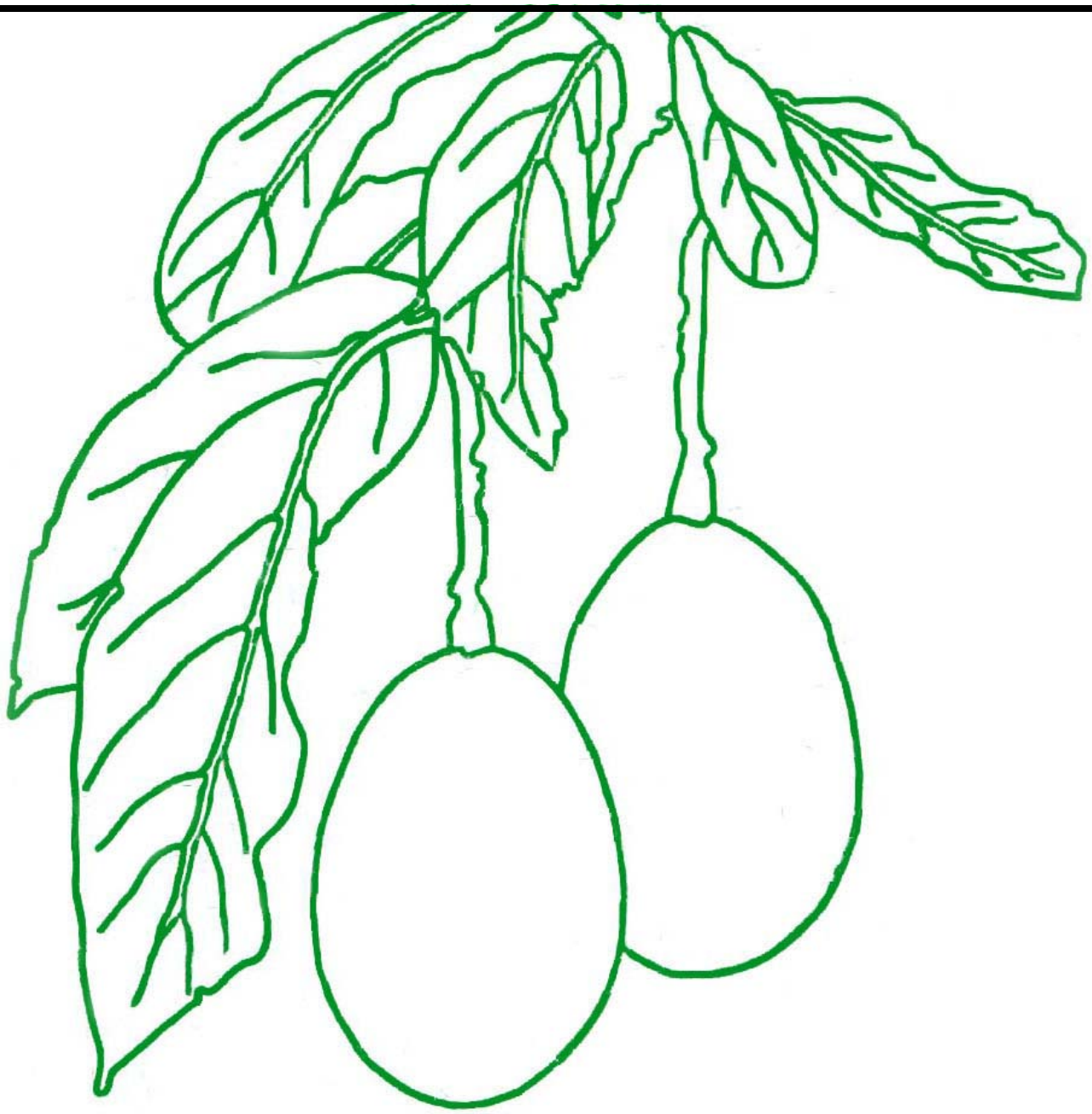

Micro-Irrigation Tips for San Diego County Orchards

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A COSTLY ISSUE

As you well know, irrigation water is very expensive in San Diego County compared to other farming areas in California. That's the price we pay for living at the end of the water supply pipeline. The results of a 1996 survey indicated that the average price of water in North San Diego County has risen to $611 an acre foot - pumping costs not included. For the foreseeable future, wildlife and urban interests will continue to compete with agriculture throughout the County and the State for bigger pieces of California's developed water supply. Due to this competition, two things are bound to happen:

You will receive less irrigation water in the future.
You will pay more for what you do get.

Because of this, sound irrigation water management now becomes crucial to your farming operation's continued survival.

EU - IQ

A given amount of irrigation water will go farther and benefit your trees more when it's evenly applied. It makes no sense to randomly under-irrigate and at the same time, over-irrigate various parts of a single irrigation set. Yet, by not monitoring and maintaining their irrigation systems, many growers are doing just this.

Emission Uniformity, or EU, is a measure of how evenly an irrigation system can apply water to a given area. Poor emission uniformity indicates that while some trees in a block are being under-irrigated, others are possibly being over-irrigated. For example, part of a single block could be swimming in water (opening the door for root rot), while elsewhere in the same block, the soil could be dry enough to cause wilt (and yield loss). While no irrigation system can operate at 100% emission uniformity, well designed and maintained micro-irrigation systems can easily achieve 85% or better.

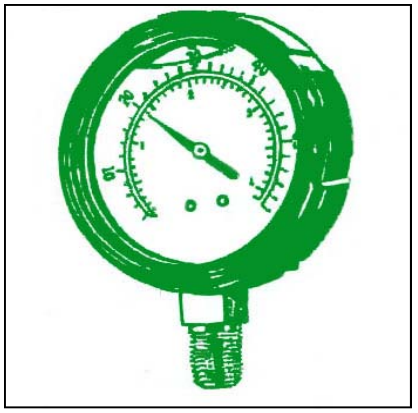
GET READY . . .

What can you do to improve your micro-irrigation system's performance? Plenty! Here are a few suggestions to help you start on the right foot.

Water Pressure - Water pressure problems can wreak havoc on an irrigation system's emission uniformity. Inadequate pressure can be just as troublesome as too much pressure. While very common in hillside orchards, pressure problems can afflict flat orchards as well.

First Things First - If you don't already own one, spend about twenty-five dollars and buy a good liquid filled pressure gauge. An accurate gauge is an essential piece of equipment needed to monitor pressures throughout your orchard.

Pressure Uniformity - Most micro-sprinklers operate ideally near 20 psi. To check system pressures, turn on a normal irrigation set and take along your new pressure gauge. Walk through the set and randomly test the pressures of ten or more sprinklers. If you find pressures above 20 psi and/or not consistent between lateral lines, you need to reduce or regulate pressures. There are three main areas that require attention. *Head Unit -* Pressure regulation at the head unit may be required if you have high system inlet pressures (over 80 psi). *Block Inlets -* Pressure regulation may be needed here if there is a large elevation loss between the head unit and block inlets. As you lose elevation, water pressure will increase by 0.433 psi for every foot of elevation loss. Conversely, water will lose 0.433 psi for every foot of elevation gain. *Lateral lines -* Lateral line pressure regulation is essential to insure even pressure distribution throughout an entire irrigation block. Good emission uniformity is difficult to achieve without lateral line regulation.

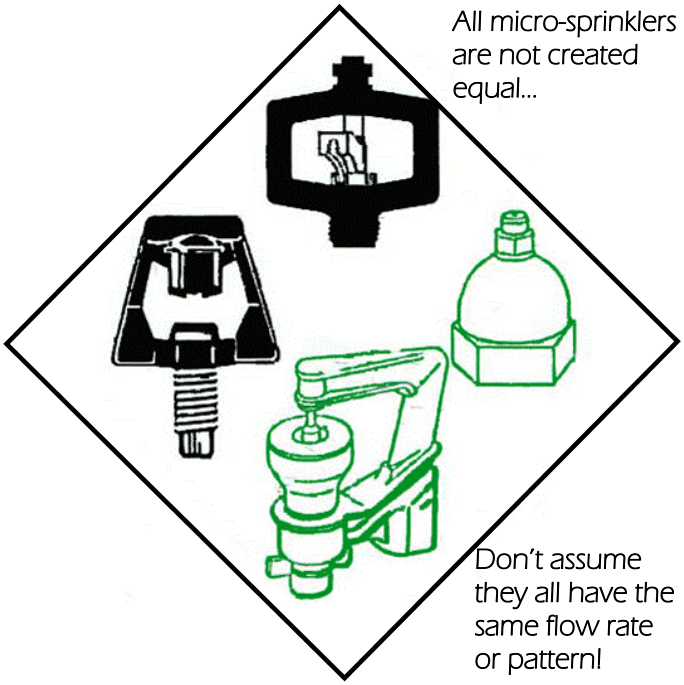


An accurate pressure gauge is one of the most important tools that you need to manage a micro-irrigation system.

Pressures can be regulated at any of these locations by using pressure regulators and/or valves. Pressure regulators are advantageous because they automatically reduce higher inlet pressures to steady lower output pressures. Valves, while generally cheaper to purchase, need to be monitored and adjusted regularly. They can

easily fall out of adjustment between irrigations. Valves are a good choice in places where few are needed, such as the head unit or at block inlets. Pressure regulators are a good choice at lateral line inlets, where the sheer number needed would make constant valve adjustment extremely time consuming.

If you find pressures below 20 psi, there are several methods to increase them. ***Lateral Lines -*** First and foremost is lateral line pressure regulation. If you have a block that has no lateral line pressure regulation, a great deal of pressure can accumulate at the bottom of the slope. This can result in the bottom lines being over pressured and the top lines being under pressured. By regulating lateral line pressures, you can take excess pressure at the bottom of the slope and "push" it up the hill. ***Friction Loss -*** As water passes through pipe it produces friction. If you try to push too much water through a piece of pipe, excess friction loss can cause a drop in pressure. To lower friction loss, irrigate fewer trees during each set, switch to a lower flow micro-sprinkler or install larger size pipe. ***Booster Pump -*** A booster pump may be required if your meter or water source is much lower in elevation than your grove. Because of the cost of purchasing, installing and operating a booster pump, it is usually used as a last resort.



Micro-Sprinklers - Another major problem that detracts from a system's emission uniformity is a lack of micro-sprinkler performance. Two of the most common sprinkler problems are:

Mixed Sprinklers - Emission uniformity can suffer dramatically when sprinklers are mixed within an irrigation block. Mixing sprinklers lowers emission uniformity by applying different amounts of water to different trees within a single block. To make things uniform, standardize all sprinklers in an irrigation block to a single model and orifice size. If you regulate pressures on top of this, your emission uniformity will increase dramatically.

Not Knowing Your Sprinkler's Flow Rate - While this may seem like common knowledge, it's better to ***know*** your sprinkler's flow than to ***assume***. A good place to start is with the specification sheet that is provided by the sprinkler's manufacturer. If you did not receive a spec sheet when you purchased your sprinklers, ask your dealer to provide you with a copy. The spec sheet will provide baseline flow rate data at several different pressures. To verify their performance however, you must test your sprinklers under normal operating conditions. Turn on a normal irrigation set and randomly test the flow of ten or more sprinklers. Capture a sprinkler's flow for a set amount of time (15 seconds, 1 minute, etc.). Then, measure the amount of water you collected (10 ounces, 500 millimeters, etc.)*. You now have a flow/time relationship that can be increased into more usable forms such as gallons per minute or gallons per hour.

System Maintenance - Like all things mechanical, irrigation systems can and do breakdown. While regular system maintenance will not eliminate problems, it can reduce their occurrence and severity.

Head Unit - Verify the operation of all equipment at the head unit. This includes water meters, backflow devices, valves, injectors, etc. Check that gate and globe valves open and close completely. Observe other control valves (such as Bermad, Cla-Val, etc.) while the system is running. If they are leaking, they need maintenance. Pay extra attention to the filter. For screen filters: Is the sock clean and free from holes? Is the sock's mesh the right size for the sprinklers you are using? For sand filters: Is the sand still sharp and angular? Round sand has reduced filtering capabilities and should be replaced. Are the insides of the tanks free from excessive amounts of rust? All of these devices, if not functioning properly, can cause excessive pressure loss and poor system performance. Replace or repair these items as needed.

*For information on how to build a simple device that captures sprinkler flow, see the Mission RCD brochure entitled "How to Build A Mad Bee."

Lateral Lines - Lateral lines should be flushed at least once a month during periods of frequent irrigation. This practice helps to clean out accumulated foreign material (sand, silt, clay, plastic parts, etc.), that has slipped past the filter and tends to settle at the ends of lines. If this foreign material is allowed to accumulate, sprinkler plugging can occur. To flush your lines, remove the last sprinkler from each line with the system running and allow clear water to flow from the riser for at least one minute.

Walk Your Orchard - Walk your lateral lines (while the system is running), as often as possible. Sprinklers can become clogged, broken, or stuck between irrigations due to leaf litter interference, foreign material in the water, plastic deterioration, animal damages, etc. Walking lateral lines often also gives you a chance to look for other problems such as soil erosion, poor tree vigor, pipe leaks, etc.

Wetted Area - While not directly tied to emission uniformity, wetted area is important nonetheless. Wetted area is simply the amount of soil that gets wet during each irrigation. The larger the wetted area, the more "on demand" water the trees have.

Maximize Sprinkler Water Delivery - Operate your irrigation system as close to the sprinkler manufacturer's recommended pressure as possible. This will produce the best sprinkler pattern.

Sprinkler Pattern - Trees are often established with sprinklers that throw less than 360 degree patterns. This is fine when trees are young and have small root systems. Why wet soil that has no tree roots? As trees mature, however, their root systems spread and their demand for water grows. A sprinkler that is adequate for a two year-old tree is often not adequate for a ten year-old tree. Be sure that your sprinklers have a pattern that is large enough for the age and size of the trees.

Sprinkler Interference - Remove all obstructions that interfere with the wetting pattern of the sprinklers. Typical obstructions including pruning debris, weeds, and low tree branches. To correct low branch problems, skirt your trees a foot or so above the orchard floor. By removing low branches, you not only improve your sprinkler's patterns but you also take away a path that non-beneficial insects use to invade your trees.

Riser Height - Extend sprinkler risers so that the tops of the sprinklers are between 6 to 10 inches above the orchard floor. Taller risers will increase the radius of the sprinkler's throw, thus increasing the size of the wetted area. Taller risers also make the sprinklers less susceptible to blockage problems associated with leaf litter.

Tilted Risers - Adjust and maintain sprinkler risers so they are perpendicular to the orchard floor. Tilted sprinklers throw very poor patterns.

Need Some Help?

Assistance with irrigation problems is available from Mission Resource Conservation District's Agricultural Water Management Program. Program funding is made available by the San Diego County Water Authority and the United States Department of the Interior, Bureau of Reclamation.

The program's mission is to provide impartial, on-farm irrigation system evaluations. An irrigation evaluation will provide you with a comprehensive report that outlines the condition and performance of your system and also furnishes recommendations to aid in correcting problems. If you own or manage 2 or more irrigated acres of irrigated crop land in San Diego County, just give us a call and we'll be happy to schedule an irrigation system evaluation at your convenience.

Funding for this project provided by the County of San Diego and the State Water Resources Control Board.

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