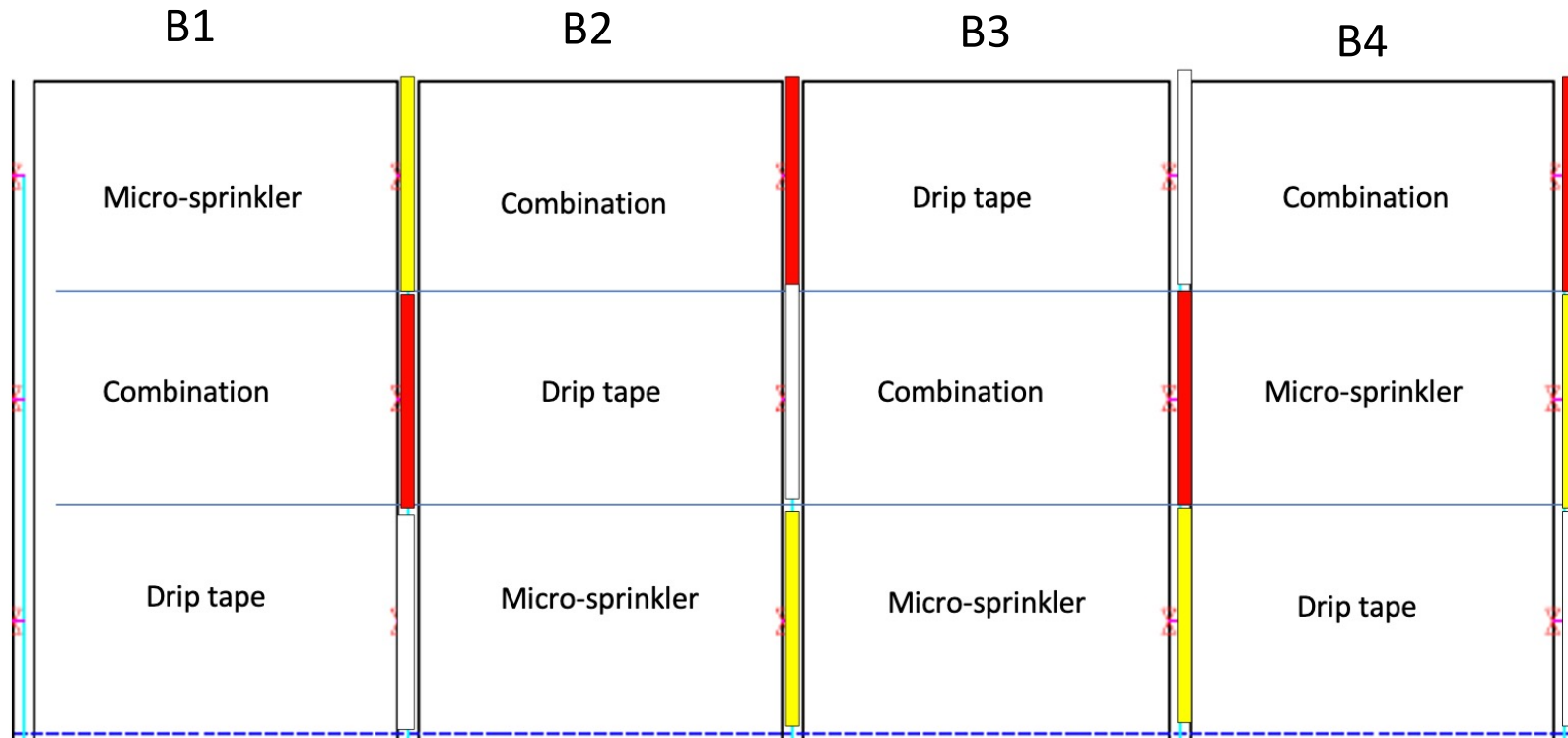
## Treatments:

1. Drip tape (micro-sprinklers used at planting day and two more times after)
2. Micro-sprinkler (grower standard)
3. Combination of drip tape and micro-sprinkler

## Parameters assessed:

Yield, water use, canopy coverage and root depth

# Experimental design



# Details

- Treatments were applied during the first 5 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 (1.7 acre plots).
- 64-in bed, three medium flow tapes, Plant Sciences cultivar planted in early October.
- Soil: Hueneme sandy loam; 800 lb/acre of 22-8-13 pre-plant fertilizer applied.

## Details (cont.)

- Irrigation of the drip tape treatment was guided by soil moisture measured with Hortau<sup>®</sup> 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.
- The combination treatment had alternating irrigations with micro-sprinklers and drip tape.
- Total precipitation: 23.9 inches total, with 7.5 inches between Nov and Dec.

# Hortau® Tensiometers at 4-in depth



# Drip Tape vs Microsprinklers





## Results Summary Table

Treatments	Early yield (boxes/acre) by Jan 31) *	Late yield (boxes/acre), by Mar 14)*	Water use (acre-in)	Canopy Size (% of ground cover) measured at: 1mo – 2mo after planting	Root depth (in) at 1 mo after planting
Drip tape	518	974	3.4	6.2 – 22.9	6.4
Micro-sprinklers	530	899	4.0	5.4 – 20.0	5.3
Combination	467	913	3.3	6.1 – 22.6	5.4

\*Yield differences among treatment are not statistically significant.

# Roots



# Moisture uniformity is more challenging with 3 vs 4 tapes





Factors affecting successful use of 4 tapes:

Proper land prep execution, soil moisture uniformity, implement quality (spike wheel), tape tension, consistent distance between tapes

# Summary

- ✓ Although not statistically significant, yield of the drip treatment by mid-March was 8.4% greater than micro-sprinkler (p-value = 0.802), and 6.7% greater than the combination treatment (p-value = 0.865).
- ✓ Water use was very similar between drip and combination treatments, and approximately 16% lower than micro-sprinklers. We expect that increasing the number of tapes to 4 will significantly reduce water use due to increased proximity of the tape to the plants.
- ✓ Differences in canopy cover were greatest between 28 and 48 days after planting.

## Summary (cont.)

- ✓ Average root depth for the drip treatment was 38% and 19% greater than micro-sprinkler for 15 and 28 days after planting, respectively.
- ✓ In summary, this trial found equal or superior performance of drip versus micro-sprinkler irrigation during strawberry establishment.
- ✓ Observations by research team and farm staff confirmed greater plant size and overall plant health for the drip tape and combination treatments.
- ✓ This study will continue for two more seasons.

## Other observations/lessons learned

- Biggest opportunities for water conservation and successful establishment are with 4 tapes (distance from tape to plant row is much smaller so it is easier to guarantee uniformity with short irrigations)
- 4 tapes is more suitable for 68-in beds vs 64-in
- Even after seeing positive results from previous studies, farm staff is still reluctant to use no sprinklers right after planting
- The sprinklers provide the farm staff with a visual confirmation (relief?) that the plants are getting water
- Soil moisture sensors installed at 4-in depth and under the plant are incredibly useful to guide irrigation during establishment

Thank you!

Questions/comments?

[asbicaro@ucanr.edu](mailto:asbicaro@ucanr.edu)

(805)645-1465



Foto: Field Day, May 15 2024