

## How Should Avocado Trees Be Irrigated?

**A. S. DeBard**

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Through long experience and education in irrigating avocado groves on many and diverse soil conditions, I have come to adopt the following principles:

A. The tree and the soil should always be consulted when considering irrigation practice and deciding on procedure—study and learn how to correctly interpret the soil moisture needs of your trees.

B. Irrigate when the soil is dry and the tree needs water. Do not irrigate by the calendar or by rule of thumb.

C. Water must be put where the roots are. Wet the ground a distance from the tree trunk equal to two feet times the age of the tree in years for the first five or six years, and after that age wet all the ground in the grove 24 inches deep or as deep as you find active feeding root fibers in your soil.

D. The purpose of irrigation is to make the trees more profitable. Now with these principles in mind we may discuss some of the details.

With us the basin system is the most expensive and is most undesirable. We use it only on young trees and for the first eighteen months of their age, and in combination with furrows. Much damage in winters of heavy rainfall was due to large basins acting as storage reservoirs which prevented the escape of excess rainfall. Also the building of large basins creates distortion of the root systems and limits the range of root systems which normally tend to radiate in all directions. After the first eighteen months we prefer the furrow system. On non-cultivated orchards the furrows are permanent. Where cultivation is practiced we often irrigate in the same furrows several times.

### **WHEN PIPING EFFICIENT, FURROWS BEST METHOD**

When the orchard is laid out with proper length of runs, correct pipe sizes, and on contour, furrows are most economical and efficient. The saving in cost of equipment, replacement and depreciation is all in favor of furrows.

There are two general classes of sprinkler systems—each with variations; the portable underthrow and the permanent or overhead. The portable underthrow we find best adapted to terraces, square plantings which should have been, contoured, and in orchards with wide variations in soil depth and texture. On one orchard where the soil was variable we irrigated one acre fourteen times, three acres eight times, and the rest of the orchard five times. This was necessary in order to maintain approximately correct soil moisture in each soil type, and the use of the underthrow system was necessary to

accomplish this.

Permanent overhead sprinkler systems have never proven entirely successful with us. They have proved the most costly of all types and after having had experience with them for several years, and in three different counties, we cannot recommend them from the standpoint of economy. Those using the sprinklers should consider them a luxury. In all orchards cared for by us, we have changed to portable or furrows in order to be in a position to vary irrigation to fit dry and wet spots and also control the amount of water applied in relation to soil depth and texture.

Trees use water according to leaf area and soils hold water according to types. Water absorbed and held by soils varies in amount from about six gallons per cubic foot in very heavy soil to about one gallon in very light soil.

### **CHECKUP ON PENETRATION**

It is advisable to examine all orchards periodically and by use of the soil auger or soil probe, determine when to irrigate. When we have an orchard ready for water the irrigator is furnished with the necessary equipment. If it is a furrow or basin job, he has a shovel and a test probe and is instructed as to what furrows or basins are to be irrigated and the desired depth of penetration. We never apply water according to the clock, but when the basin or furrow shows water penetration eighteen inches deep the irrigator is through. The time of holding water on the ground varies widely from two hours in coarse granite to as much as fourteen hours on heavy tight clays and adobes.

In the case of a sprinkler job the irrigator is furnished with a test probe, wrenches, and hose coupled in 25-foot lengths, and with the number of sprinklers which meter and pipe lines can carry. Here again he keeps water running until a penetration of eighteen inches is secured, the time varying according to soil condition and water pressure. Last season we irrigated adobe soils about four times and pervious granite soils about ten times.

Last season we had the care of 28 groves aggregating 156 acres. Of this, 105 acres were furrow irrigated, 29 acres sprinkled, 13 acres basin irrigated, and 9 acres combination basin and furrows.

Some comparative labor and application costs follow:

PER ACRE	SEVEN YEAR OLD TREES		Cost of Application
	Times Irrigated	Amt. water used	
<b>Granite Soil</b>			
Furrow	8	14 inches	\$14.00
Sprinklers	8	12½ inches	14.00
	<b>FOUR YEAR OLD TREES</b>		
<b>Heavy Soil</b>			
Furrows	4	8 inches	11.23
	<b>TWELVE YEAR OLD TREES</b>		
<b>Heavy Soil</b>			
Sprinklers	8	14 inches	20.67
Furrows	6	10 inches	17.55
	<b>SIX YEAR OLD TREES</b>		
<b>Steep Granite Soil</b>			
Sprinklers	7	10 inches	12.40
Furrows	8	11 inches	14.00
	<b>EIGHT YEAR OLD TREES</b>		
Basin and furrows	7	12½ inches	19.64

Last season our average use of water was 9.84 acre inches per acre. This average is influenced by a considerable number of small trees. It may be of interest to state also that our average fertilizer cost was \$32.00 per acre. Labor cost averaged \$28.77, and charges for equipment used was \$6.41 per acre.

## GENERAL OBSERVATIONS ON IRRIGATING

Our general observations are that the average orchardist is likely to use fertilizer and water on the assumption that all of his soil is deep and well drained. Many failures are due to this mistaken assumption. If the average orchardist would try to synchronize his irrigation practice, cultivation, fertilization, pest and disease control, etc., with his actual soil conditions, he would, in our opinion, secure far better results as measured by dollars and cents profits.

Too many orchards have a needlessly high cost of applying water because of improper pipe sizes, poor location of riser valves, and insufficient volume of water. One season's irrigation in mature orchards with 60 per cent efficiency requires about fifteen acre inches of water per acre. With similar soil conditions, half grown trees require from six to eight acre inches.

Granite soils four to six feet deep call for an irrigation interval of not over 45 days. The more shallow the soil, the more frequent the irrigation. In properly laid out orchards on hillsides, one should get about 65 per cent efficiency, and on level land, 80 per cent efficiency.

In fertile soils above the wilting point and to field capacity of water, the rate of water absorption by trees is the same as the rate of growth, and is controlled by local climate and weather conditions.

From 50 to 60 per cent of avocado root activity is in the top foot of soil.

In good orchards with a cover-crop, the winter water requirement is about ten acre inches, or the equivalent of ten inches of rain well distributed with little run-off. Thus, as

a rule, the winter rains, when properly distributed, meet the water requirements of our trees, but a period of drought of more than six weeks is dangerous, no matter how heavy the last rain. An examination of the rainfall records for northern San Diego County as recorded at Escondido shows that we would expect to have to irrigate some in the winter in three out of ten seasons. We cannot afford to depend on or wait for the rain too long and risk serious loss from drought.