

## ORCHARD MANAGEMENT IT'S THE LITTLE THINGS THAT COUNT

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Orchard management is very much like a jigsaw puzzle in many respects. There are a great many pieces of information that make up the whole picture. I can't possibly discuss all the aspects of this broad subject, but I hope to give you a few ideas and conclusions we have come to in Santa Barbara County in the past year or so.

To pin this broad subject of orchard management down to a more specific idea, may I amend the printed subject to read "Orchard Management—It's the Little Things That Count." Because to me, Orchard Management is the art of fitting together small pieces of information into a plan of operation. A successful manager is one who can plan, care, and harvest his orchard so that it produces a profit.

You must constantly make decisions on all your operations: should I irrigate today? When should I pick? Should I spray for zinc deficiency? What are the best kinds of nursery trees? And so on. Your decisions are only as good as the information on which they are based. No one can make these decisions for you and you can't find out everything at once. A successful manager must constantly know the latest developments in the industry. It is for this reason, I am sure, that you are here today.

We in Santa Barbara County need to know many things and through the cooperation and experiences of our growers, we can list nine conclusions that add to our knowledge of avocado production.

Of utmost importance, are the decisions regarding parentage of nursery trees, types of nursery trees, planting schemes, and the like. We have considerable evidence that you can't plant any trees just any way and expect to have a good orchard. You must obtain the very best trees possible and plan and care for them correctly to have a very high producing orchard.

Our first conclusion is that there is still considerable room for new varieties; varieties that produce consistently high yields of top quality fruit. No variety fits this requirement yet. We are cooperating with the Avocado Society Variety Committee in the introduction and trial of promising varieties from other areas. Also Stanley Shepard of Carpinteria and other growers are planting and observing seedlings in our constant search for better varieties.

We recommend for commercial planting four varieties: MacArthur, Rincon, Hass, and

Anaheim, but none of these are completely satisfactory. New varieties that are showing promise for us are Corona, Wurtz, and Mesa.

Our second conclusion is that rootstocks are important. As many of you know, Dr. Fred Halma of UCLA began some years ago establishing a large number of avocado rootstock plots in all avocado growing districts.

We have 12 active plots in our county and to date we have learned *several* things. First that Guatemalan race seed sources, such as Nabal, Anaheim, Itzamna, are more susceptible to a chlorosis or yellowing on certain soils than Mexican type sources. In one of our plots, 42% of the Guatemalans turned yellow and 14% actually died from this chlorosis, while only 17% of the Mexicans turned yellow and these have all recovered.

The *other* thing we learned is that Guatemalan rooted trees were worst affected with *Verticillium* wilt, a soil fungus of increasing importance in our county. In one plot, 10% of the trees have wilted and all were on Guatemalan rootstock except one. *This relation of rootstock type and Verticillium wilt needs to be further studied, but it is at least a trend.*

*It is a little too early to indicate a trend in yield records, since yields are so variable in avocados. However, we are accumulating evidence that trees should be grown on Mexican race rootstocks, as has been the practice followed by most nurserymen.*

This leads me into our third finding. Not all Mexican seed sources are good. In a project set up in cooperation with the Variety Committee of the Avocado Society, we are raising, experimentally, nursery trees from 4 sources of seed that were submitted for registration. All four of the parent trees were considered good Mexicans, producing seed desirable for nursery use. Here are the results in terms of percentages of first year saleable trees. Source A—47%, Source B—36%, Source C—12%, and Source D—0%. Source D were all discarded, not only because the seedlings grew poorly, but also we suspected them of carrying sunblotch, the virus disease of avocados.

These trees have been budded to experimental varieties and will be planted out with cooperating growers for long range trial. But certainly we can come to the conclusion that the individual tree seed source is important and that each source should be tested before it is used extensively. We suggest seed be obtained from named Mexicans, such as Topa Topa, Ganter, Duke, Northrup, Mexicola and that these seed source trees be individually identified so we can learn which are the best.

The fourth little piece of information to fit into our jigsaw puzzle of management knowledge is that *Phytophthora cinnamomi*, the root rot fungus, can be introduced by nursery trees and can cause the death of young trees the first year in the orchard. This is a complicated problem and will be discussed later this afternoon by Joe Coony in more detail. However, I would like to give you a few figures which will indicate the seriousness of this problem.

We have found eight orchards infested. The nursery trees did not show any symptoms at the time of planting, but those that were infected wilted down either in the first season or the second. The percentage infection has ranged up to 60% in one large planting and 90% in another small planting. Many of these cinnamon fungus infected trees were planted in what could be called excellent avocado soils, deep and well drained.

We feel something must be done to minimize the threat of root rot, and nurserymen are

urged to do everything possible to prevent infection. This is a difficult task and will increase the cost of trees. You as managers are urged to pay more for trees grown by reputable nurserymen that take the precautions necessary to prevent the cinnamon fungus infection.

Every grower enjoys arguing with his neighbor about tree spacing and orchard layout. And I should hasten to say that there are so many variables in this subject that probably both are right for their particular orchard. But as our fifth contribution to management knowledge, I would like to list several ideas which contribute to good orchard layout.

Trees can be interset in old lemon orchards if the avocados are adequately irrigated, without any loss of growth or production.

Access or haul roads or picking drives should be planned for, when the orchard is set out.

Management can be simplified by putting all the trees of one variety in one part of the grove, another variety in another block.

Because intercropping in the young orchard has been neither profitable nor good for the young trees and because trees set at mature orchard distances leave a lot of bare ground in the young orchard, we are quadruple setting most of our groves in Santa Barbara County. This means that three-fourths of the trees will be cut down as the grove becomes crowded.

We believe the proper tree spacing for planting is from 15'x15' to 25'x25' depending on the variety and soil type.

So much for our ideas in starting right with a young orchard. Now I should like to discuss four conclusions regarding mature orchard management. Foremost in the minds of all grove operators is irrigation. This is a subject of paramount importance and one on which we actually know very little specifically. The manner in which a grower irrigates his grove can either make or break him. Soils, climate, trees, and methods of application vary greatly. We need a great deal more information and I am confident we shall receive it from Dr. Sterling Richards of the Citrus Experiment Station as he pursues his research. But it's a long range project and he is really just getting started.

For our sixth contribution I would like to tell you of a small experiment on which we have been cooperating with Dr. Richards. The question arose "What is the spread of roots beneath a young avocado tree say 2, 3, or 4 years old?" By using tensiometers, which I'll not take time to discuss other than to say they provide a good tool to measure water use, we have pretty well shown the spread of the root system. Roughly avocado tree roots extend horizontally out to about twice the spread of the top of the tree. If your tree spreads out 3 feet from the trunk, the roots will be active out to about 6 feet. From this, you can conclude the proper basin size or area to be covered by sprinklers.

As for depth of rooting, on a deep soil we had considerable moisture absorption at 4 feet depth. On shallow soils, of course, the root would be limited to the depth of surface soil. The rate of use of water was greatest at the 2 foot depth, about 90% as great at the 1 foot depth and 45% at 4 foot depth on the trials we have run. It could be quite different in other soils and areas.

The seventh piece of our jigsaw puzzle is our work on spray treatments for minor element deficiencies. We can only recognize two deficiencies—zinc and iron.

Zinc deficiency causes mottled leaves that become stunted and in severe cases the twigs die back and the tree may even die. To prevent this, the tree should be sprayed as often as you see the symptom, with a foliage spray. In badly affected groves, two or three sprayings annually with zinc sulfate hasn't done the job, so we have been trying a new formulation called EDTA, a chelated zinc. Our trials have only been on since last fall, but it appears that we are correcting the deficiency, at least as well as with multiple sulfate sprays.

Iron Chlorosis is a limiting problem on some soils and up until this time there was very little that could be done to correct this yellowing of the leaves and death of branches. Again the EDTA or chelated iron sprays show promise. We have been working with Dr. Ellis Wallihan of the Citrus Experiment Station and he feels that these chelated minor element sprays show promise for the treatment of iron deficiency. However, much more test plot work will have to be done.

I feel that just a word should be said on Root Rot because of its seriousness in management discussions. We have been working with Dr. George Zentmyer of the Citrus Experiment Station for many years now and all our plots have lead us to conclude that at present very little can be done to prevent Root Rot on susceptible soils.

To sum it all up in a few words, as our eighth point, avocados should not be planted on poorly drained soils. In connection with our recent Avocado School, we have published a list of soil types to be avoided for avocados. This list is tied into our Soil Survey Map and would apply to the soils in Santa Barbara County only. However, such a list might be helpful if it were worked up for other areas. We shouldn't give up on root rot yet and Dr. Zentmyer and all others working on the root rot problem should be given all the assistance possible to find the answer for the industry.

My ninth and last point relates to yields and harvesting efficiency in older groves. Many growers in the past have said: "If there is fruit on the trees, I can get it out no matter how crowded or tall the trees are." As our industry matures and our crops increase in size, the prices received will fall from the high levels of recent years. This means that avocado growers, like any other grower, are going to watch every cost, including harvesting. Therefore, we should look toward pruning and thinning our groves for efficient harvesting.

Fruit is more expensive to pick when it is in the tops of tall trees. So the question has been raised "can avocado trees be topped satisfactorily without reducing yields?" The answer is yes, if the grove is not crowded. Our observations indicate that a topped tree in a crowded grove goes right back up where it was, seeking sunlight, with the net result of the topping being reduced yield.

However, if the trees are thinned out so each permanent tree can maintain a producing skirt, trees that grow too tall can be cut back successfully. Particularly with tall growing varieties like Anaheim, Edranol, Zutano and Elsie, establishing a maximum height can be accomplished by annual pruning or topping without loss of production.

This top pruning should be started when the trees first reach a height of say 20 feet. If

the topping, coupled with tree removal, is started early enough and a little done each year, production will remain high and the fruit can be harvested economically.

Since we agreed at the outset that successful orchard management is the art of fitting together many ideas and decisions into a plan of operation, let's tie the conclusions I have presented together and see what we can learn.

1. No single presently planted variety is completely satisfactory. All of us have a responsibility to try and observe varieties that might be superior to what we now have.
2. Nursery trees grown on Mexican rootstocks are to be preferred, because they are less susceptible to Chlorosis and Verticillium Wilt.
3. Individual tree seed sources for rootstock purposes should be tried and evaluated before they are used extensively to prevent runt trees and sunblotch infected trees.
4. All precautions possible should be taken to assure the absence of *Phytophthora cinnamomi* on nursery trees.
5. Considerable thought should take place in planning your orchard lay out and tree spacing, taking into consideration intercropping, access roads, block planting, and quadruple setting. We suggest you get all the help you can to arrive at a satisfactory plan combining the many factors to consider.
6. Young avocado tree roots extend out about twice as far as the skirt of the tree and absorb moisture down to 4 feet in depth if not limited by shallow soil.
7. The correction of zinc deficiency by minor element sprays should be accomplished whenever leaves show the typical mottling. The new materials called EDTA chellates, show promise in the correction of both zinc and iron deficiency.
8. Avocado Root Rot continues as the most serious malady of the industry and the best practical way to avoid it is not to plant poorly drained or otherwise susceptible soils.
9. Mature groves can be thinned and topped without loss of production in order to increase harvesting efficiency.

Thus you can see that avocado growing is becoming a business with many ramifications. The profitable orchard is managed by one who constantly looks to the little details and pieces of information. Each fact and conclusion is like a piece of a jigsaw puzzle. When it is assembled with all the other little pieces and put into the plan by a good manager, the resulting picture becomes one of a profitable avocado enterprise.