

## AVOCADO IRRIGATION

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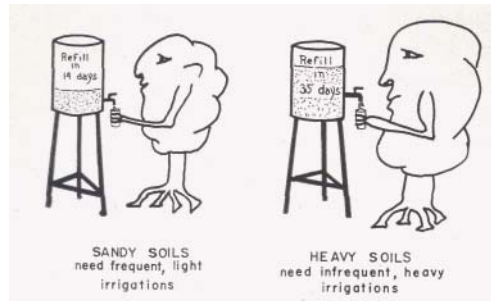
Irrigation is the most important operation in avocado production in California. Avocado trees will grow and bear some fruit without fertilization. They will grow for years without attention to pest or disease control. Pruning and cultivation are not essential. But if irrigation water is withheld during our dry summers, serious damage to trees and loss of crop will follow. A more common loss from inadequate irrigation is the reduction of fruit size by allowing the trees to suffer from lack of water for short intervals between irrigations.

Fortunately, there is nothing complicated about doing a good job of irrigating. Although hundreds of pages have been written about irrigation principles, all that has been written can be summed up in seven words: **IRRIGATE DRY SOIL—DON'T IRRIGATE WET SOIL**. All else that has been written about irrigation has been in way of explaining how wet is wet, how dry is dry, how soil becomes wet and how it dries.

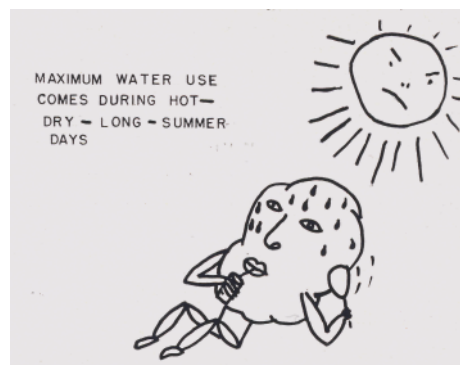
No attempt will be made in this article to explain in scientific terms what happens to the irrigation water in a soil during and after an irrigation. Neither will any attempt be made to discuss the special irrigation requirements of problem soils, such as the shallow, heavy, hard pan, or saline soils. None of the problems concerning the handling of poor quality, saline water are considered. Irrigation practices in orchards having avocado root rot should be dealt with as a distinct and separate subject and will not be considered herein. The purpose of this article is rather to state some easily-observed facts about irrigation and to suggest a few tools the irrigator can use to help him see his soil as the tree roots see it, and to help him decide if his soil is wet or dry.

Here are a few facts which most irrigators know from experience:

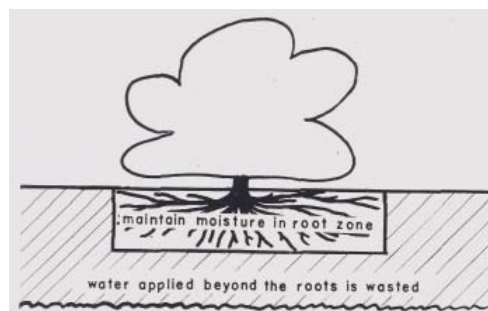
1. Light, sandy soils hold relatively small amounts of water. They absorb water rapidly, and a light irrigation will wet them to the full depth of soil occupied by the tree roots. Since they hold but little water, the trees will use it up rapidly, and they will need to be irrigated frequently—every 10 to 14 days. At the other extreme of soil types are the heavy clay and adobe soils. These hold a great deal of water. They absorb water slowly; but after they are thoroughly wet to the full depth of rooting, they have enough stored to supply the needs of the trees for as long as 6 to 8 weeks without additional irrigation. The water-storing ability of the medium-textured soils falls in between the sands and the adobes. The sandy loams will hold a little more water than sandy soils, and the clay loams will store somewhat less water than the clays or adobes.



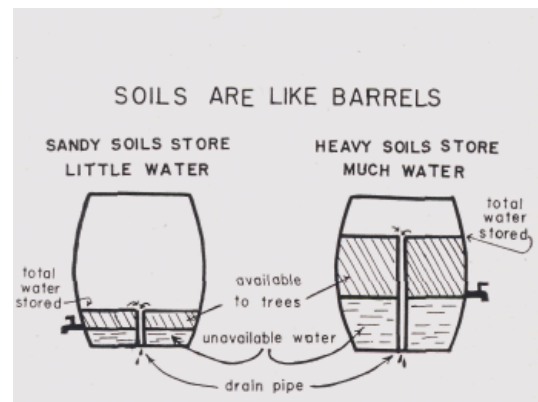
2. The weather has an important influence upon the rate that trees will use soil moisture. The least amount of water is used when days are short, temperatures are low, the humidity is high, and when there is little wind. Avocados require the maximum amount of water during the long days of summer when temperatures are high and the humidity is low. When strong winds occur during this season, trees are often taxed beyond their capacity to absorb soil moisture as fast as it is lost to the air, and they wilt.



3. Roots can absorb water only from the soil which surrounds them. In deep, well-drained soil any water which infiltrates below the depth of rooting is beyond the reach of the roots and of no use to the tree. Such water might be compared to a glass of water in the middle of a table and which a small child is trying to reach. Although the water is near, it is out of reach and, therefore, not available to him. The application of excessive amounts of water which penetrate below the root zone is out of reach for the tree and is wasteful of water.



4. Soils dry from two causes: evaporation and withdrawal of water by plant roots. Evaporation affects only the top 4" to 6" of soil. Below that depth, root activity is the principal means by which soil becomes dry. After a certain percentage of the soil moisture is used by plants, a point is reached where roots can no longer extract water, even though there is still a small amount of water in the soil. With sandy soils a relatively small percentage of the total amount of water which it holds when wet is unavailable to plants. The heavy clay soils retain a much greater amount, and in some cases may actually feel moist when plants can no longer extract water from them.



5. Soils remain wet for two reasons. Either there are no roots in it to extract water, or weather conditions are such that water is being used by plants at a very slow rate. The first condition is often observed in young orchards where the whole soil mass may be irrigated, yet water is used from a small portion of the soil actually occupied by roots. Only the soil occupied by the limited root system will dry out and needs irrigating.

Avocados are frequently attacked by the cinnamon fungus which results in a root rot. Rotten roots will not absorb water. Wherever trees so infected are found the soil remains wet in the root zone. The addition of more water by irrigation under these conditions is pointless and will only hasten the death of the tree and encourage the spread of the disease to adjoining trees.

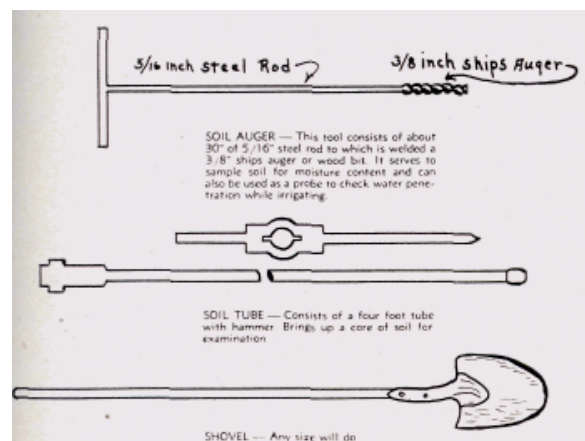
## AIDS TO IRRIGATION

Several tools or aids are available to the avocado grower which will help him decide when to irrigate. The one most commonly used in some districts is the Zanjero. The Zanjero is an employee of the Water Company, who at the beginning of the year sends you a notice stating the dates that water will be delivered to your orchard. You simply transfer these dates to your calendar, and your irrigation program for the year is settled. If you use all of the water to which you are entitled at each irrigation date, you will probably use too much early in the season and not enough during the hot months of July and August. There is one advantage to using this tool. It is easy to use and requires no thought on your part.

Some companies with limited water and limited distribution systems must operate on rigid schedules and the grower has little choice in determining the best irrigation schedule for his orchard. Irrigating on set dates or at fixed intervals is not the best irrigation practice. It is obvious that such a program is based on expediency rather than on tree requirements. Where rigid irrigation schedules prevail, one should make sure that the intervals between irrigations are short enough to take care of the maximum water requirements during the hot, dry, summer months.

Other water companies can permit more flexible schedules and can deliver water on demand. Growers in these companies or those having their own dependable wells are fortunate in that they can develop an irrigation program based upon the needs of their trees.

These growers will find one or more of the following tools to be essential for good irrigation practice: A 3/8" soil auger, a soil tube, a shovel. All three are used to sample the soil around the tree roots and help the grower to see his soil as the roots see it. He can then readily determine if it is dry and in need of water, or if there is sufficient soil moisture present to satisfy the trees for a while longer.



The successful use of any of these tools requires that soil samples are taken from the soil actually occupied by roots. If samples are taken from where no roots exist, the soil will always be wet and the irrigator may err in withholding water when perhaps it should be applied.

Avocados are shallow rooted. Even on deep soils most of the roots will be found in the top 2 to 3 feet. On shallow soils, roots may be confined to the upper one foot of soil. If you are not sure of the root distribution in your orchard, it may be determined by digging a trench close to the drip of the tree and observing the roots. Once having determined the root distribution in your orchard, you can take your samples where you know roots exist. Shallow soils will need to be checked more frequently than deep soils both to avoid excessive drying and to prevent overwatering and the waterlogging of poorly drained soils.

The soil in most avocado orchards varies from place to place both in depth and water

storing ability. Soil sampling enables the grower to know the spots that dry out quickly, those that remain wet, those that take water readily, and those that absorb water with difficulty. Dairymen feed their cows individually according to their production and need. Avocado orchards may be improved with a little attention to the needs of the individual trees, or groups of trees, requiring a special irrigation practice because they are on a spot of soil which differs from the rest of the orchard. If your soil is variable, you should take several samples to determine the limits of each soil type which might require a different irrigation practice. The marking of trees in these areas with a band of paint or by other means will assist the grower to give these areas any special care they may require.

If soils are uniform, only a limited number of samples should be necessary to give the grower a picture of his soil moisture condition for the entire orchard.

The soil auger is perhaps the easiest tool to use in taking a soil sample in soils that are not too sandy, nor too rocky, nor too hard when dry. On rocky soils the shovel is the only tool with which any satisfactory sampling can be done. Heavy soils that get hard on drying can be sampled more easily with a soil tube than with an auger. The auger will sample sandy soils satisfactorily when they are moist but will not hold a sample when they are dry. The 3/8-inch soil auger can tell you both when to irrigate, by using it as an auger, and when enough water has been applied by using it as a probe. The use of the soil auger, as a probe, is discussed in a later paragraph.

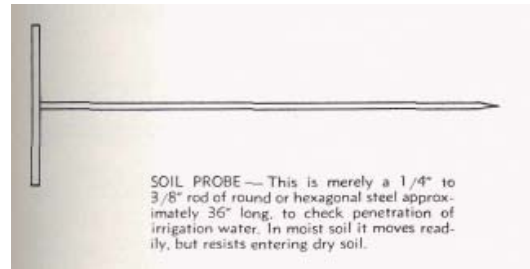
To use the soil auger it is pushed into the soil for a depth of about 18 inches or two feet. As it is pushed an additional six inches deeper, it is twisted in order to fill the auger with soil at that depth. When the auger is withdrawn, it will contain a small sample of the soil. Examine this soil for moisture. The soil tube is driven into the soil with a special hammer to the desired depth. When withdrawn it will contain a core of soil for examination. No one need be told about using a shovel.

With a little experience, any grower can tell if the soil needs an irrigation. Squeeze the soil sample in the hand. Moist soil will tend to hold together, even when dropped from a height of a foot or more. Dry soils crumble readily after squeezing, and will fall apart if dropped. Moist soil is darker than the same soil when it is *dry*. With a little observation a grower will recognize this color change.

A simple way to recognize what your soil looks and feels like when dry is to examine a sample taken from under some of the shallow-rooted, broad-leaved weeds which have wilted during the heat of the day but which recover during the night. Good irrigation practice calls for replenishing soil moisture *before* this condition occurs. Soils upon which avocados are grown are so variable that it would be impossible to describe in this article when that time is reached by your soil. However, every avocado grower should determine just how dry he can safely let *his* soil become and still allow himself enough time to complete an irrigation before his trees are stressed for moisture. He can do this by periodic, frequent soil sampling, at the same time observing tree condition. The first irrigation season that this is undertaken is the hardest. With experience comes good judgment. No article on irrigation can make of you a good irrigator. It can only point the way.

During an irrigation it is desirable to know how deep the soil is being wet. Either the 3/8-

inch soil auger or the soil probe can be used to check water movement in most soils, except those containing much rock. As the soil is wet it becomes easy to push a probe through it.



If one pushes either the auger or the soil probe into the wet soil, it can be pushed with little resistance through the wet soil. When sudden resistance is felt, you have reached dry soil. This test can be used to tell how long to apply water to any piece of soil at any time of the year. When water has penetrated to the depth of rooting it can be turned off.

Perhaps the preceding suggestions sound like work. However, there is no other way to *know* soil moisture conditions. Orchards on so-called problem soils that are shallow and poorly drained require close attention to moisture regulation for maximum production and tree health. Orchards on deep well-drained soils don't get into trouble so quickly. On such soils, the value of soil sampling lies in helping the grower to time his irrigation so as to avoid any moisture stresses and in controlling the amount of water applied so that most of the root zone is wet without excessive waste through deep percolation.

An exception to this rule occurs where soils accumulate alkali and become saline. It then becomes necessary to leach out these salts by heavy irrigations. This corrective leaching can only be accomplished on well drained soils. It is not the purpose of this discussion to discuss such reclamation measures, but this problem is mentioned in passing as an exception to the above rule. When leaching becomes necessary, it is good irrigation practice to do so; otherwise it is not.

The proper use of these sampling tools can bring results in four ways:

1. They will insure the timely application of irrigation before trees show signs of wilting.
2. This will help insure good fruit sizes.
3. They will help conserve water where excessive amounts have previously been used to wet soil not occupied by roots.
4. Their use will help the avocado grower, having poorly drained soil, to avoid waterlogging which in turn contributes to avocado root rot.

**THESE TOOLS CAN HELP YOU — USE THEM!**