Irrigation

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As Mr. Schoonover has said, we can determine the amount of water that a soil will contain when at its field capacity. Furthermore, he stated that it is not necessary to apply water to a soil that is already sufficiently wet. Water applied to a soil in this condition results in leaching of valuable mineral nutrients and is a waste of irrigation water.

We have been conducting a series of investigations on the amounts of water normally removed from the soil by avocado trees growing in the Whittier-La Habra area. An investigation of this nature consists in obtaining a record of soil moisture fluctuations in the soil containing a large part of the root system of the trees in question. Simple calculations using the data obtained give the amount of water removed from the soil by the trees.

Work was started in 1932 in the Hart grove of Fuerte avocados located in the North Whittier Heights area. The trees were large and vigorous, about seventeen years old, and were growing in a recent alluvial soil. Soil samples were taken in one foot increments to a depth of six feet.

At the end of the season it was found that the trees had been removing water as follows:

Month	Acre inches per acre
April	1.8
May	2.3
June	3.3
July	3.5
Aug.	2.8
Sept.	2.0
Oct.	2.0

17.7 acre inches per acre total seasonal amount withdrawn.

One important feature of this chart is that moisture is not withdrawn from the soil at the same rate from month to month. To supply this amount of water would require a total seasonal application of from 15 to 18 acre inches per acre in addition to rainfall. It is assumed that rainfall has been sufficient to wet the soil containing a majority of the roots to its field capacity, by April first. The time of the first irrigation in the spring would depend upon climate and the water holding capacity of the soil, other things being equal. Coarse-textured soils would require earlier and more frequent irrigations than the fine-textured soils.

Similar studies in 1933 on the P. J. Weisel grove of the fifteen-year-old Fuerte avocado trees showed that soil moisture was withdrawn at the following rates:

May	2.1	Acre inches per acre.
June	3.8	" " " "
July	3.9	" " " "
Aug.	2.9	" " " "
Sept.	2.1	" " " "
Oct.	1.9	" " " "

16.7 acre inches per acre total seasonal amount withdrawn.

Here, again, the increase in mid-season compared to that in the spring and fall is of importance. With average rainfall and climate as that prevailing in 1933, about the same amount of irrigation water would be required as was found necessary in the first-mentioned grove in 1932, that is, about 15 to 18 acre inches per acre.

Another record obtained in 1933 in the ten-year-old Fuerte avocado grove of Mr. A. C. Adams gave us the following figures:

May	1.4	Acre inches per acre.
June	2.3	" " " "
July	2.7	" " " "
Aug.	2.4	" " " "
Sept.	1.9	" " " "
Oct.	1.2	" " " "

11.9 acre inches per acre total seasonal amount withdrawn.

The younger and, therefore, smaller trees account for the low seasonal water demand. However, the trees show the characteristic increased demand in June, July and August. A total seasonal application of from 12 to 14 acre inches per acre of irrigation water is indicated from this study of this young grove.

To apply irrigation water most efficiently requires a knowledge of the distribution of the roots of the plant being grown. Perhaps the best way of obtaining this information is to study the rates of extraction of soil moisture from the various soil depths. Such a study has been made for the three groves mentioned above. The average rates of water extraction show that of the total amount of water removed from the soil by the trees a larger percentage was removed from the top foot of soil. In passing, it should be mentioned that the soil mulch was discarded in taking soil samples. The second foot of soil supplied only 80 per cent as much as the top foot, the third foot 50 per cent, the fourth foot 30 per cent, the fifth foot 25 per cent, and the sixth foot only about 12 per cent as much as the top foot of soil.

Remembering that a soil already sufficiently wet should not be irrigated and knowing the total seasonal water demand and the rates of extraction of this water from the different soil depths, one is in a position to formulate an irrigation program that will result in logical distribution of water in the most efficient manner. Irrigation water would thus be

supplied at more frequent intervals during the summer than in the spring and fall, and in amounts at any one irrigation that would wet only the dry soil and not that soil which is already sufficiently wet.