

## Experiences in Irrigating Avocados

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**Mr. Chairman, Ladies and Gentlemen:** A few years ago I spoke before this body on the balanced care of the avocado tree, and knowing it was rather a difficult problem, I was mighty careful of what I said. Following that meeting a friend of mine said: "Mac, you are a genius. They can't pin anything on you after that speech of yours."

Not long ago we had a tour through San Diego County—a number of us growers in the county. We went through Vista, Carlsbad and came to Rancho Santa Fe, where I am taking care of groves. I happened to be the leader of this tour through the Rancho. We had gone by different groves, good and bad in every section. After I had shown them over the Rancho, someone said: "Mac, how did you do it? We didn't see a poor grove on the Rancho." So evidently I was a good guide.

A few weeks ago Mr. Christie asked if I would talk on irrigation of avocados. If you will look on your program it shows "Experiences in Irrigation of Avocados," so you see I again was careful.

Therefore I approach this meeting in a three-fold manner; first as a diplomat, second avoider of unpleasant situations (as I avoided the poorer orchards) and third as one who may change the subject!

In speaking of experiences in irrigation, most of us who are avocado growers have formerly been citrus growers. Many of us have been in the business a long time. I think it would be wise to put in a little foreword of the earlier period which many of us have gone through in the irrigation of citrus. I remember my first experience in Chula Vista taking care of my father's lemon grove. It was in those days in irrigation that if after the second day we did not put on a pair of high top rubber boots, we didn't think we had done a job of it. When we plowed our groves, if we didn't snap the roots up the size of your thumb we thought we had not done a job. It was in this period of time, I remember, that we had a man on the ranch who decided to irrigate properly, so he changed the angle of the furrows. He finished the irrigation in about ten days. He had the grove like a duck pond. I think that many of the old citrus growers remember that time.

We then came to a second period—a transition period—when we found that our trees were beginning to have rotten roots. Soil augers were coming into more common use and the only roots we could find were underneath the drip of the tree and perhaps in the tree row where water did not reach. With this period, we began to question our practices. Even the Experiment Station began questioning some of the old data.

We finally passed through this period into period three, and we are in this period at the present time—a period of careful irrigation and rather light cultivation—perhaps at times too light. In fact I left the ranch today, having started out a new tool which I call a

Bermuda knife. The Bermuda is coming into some of the groves very thickly but I won't go into that question because some people even plant Bermuda.

This is then a period of lighter cultivation—of merely keeping down wild weed growth. A period of extra careful watering. We are beginning to use our soil augers more and there are several soil moisture laboratories throughout the state.

All in all I think we have learned something in the two periods which we have gone through and it has been a very fortunate thing that the avocado did not become known in that period number one, because I question whether it would have survived.

Going on definitely into the irrigation question there are a number of methods of applying water. First we have, of course, our rain—nothing more than nature's way of irrigating. At certain times and places this is the only way that irrigation is done. Following that we have overhead irrigation. We have also our flooding, basins and furrows. I have even plowed up sub-irrigation systems in one or two of the old places we have (tho in some places, doubtless, even this is a good way of irrigating).

The only answer I can make when asked which is the better system, is, "all of them."

The soil is the factor which limits almost any type of irrigation that we have. I recently saw a soil map of San Diego county—one of these new soil maps gotten out by the U. S. Bureau of Soils some few years ago. The map is a rather large one and had all the colors of the rainbow on it. Furthermore, no soil names with which we are familiar. In fact we tried to draw up a map of a certain locality and we had to manufacture colors to get all in that we wished. But with all these various soil colors we can only consider a few general types. First we have light soil, composed of sandy loam. Second a type which we might term "loam." Third, heavy soils—adobes and clays are under this type. We must remember also that the surface soil, plus the sub-soil determines the character of the land. For example, a light top soil with clay subsoil is one type. A heavy topsoil and a light subsoil is another.

Now as yet I haven't said much about irrigation but we must talk about drainage before we get to irrigation. Drainage is one of the most vital things with which any irrigator has to deal. Water must get away quickly from a tree as it can't stand stagnant water. The water which is stagnant and is not moving is the thing which does damage to most all of our plant life. Even in our tropical, rainy countries, much of the soil is very free, and water passes through quickly. Soon after a rain the ground is more or less dry again. So drainage is the most important thing of all, and in order to know just how to irrigate you must know whether or not you have good drainage.

Passing on then to the subject which I am to speak about—experiences in avocado irrigation. Let us take a few more or less definite types of soil with which I have had recent experience. I have in mind an orchard which has rather light top soil and heavy clay sub soil. It isn't avocado soil, but at any rate the trees are planted near a good building site and probably have some asset to the property. I struggled along with this grove for some time using what little water I had in furrows and didn't make much progress. Then I used large basins with the fertilizer put directly into the basins. By using a soil auger, we found in certain places that the drainage was poor and made a drainage problem in that particular basin. This condition is hard to control in furrow

irrigation. The trees have improved under the basin system. Another orchard had a light top soil and was very difficult to irrigate because the water went straight down—not enough lateral spread to irrigate the roots. We finally put this grove into basins and were able to bring the trees into a good grove merely because we were able to concentrate the water where it belonged.

Passing on, however, to heavy subsoils with which I have had considerable experience. We have a certain type of soil in San Diego which I call a calcareous adobe—it cracks easily and the dryer the soil gets the more friable it is. When full of water it is like a sponge which will swell up, and all air is excluded. That is the type of soil which we have along the golf course at Rancho Santa Fe—we even lose golf balls in these cracks when playing golf.

I was irrigating a citrus grove of this type at one time and had to put about four men on twenty to twenty-five inches of water to get the water down the furrow. Those cracks went right straight down the hill! I have several groves planted in this kind of soil and we have to be very careful with it. In one of my best orchards on this type of soil I have to start very carefully one furrow at the stand and divide it at the lower end. If I started all four furrows at the top of the run I would only have to do it once to turn the grove back into a hayfield!

I have another grove on similar soil which is on a rather heavy slope—the grade of the furrows was slower than it should have been for such a steep slope. Recently we have been having some trouble on the lower end of the grove—we do not know why—unless it is the water seeps downhill so fast on the lower side that the water cannot get down to the end of row fast enough. Some of the trees look rather wilted at the present time and is largely due to the water situation—a situation which we have been attempting to control for some time, but it is difficult without extra pipelines. I believe the result of the water traveling down and filling up this heavy soil causes a sort of suffocation, or as Dr. Coit says, "asphyxiation." Whatever it is, I believe it is the result of keeping the air from the roots of the tree.

We will go on now to our medium or loam soils. That person is lucky who has loam soil. It requires less fertilizer than light soil, and naturally it is a soil which is much more easily handled. If you have such land with no frost, you are fortunate indeed. A true loam soil gives good drainage, a prerequisite of any good soil. If a person has loam soil with good drainage, the battle is half won. However, he must still look after his irrigation and he should still investigate soil moisture at all times. That I term is necessary both in our light, medium and heavy soils. Even our light soils, and some of the loams possess subsoil which are too heavy to drain out. You need not always have a hardpan class of subsoil, other types will do the same thing. I have had owners say "you state my drainage is poor. Why we are on steep side-hill and water surely will get away from there." If every one knew how subsoil varied in depth and how the water from above may follow an uneven subsoil down the slope and come near the surface part way down the hill and saturate a row of trees, they would understand that true drainage must be perpendicular.

We must also remember that there is perpendicular run-off as well as lateral. We must watch the giving of too much water or we lose our soil nutrients which are valuable and

necessary to growth.

I have been trying to give you a picture as to what irrigation should be in relation to soils. We must start primarily with soils in order to relate irrigation to it. A person must know his soil in order to be able to irrigate properly. If you do not know very nearly every inch of your grove, you will not know what your water is doing as you are irrigating. If, when you irrigate, you do not use your probe or auger in order to know how far water is going you may be drowning out your trees and do not realize it.

Before closing, however, I wish to give one or two definite ideas of the type of irrigation which I personally refer to.

I believe sprinklers for light soils are about as good as we can get. Don't put them over the tree, but as Dean Palmer does—he has overhead sprinklers. If you are unfortunate to have been sold one of these shallow avocado soils and haven't been able to find the real estate man who sold it to you, put the trees in basins and do the best you can—wide basins and keep a lot of fertilizer in them. If you have a heavy soil, although it may be a problem, such soils are very rich. If proper headwork is used in handling water, I believe furrows are the best thing for this type of soil. But above all, for any type of soil, you must use your own good common sense.