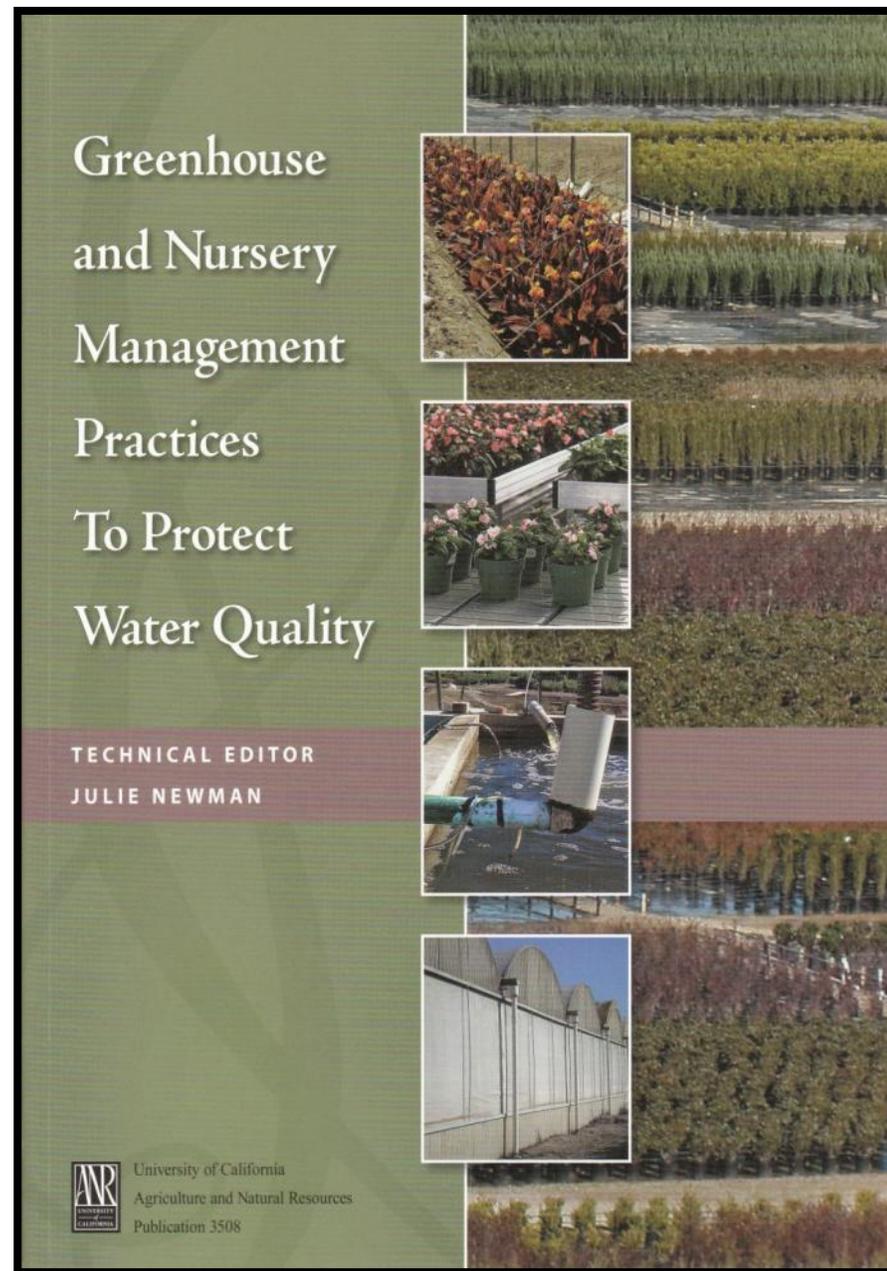


# Improving Irrigation Performance Using Micro-Irrigation

Andre Biscaro  
Ben Faber

Univ. of Calif. Cooperative Extension,  
Ventura County



# Water Use Terms

**Plant water use:** Turgor pressure, nutrient uptake, heat management

Often measured by **Transpiration**



**Beneficial water use:** Transpiration, Evapor., salt leaching, DU etc



**Irrigation Efficiency** = Beneficial water use/Applied water

**If you apply more water than needed, you are less efficient**

Underlying Beneficial Use is **Distribution Uniformity**  
(Irrigation Uniformity, Emission Uniformity)

Without good DU, it is impossible to have a good  
Irrigation Efficiency

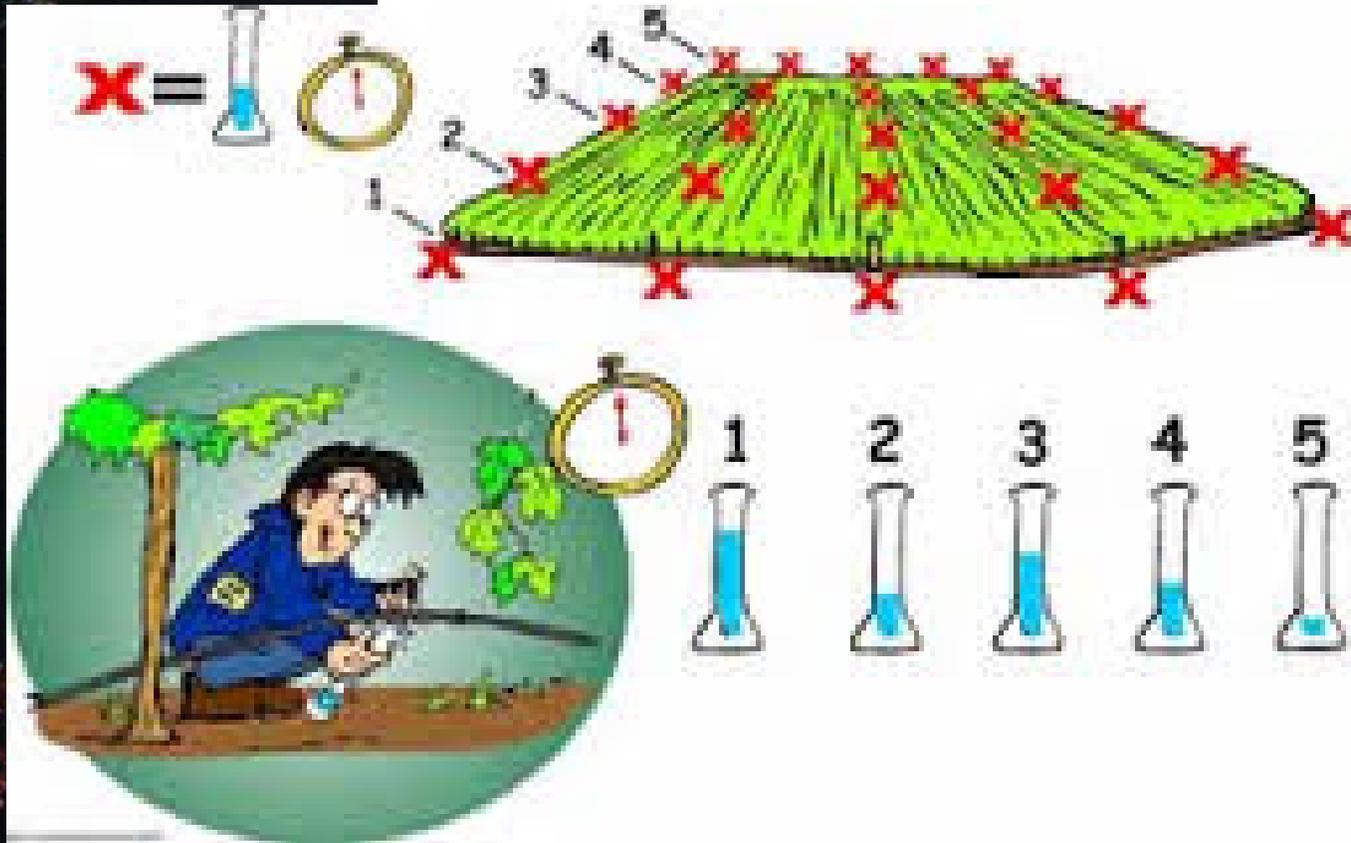
DU is how evenly water is applied or how evenly water is emitted



Measured with a “catch-can” test,  
and influenced by pressure  
uniformity.

It can never be 100% uniform





The most common measure of DU is the **Low Quarter DU**

= Average of the lowest quarter of samples /  
Average of all samples

16 cans:



$$\text{DU} = 74.7/82.9 = 0.90 = 90\%$$

$$0.25\text{in} / 0.9 = 0.28$$

$$0.25\text{in} / 0.7 = 0.36 \text{ (28.6\% more)}$$

In order to account for the plants that are getting less than the average, the system is run longer to ensure that they get adequate water, which means all the other plants are going to get more than they need.

... which leads to water stress and disease



- Lack of soil aeration affects root respiration = hinders plant growth, leading to plant disease
- Waste of inputs: fertilizers, pesticides, water
- Environmental concerns

# So how to improve DU?

- ~ Initial proper design - emitter spacing, pipe/tube length, etc
- ~ Pressure regulation
- ~ Filtration
- ~ Equipment inspection
- ~ Maintenance

Are the emitters consistent within an irrigation block?



Block:

- Same plants?
- Media type?
- Container volume?

Keep it as uniform as possible

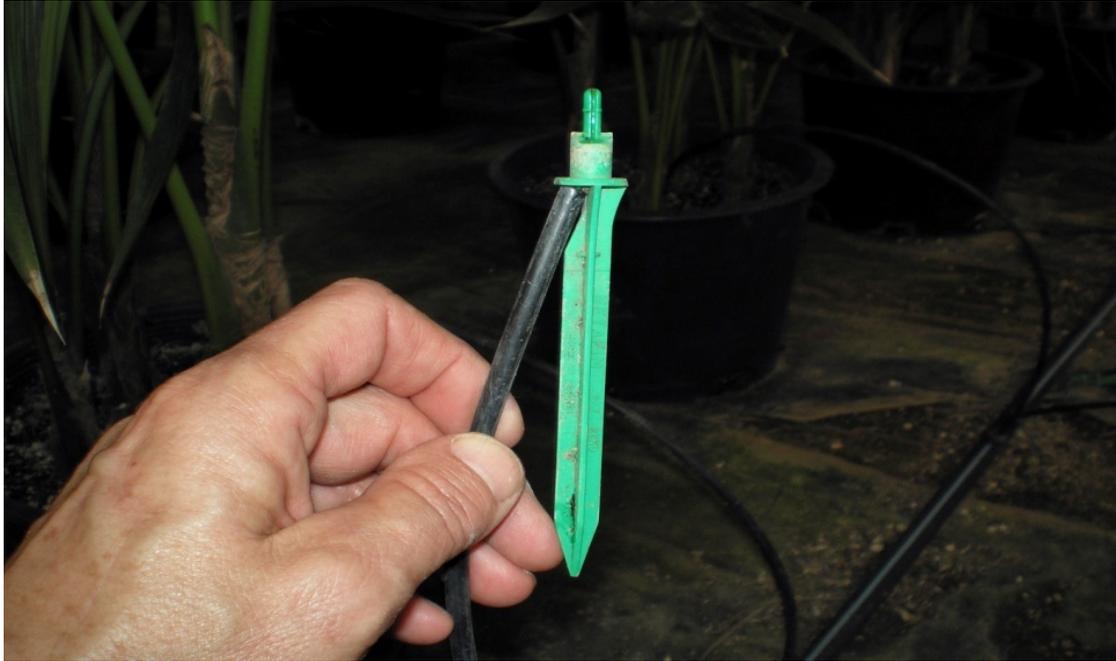
Make sure the water is going where you want it to go



Be flexible with the wind...



When overhead irrigating  
space plants as close together  
as possible



...and shut off irrigation in unused portions, including spray stakes and other emitters that can be “turned off” when not in use.

Manage every spray stake and dripper systems to ensure that every emitter is located in a plant or pot.



## Pressure regulation

- Adding sprinklers to existing system, reduces pressure
- Small pipe to a system, increases friction and lowers pressure
- The longer the pipeline, the more friction and lower pressure
- Increasing nozzle size, increases discharge and lowers pressure

## Pressure compensating emitters or inline



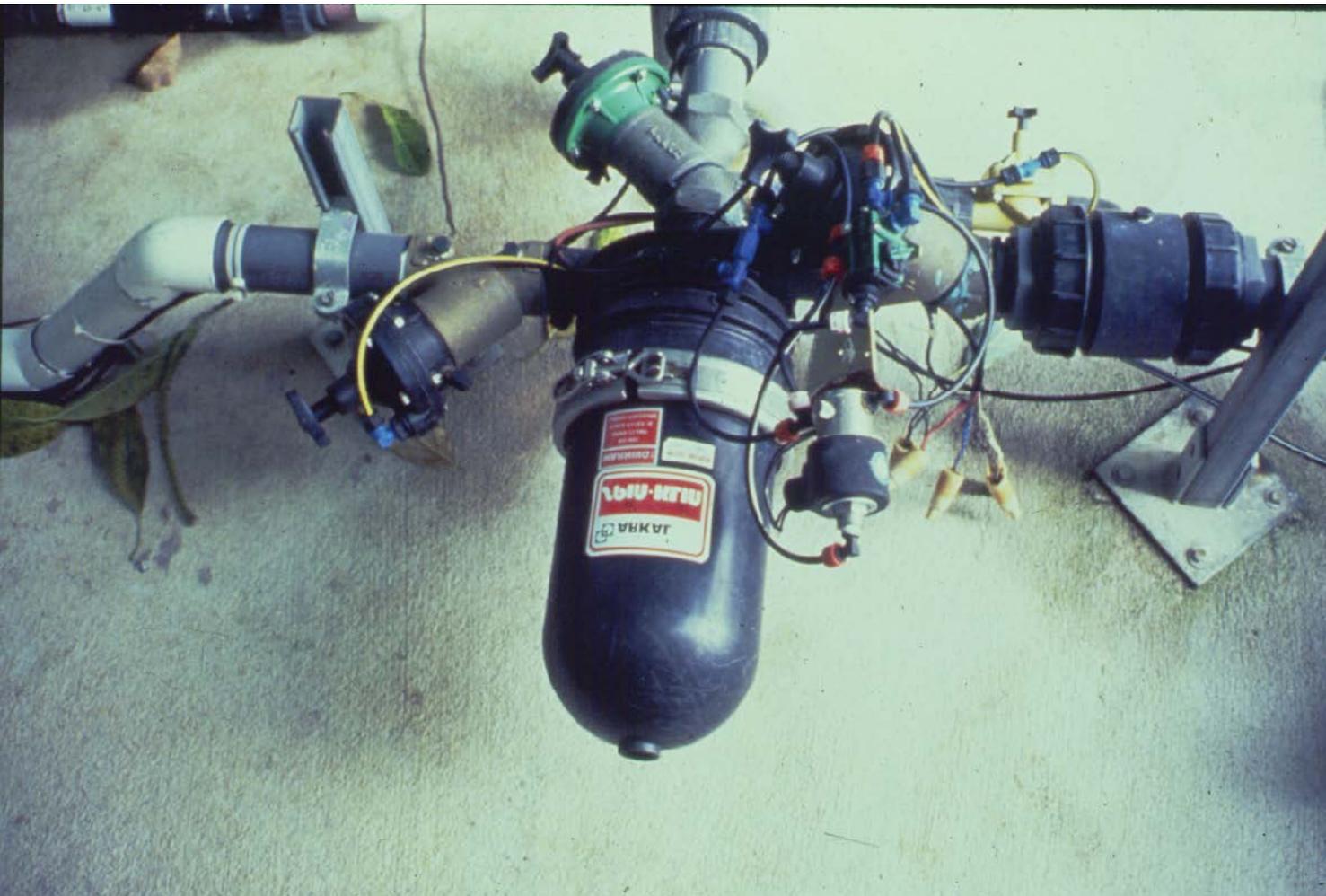
Avoid mixing different sizes and brands of emitters  
(operate efficiently at different pressures)



Avoid mixing  
equipment  
in the same  
irrigation block



When growing on slopes, are elevation differences compensated for pressure differences?



Micro-irrigation requires good filtration, even with city water





It might even require individual lateral filtration



Check for pressure drop,  
and  
maintain that filter!!!!!!

Flush valve



Flush, flush and flush  
those lines...





Chemical injection may  
be required to control:

bacteria  
Fe + Mn  
lime

Fix those leaks!!!!!!



Regularly replace worn, outdated system components and equipment



With overhead emitters, use check valves to prevent line and drip drainage  
(prevent back flow)



Check valves would also be valuable on sloping ground so that all the water didn't drain onto the lowest position



Avoid overhead irrigating on windy days.  
Small droplet size is especially affected.



Are plants blocked according to their irrigation needs, with separate valves?



# DEPARTMENT OF WATER RESOURCES

Resource Conservation District

Irrigation Mobile Labs - for FREE



Questions?