

# Remote site irrigation

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\*Author: *Gardening with Less Water (2015)*

*A Guide to Desert and Dryland Restoration (2007)*

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# Plantings often need water

- ❖ Planting container plants at remote sites is often essential
- ❖ Without irrigation few plants may survive
- ❖ Direct seeding or cuttings may also be possible with irrigation
- ❖ But hauling water is costly



# Irrigation for remote places

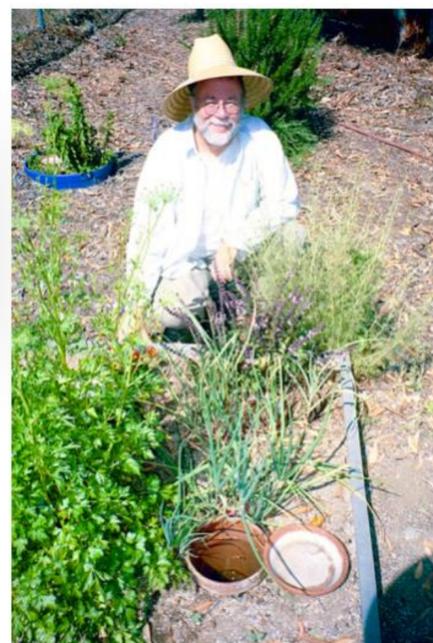
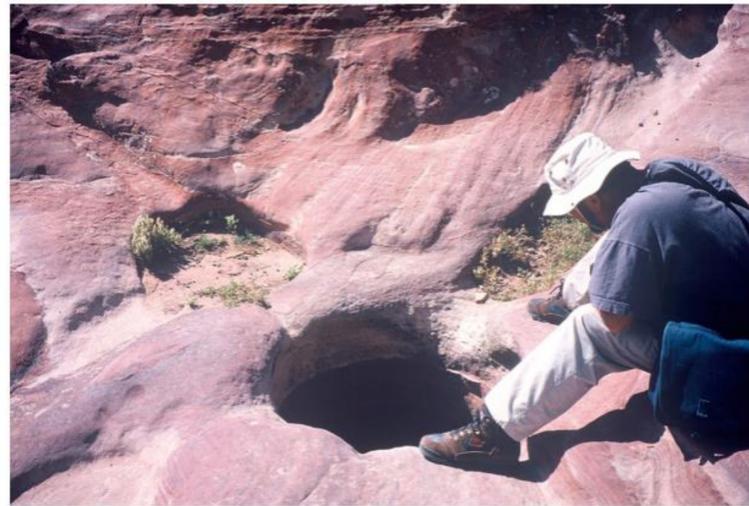


- ❖ Water is expensive and scarce when it must be carried in from far away
- ❖ Super efficient systems allow for planting success far from water sources



# Experience Based

1976-2006  
Research on desert restoration - Mojave, Sonoran Deserts

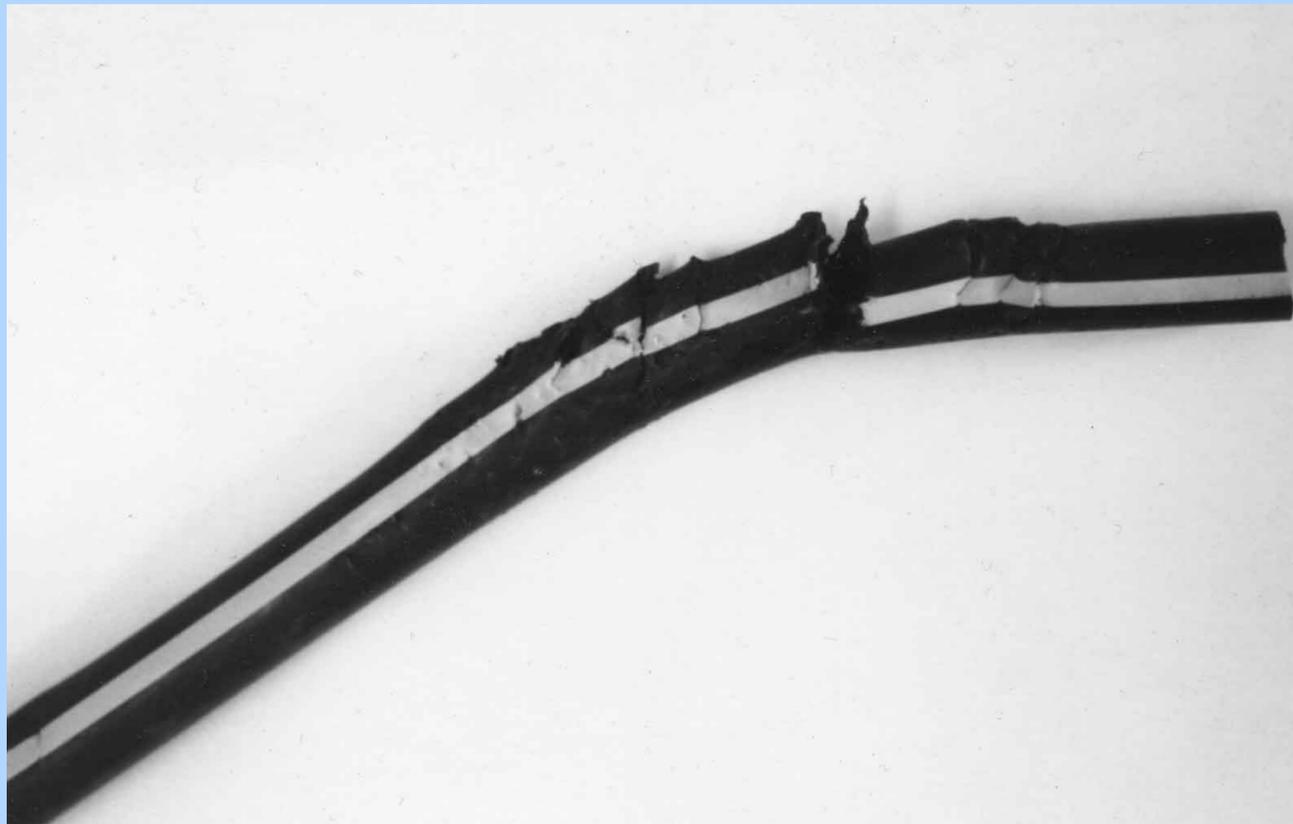


2006-2016  
Research on super efficient irrigation

# Super efficient irrigation options

- ❖ Deep pipes
- ❖ Wicks
- ❖ Ceramic - clay pots, capsules, pipes, ollas
- ❖ Responsive Drip Irrigation (new)

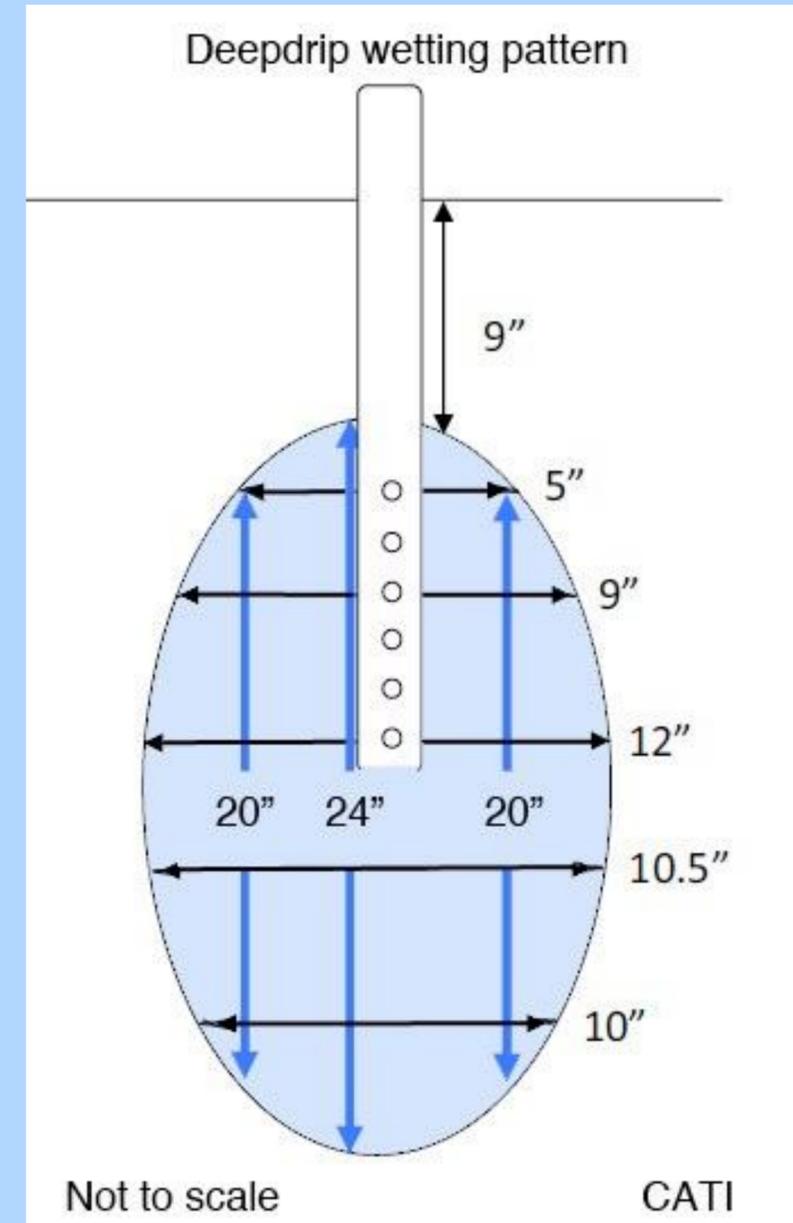
# Why not drip?



- ❖ Animal damage
- ❖ Insect, algae and salt clogging
- ❖ Needs constant vigilance
- ❖ Less efficient

# Deep Pipe Irrigation

- ❖ A vertical open ended pipe has been the best system for planting trees and shrubs
- ❖ Cheap, durable and very effective, reusable



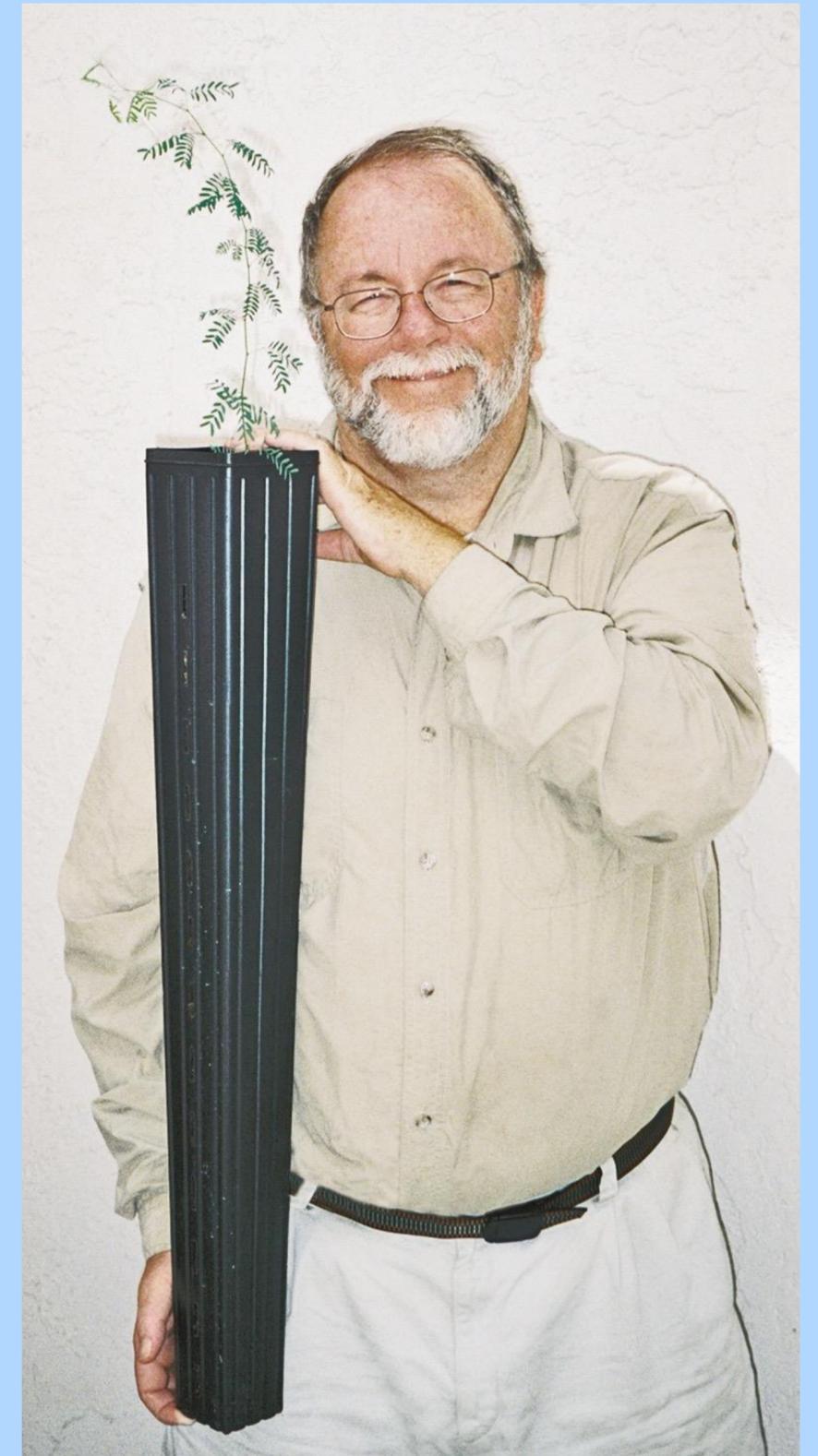
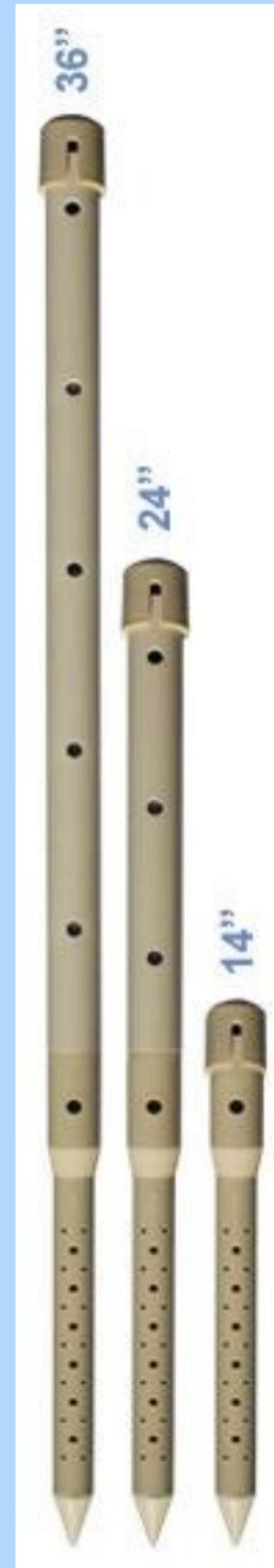
# Deep pipe efficiency

- ❖ Little water evaporates when water is placed deep in the soil
- ❖ Fast and easy to fill the pipes
- ❖ Works well on slopes
- ❖ Develop large deep root systems



# Deep pipes are important for deep rooting

- ❖ DeepDrip commercial pipes expensive but easy
- ❖ Deepot container can be used for irrigation after planting (Stuewe and Sons)



# Typical deep pipe installation

- ❖ 14-16” long, 1.5-2” diameter
- ❖ Small holes are drilled on the plant side
- ❖ Screen lid to protect wildlife and control mosquitoes



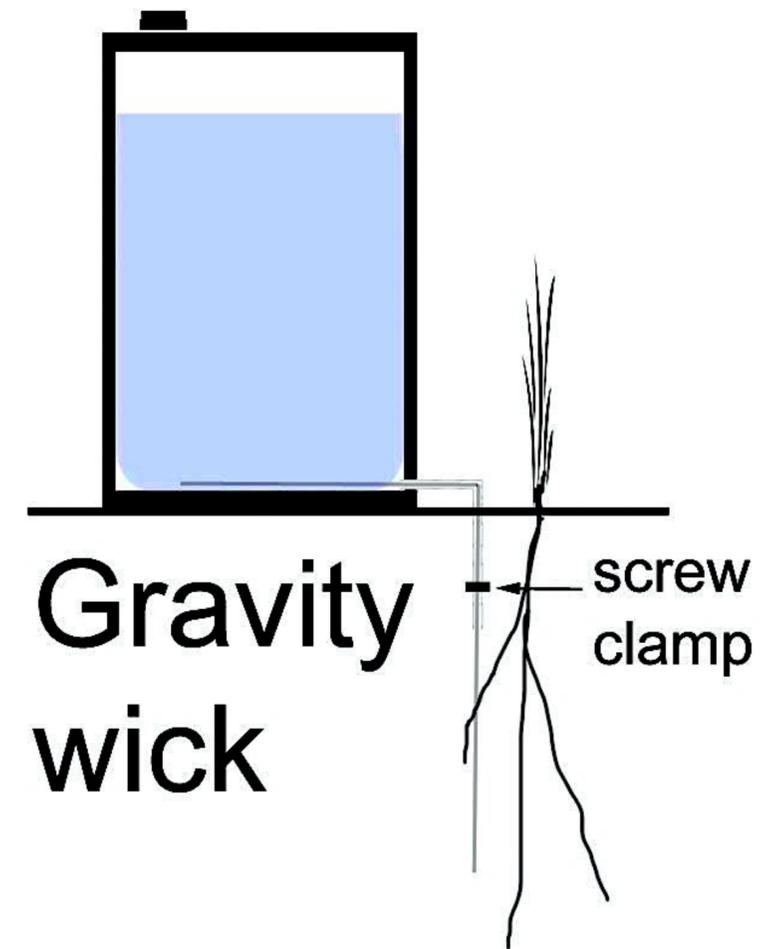
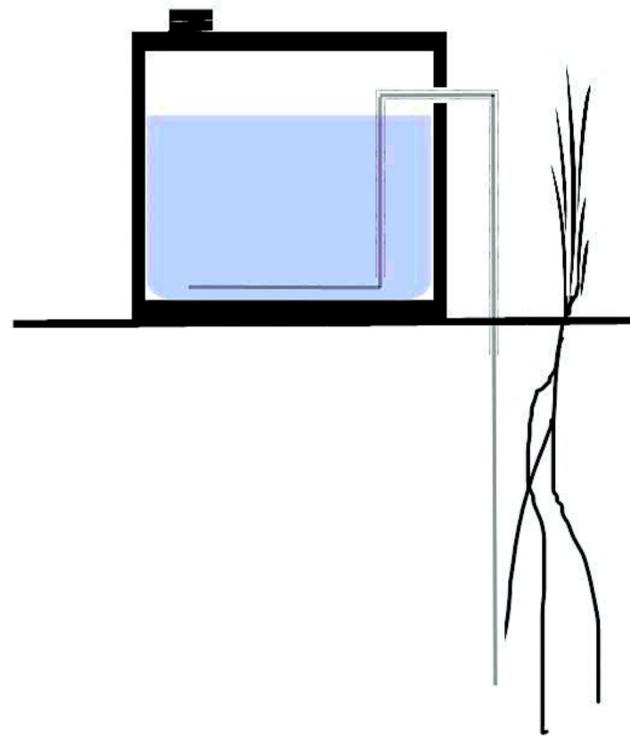
# Deep pipe drip

- ❖ Drip can also use deep pipes
- ❖ Smaller pipes
- ❖ Emitters can be easily pulled, checked and cleaned



# Wick options

Capillary wick

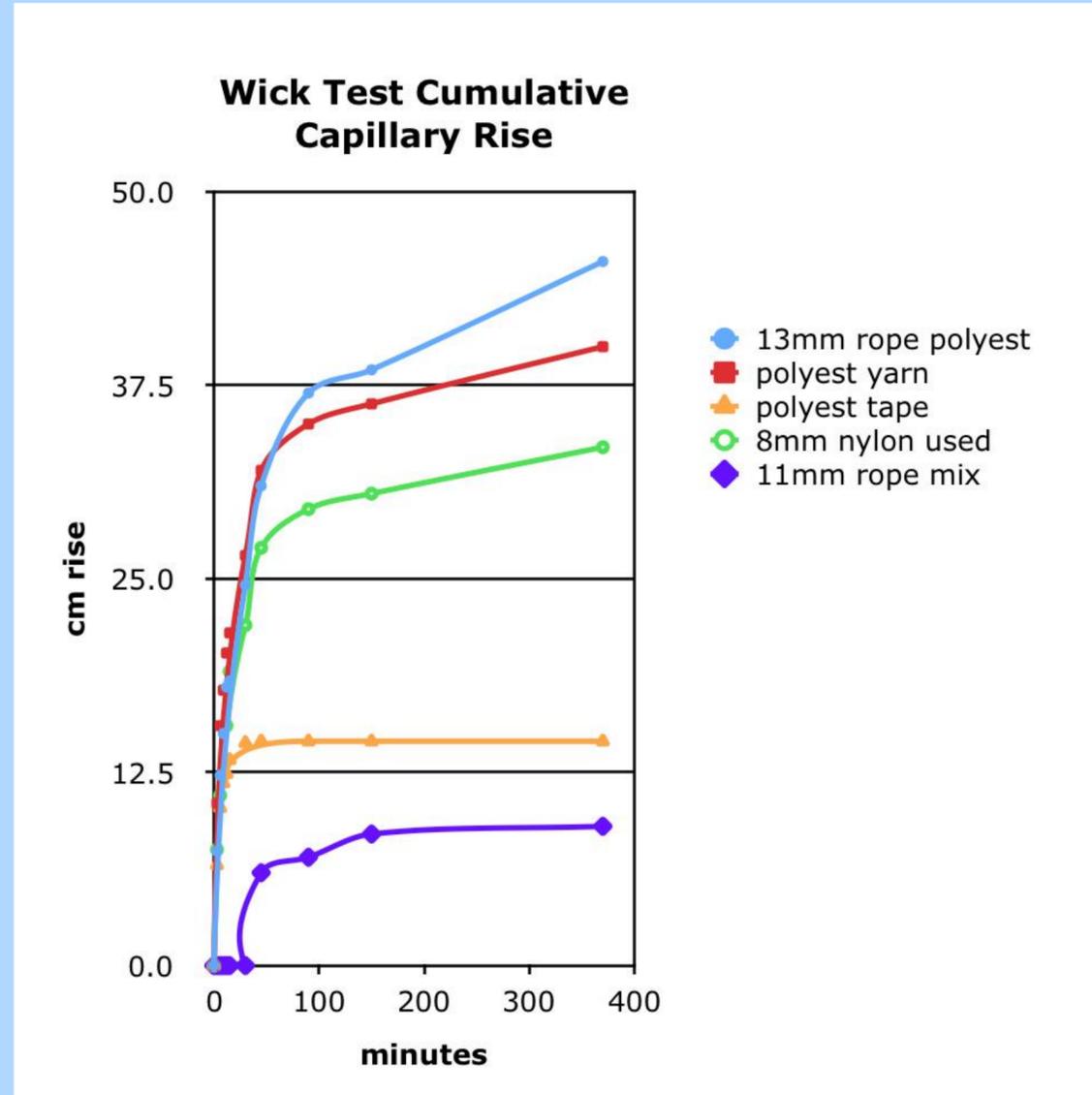
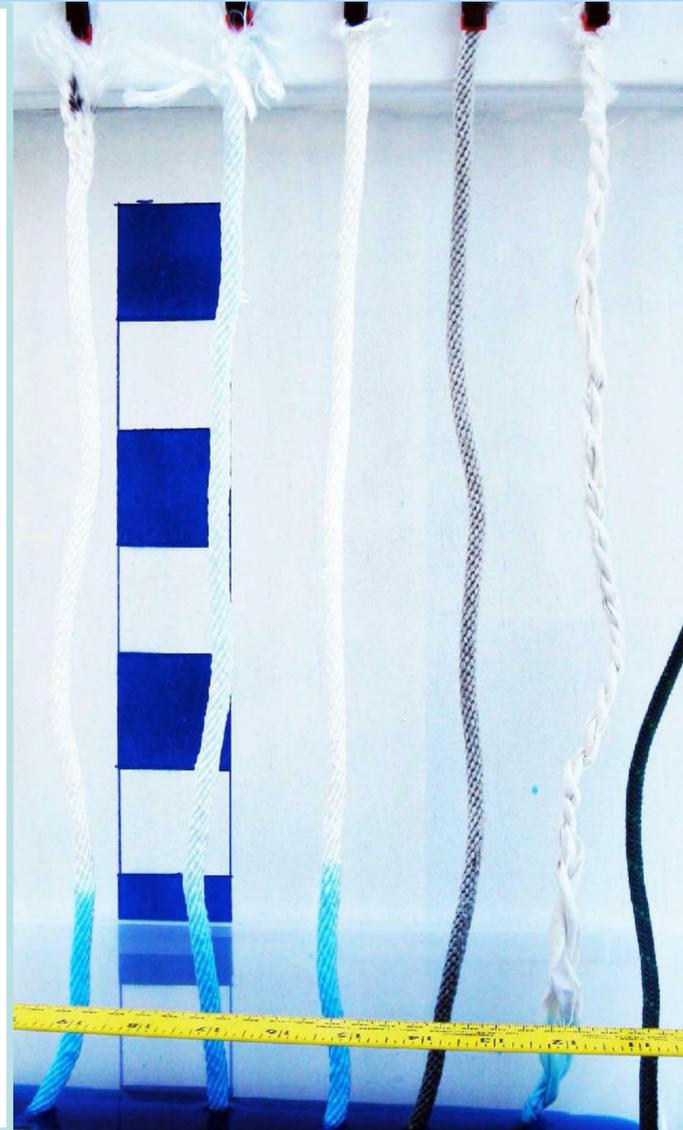


Gravity wick

screw clamp

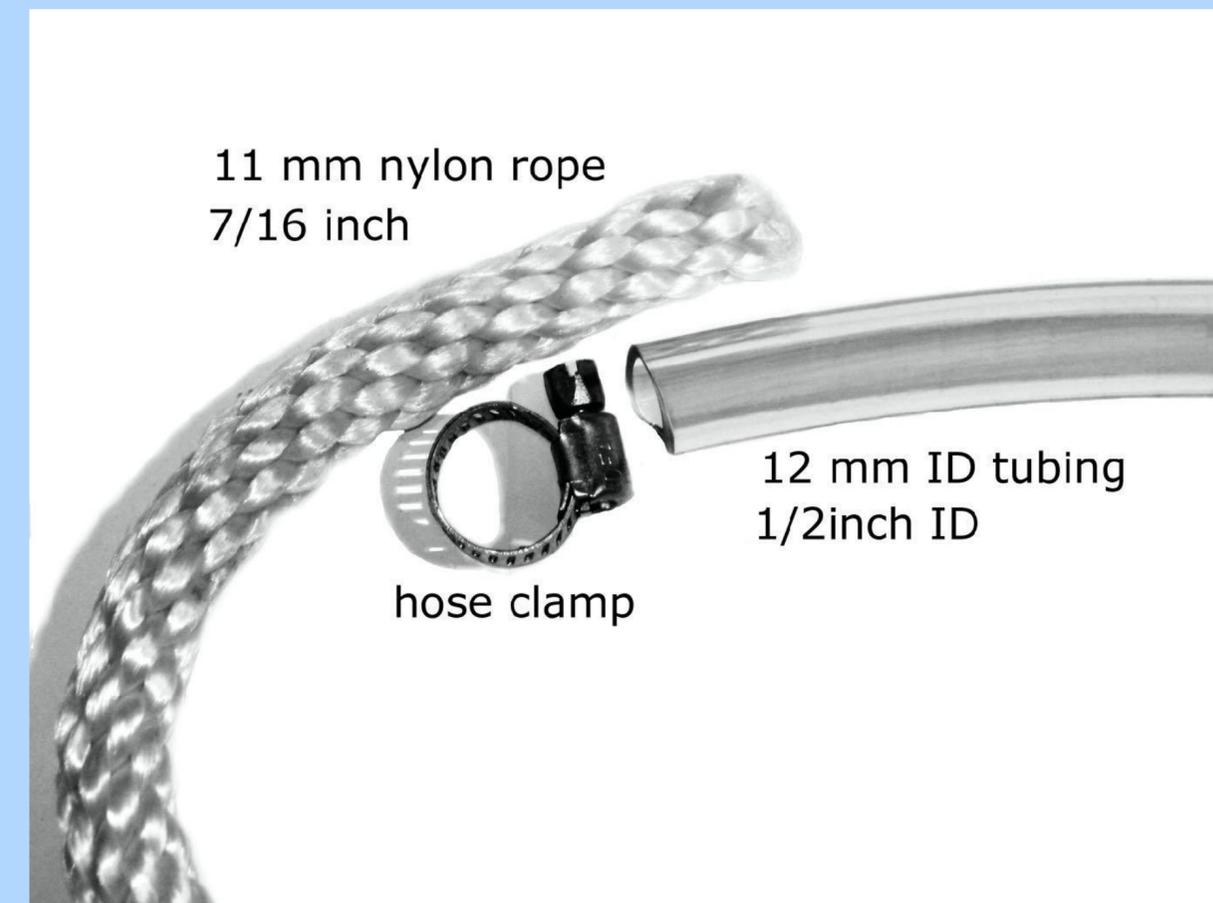
# Wick Tests

- ❖ Food coloring in water
- ❖ Hang wicks
- ❖ Measure capillary rise
- ❖ Nylon or polyester
- ❖ Cotton got moldy
- ❖ Polypropylene and mixed fibers do not work

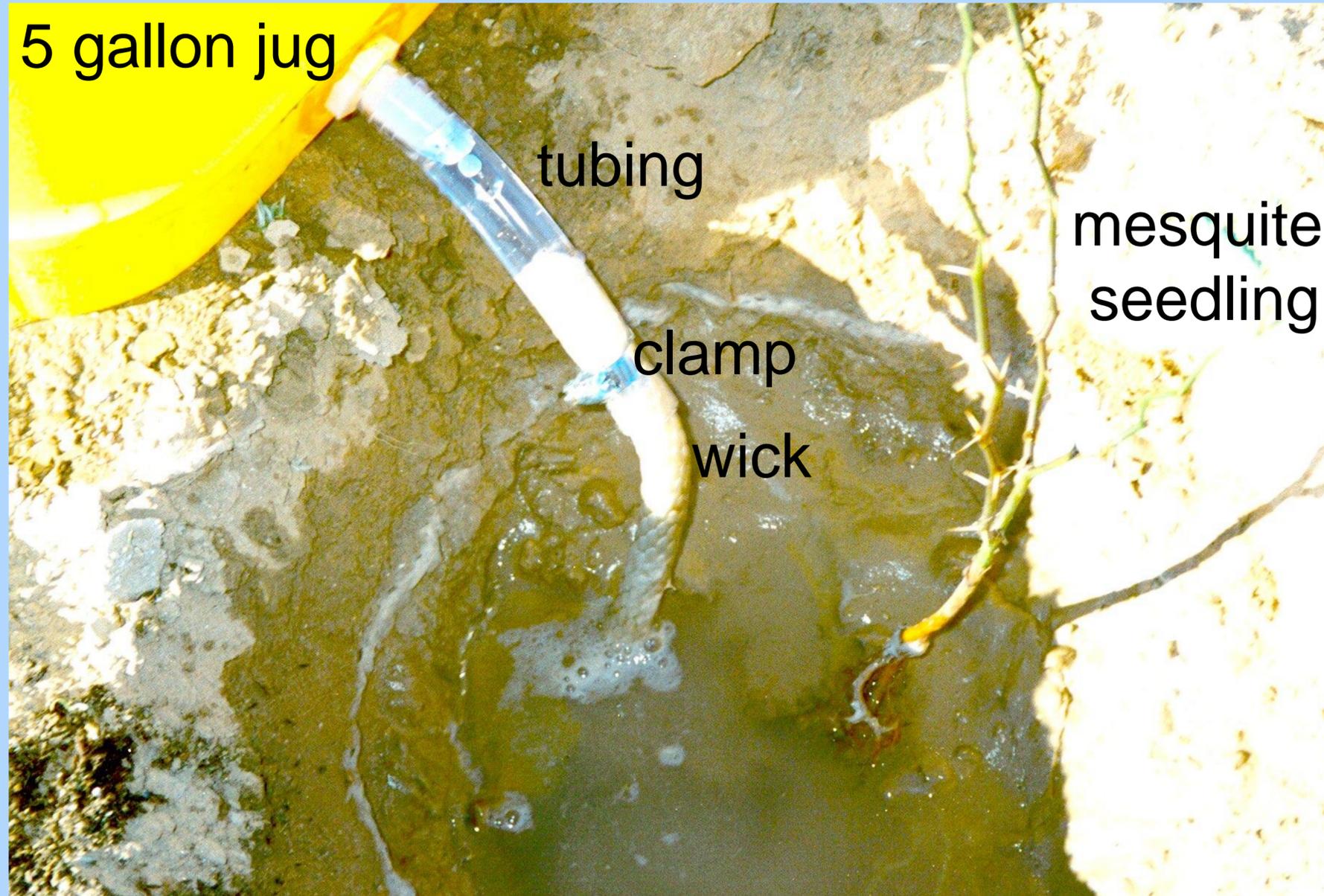


# Wick Material

- ❖ I preferred solid braid woven nylon rope (3/8"-1/2")



# Gravity wick for field



- ❖ Gravity nylon wick
- ❖ Refill jug every 2-4 weeks
- ❖ The planting hole was also watered (not from the wick) when planted
- ❖ Annual rainfall <3 inches

# Excellent Results

- ❖ Mesquite trees were started with deep pipes and a total of only 5 gallons of water
- ❖ Not five gallons a week  
five gallons an hour
- ❖ 5 gallons total

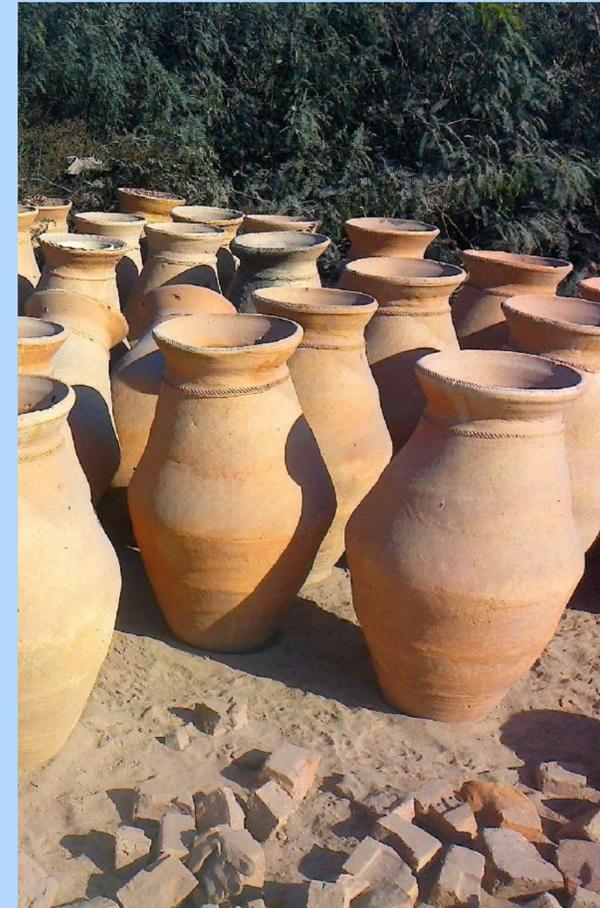


# Ceramic based Irrigation

- ❖ Buried porous clay pot, pipe, capsule or *olla* full of water
- ❖ Capillary flow through the clay wall is demand responsive leading to very high efficiency
- ❖ Ideal for propagation from cuttings, good at remote sites but costly

# A Long Tradition

- ❖ Fan Sheng-zhi recommended olla irrigation in Xi'an more than 2,000 years ago
- ❖ For farmers with **too little land and too little water**



# Good in difficult soils

- ❖ Ceramic irrigation works with saline water
- ❖ The steady moisture reduces salt buildup in the root zone
- ❖ Also good in gravel and fast draining sand
- ❖ Ideal for plant propagation from cuttings

# Porous Capsules

- ❖ A modern adaptation of olla irrigation
- ❖ The capsules can be placed on a water line or reservoir
- ❖ Porous clay pipe has also been used



# Custom made

- ❖ One of my staffers made these for me
- ❖ They worked well
- ❖ Breakage has not been a problem



# Ollas

- ❖ Increasing use in gardens
- ❖ Good for remote sites but expensive
- ❖ [growoya.com](http://growoya.com) and others



# Or use terra cotta pots

- ❖ Use a rubber stopper or epoxy to seal the hole
- ❖ Use a pot base, pie tin or plate for the lid
- ❖ Hole in lid to capture rainwater



# Ideal for Plant propagation

- ❖ Double clay pots for starting cuttings
- ❖ Water filled olla or pot in center



# Root patterns

- ❖ Roots wrap around the pot
- ❖ But trees and shrubs did well even after pots were removed (after less than a year)



# Responsive Drip Irrigation

- ❖ A new option with some potential
- ❖ Operates at very low pressure
- ❖ Coating on tubing allows water to move out only on demand from roots
- ❖ Might be best for windbreaks or lines of plants

❖ [www.responsivedrip.com](http://www.responsivedrip.com)



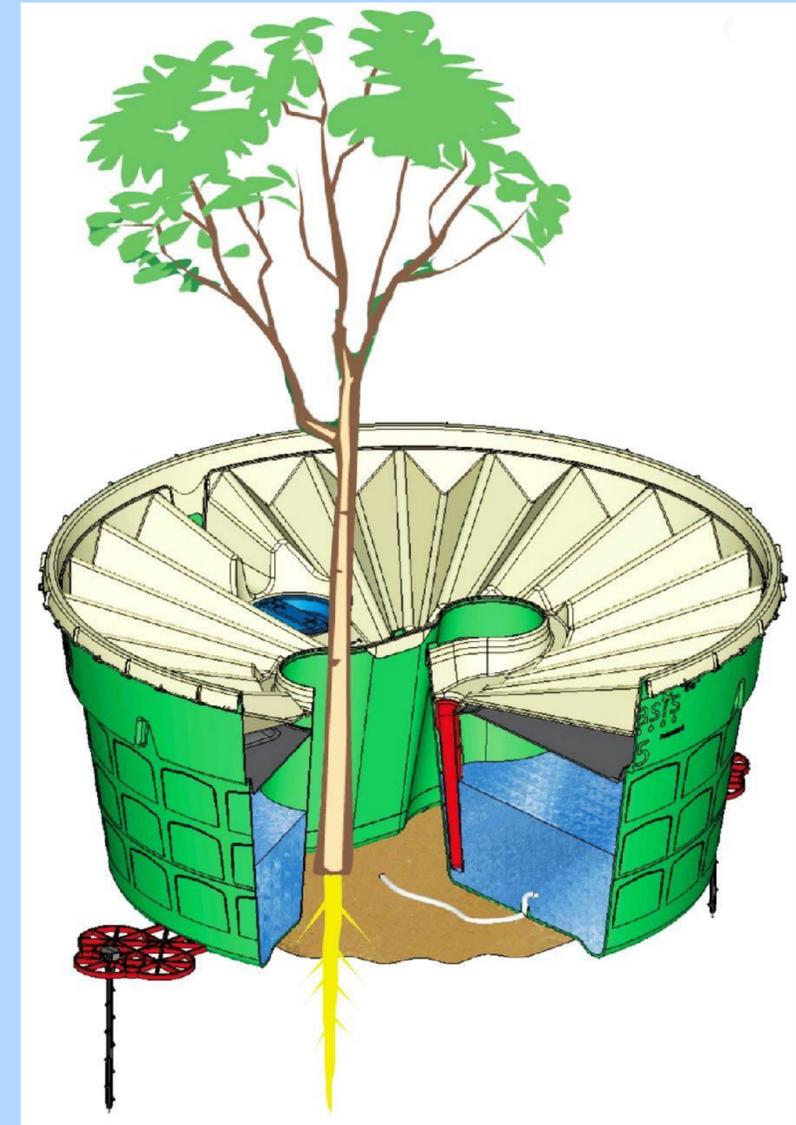
# Rainwater catchments



❖ Rainwater harvesting worked for remote sites

# Water catchment per plant

- ❖ Rainwater collection for each irrigation spot has also worked (if it rains)
- ❖ Collection, reservoir and wick
- ❖ Commercial [www.groasis.com](http://www.groasis.com)
- ❖ Home-made (see my book)



# The best system? It depends

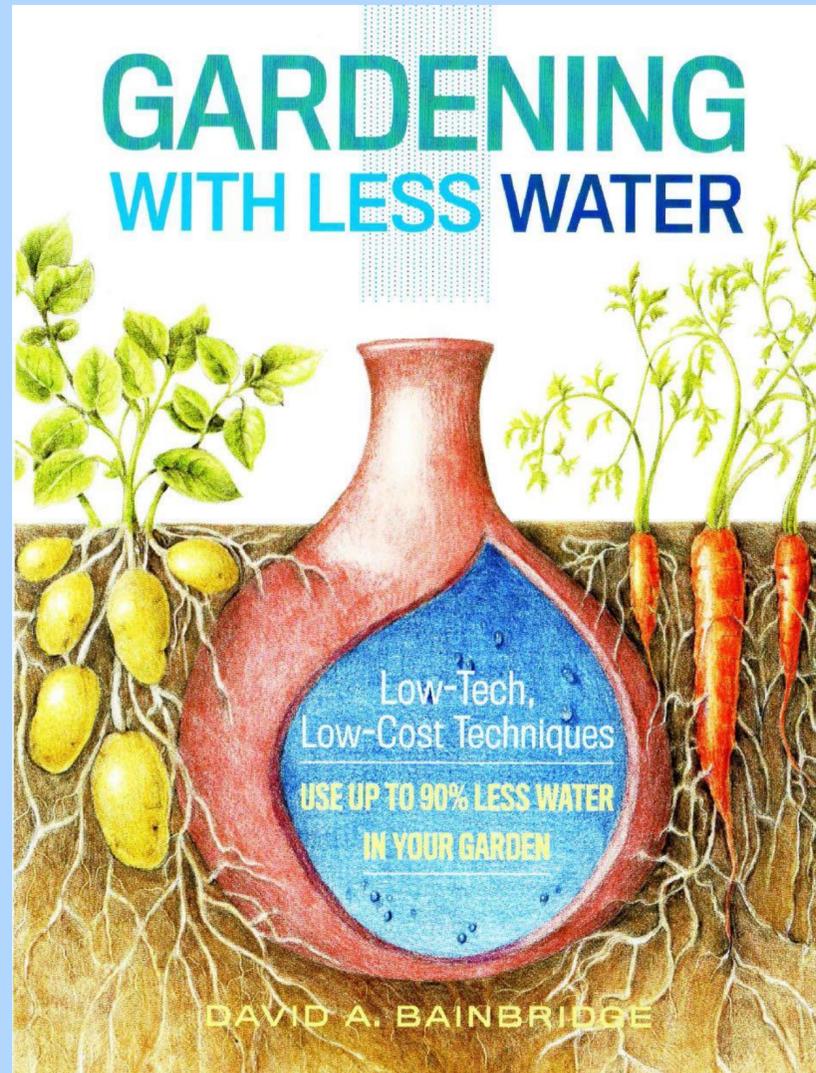
- ❖ Water quality and cost?
- ❖ How difficult is it to get water to the site?
- ❖ How often can tanks be refilled?
- ❖ Will tanks be stolen or vandalized?
- ❖ How deep will roots be from containers?
- ❖ How much water will seeds or seedlings demand?
- ❖ Depth to groundwater - if any (deep pipe or wick)

# Water tanks

- ❖ Poly tanks worked well and were not shot up
- ❖ Tie down to resist wind
- ❖ Paint to reduce algae
- ❖ Stock tanks ok



# More information



\$14.95 Storey Publications. Also available as e-book and Kindle

Thanks to my friends, students (AIU, SDSU, UCR, WCIU), staff, funders, vendors and family and to UCR agricultural librarian Steve Mitchell. Special thanks to the farmers who figured most of this out long ago!

Tell a friend - buy a gift book! Give one to your local library

References and detailed info for most systems at

[www.works.bepress.com/david\\_a\\_bainbridge](http://www.works.bepress.com/david_a_bainbridge)

# You Can Help

- ❖ Try these systems — help make them better, cheaper and more efficient!
- ❖ Keep notes and report results
- ❖ Work with schools, universities and training programs
- ❖ Support the innovators who are making and selling ollas and other efficient irrigation systems