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AVOCADO IRRIGATION

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The ultimate purpose of irrigation, as with all other cultural practices, is to produce the greatest possible net returns per acre to the grower.

This, of course, means the production of the greatest amount of top quality commercial fruit that can be grown per acre in a particular location with the least expense, commensurate with the normal life expectancy of the grove, giving consideration to all the factors present.

In any discussion of avocado irrigation recognition must be given to the many factors affecting the profitable use of water. Any attempt to completely cover the subject will require a course of lectures running into many days, or a set of volumes equal to the Encyclopedia Britannica.

In this paper it is presupposed that the reader has a basic knowledge of the fundamentals of irrigation such as set forth in the 1927 Yearbook of this Society by Dean Robert W. Hodgson (1). In this article Dr. Hodgson discusses "How water occurs in soils," "How plants use water," "Factors affecting the rate of use of water" and sums up his paper with the following paragraph: "Irrigation practice . . . must be determined primarily on the basis of the water requirements of the trees, the water holding capacity of the soil and the amount of moisture in the soil as determined by periodic examinations. The method of distribution must be governed by the topography and supply and must be so arranged as to guarantee uniform distribution and penetration. These in turn can be determined only by trial and experiment and frequent examination of the soil."

In a study of water usage of the avocado by Cecil Compton (2) in 1936 he brought out the fact that the water requirements of the avocado varied during the season, with June, July and August being the months of heaviest usage. This study called attention to the need for more information on the irrigation of the avocado and that an irrigation program based on a definite irrigation schedule of the same duration throughout the season without consideration to weather conditions will not maintain a uniform supply of moisture for the tree.

Following up on the work being carried on by Dr. Sterling Richards (3) at the Citrus Experimentation Station, recent experiments with tensiometers in San Diego County by March and Gustafson (4) have brought out the fact that frequent light irrigations to maintain soil moisture in the root zone has materially improved the tree condition and thereby the production, in several commercial avocado groves, over previous practices of heavy irrigation of regular and much longer intervals. This is being accomplished with the use of an equal or less amount of water during the season.

Although the avocado industry of California is located in a semi-desert area we can learn something about orchard irrigation from observation of the avocado in its natural habitat. Seedling trees have been observed in Mexico and Guatemala growing vigorously on shallow hillside soils where the soil consisted of four to eight inches of humus over an impervious clay. By virtue of the slopes, good lateral drainage was evident. Here many trees had a girth of 18" to 3' and were reported to be more than 50 years old. Obviously there was an adequate supply of rainwater and no Phytophthora cinnamomi present. Again on a comparatively deep clayloam soil at Sabinas Hidalgo, in the State of Nueva Leon, Mexico, orchards of budded avocado trees are growing well with flood irrigation, and water standing about the roots of the trees for weeks at a time. Good river water is used and tests show no root rot present. It has been said that there have been no imported avocado trees planted in this area. Some old seedling trees at Sabinas Hidalgo are very large, with trunks in excess of 3' in diameter at 6' from the ground. These trees are probably about 40 years old.

At Santa Engracia, in the State of Tamaulipas, Mexico, there are some very large seedling avocado trees. Several visitors from California have seen this planting where there are two huge trees growing beside an irrigation canal with some of their roots constantly in the water. These trees are reputedly over 100 years old.

These observations south of the border bring out the fact that whether in a tropical forest or a cultivated, irrigated planting, the avocado will prosper on a wide variety of soils provided there is no root decaying organisms present and where there is good water used for irrigation.

Avocado orchards are being irrigated by many different methods, any of which may be successful from the standpoint of the optimum growth and production of the trees when all of the factors involved are favorable.

As there is a comparatively limited amount of valley land in California in the areas climatically suitable for avocados, and the fact that the level valley lands are rapidly being absorbed by subdivision, the avocado industry is primarily located on upland and hill land. The farther the location from the valley floor, the more varied becomes the soil. This diversity of soil type in turn poses a problem for the avocado grower in irrigation as well as other cultural practices.

In order to accomplish a good job of irrigation, the grower must know the type of soil in which the roots will grow and its depth, the kinds of subsoils, the drainage, both surface and subsurface, and also the quality of the water used.

Today the most common method of avocado irrigation is by the low or undertree type of sprinkler system, therefore the remainder of this paper is confined to some of the factors involved in the installation and use of this type of irrigation system.

In the 1949 Yearbook of this Society, J. J. Coony (5) gave a concise and apropos account of the "How" of installing a sprinkler system, so this phase will not be covered, except to note a few observations on some permanent installations.

Usually when a permanent system is installed at the time of planting, the sprinklers are placed close to the tree and small "spitter" type heads are used to supply water direct to the newly planted tree (usually in a basin the first year). As the tree becomes larger

after a couple of years, the area covered by the sprinkler must be enlarged, and this may be accomplished by the use of a lawn type head with a wider angle of coverage or one of full circle. There are heads manufactured which have two holes, each giving a spray covering 180 degrees. One hole is plugged for the first year or two, then, when a larger area is to be covered, the second hole is opened, giving a full 360 degree coverage. This type of head requires a pressure of 25 pounds or more at the sprinkler. In most cases observed, where this system is installed at the time of planting, the pipeline is not moved as the tree grows, with the result that the lower branches of the tree must be kept pruned and there is a tendency for water to accumulate at the trunk. Where drainage is excellent, there probably will be no bad effect from this accumulation of water at the base of the tree. But, most hill soils are not of sufficient depth to have ideal drainage, and there is the danger of developing a saturated condition directly under the tree which is conducive to root injury. The solution to this problem, would be the removal of the sprinkler back from the tree trunk as the tree increases in size until such time as another type of head is installed which will give greater coverage. At that time the system can be permanently installed in the ground with the sprinklers spaced so as to cover all the area between the trees. Otherwise, for the first two to four years, it is recommended a temporary placement of the pipelines with sprinklers be made so that they can be moved with the growth of the tree.

A common error made in installing a permanent underhead sprinkler system in a producing grove is to place the sprinkler in the center of four trees. This location is usually inconvenient where it is necessary to enter the orchard with tractor or truck for distribution of fertilizer or hauling fruit. This should be obviated at the time of installation by placing the sprinklers about six feet off the tree row but equally distant from the trees in the row.

Another suggestion is that the system should be so planned as to be able to irrigate different areas of soil types in separate units. An extreme of this type of installation that has been observed in operation, has one block with as few as five sprinklers on one type of shallow but coarse well-drained soil which is irrigated every five days, and the largest block of trees of over an acre of relatively deep soil of fine texture but good drainage, which is irrigated at varying intervals of 15 to 30 days. However, on inspection of the grove, there is little or no difference in the size and condition of the trees.

There can be no general recommendation for type of sprinklers as location, soils, tree spacing, ground cover, and many other factors including convenience, must be taken into consideration in selecting the sprinkler best suited to the particular grove. If the soil is very fine and tends to seal over, a sprinkler giving a fine spray and applying water at a slow rate would be indicated, whereas with a coarse textured soil a sprinkler applying water at a rapid rate could be used.

In many side hill groves it is necessary to have a ground cover to prevent erosion. Eventually, a living cover will be Bermuda grass, and the water use of this ground cover must be taken into consideration in determining the amount, rate and timing of the water application.

In studies made on large properties it has been found that the cost of a sprinkler system and its operation is about equal to that of furrow irrigation, but has the advantage of

better distribution and less waste of water. However, the sprinkler system cannot operate successfully without attention, as there is no known sprinkler that will not, at some inconvenient time become plugged or cease to revolve, nor is there a pipeline that will not spring a leak some evening just as you are leaving the farm dressed in your best bib and tucker.

LITERATURE CITED

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