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Results and Observations on Pruning and Rebuilding Methods Following the Freeze

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We will now proceed with "Results and Observations on Pruning and Rebuilding Methods Following the Freeze."

M. B. Rounds: Mr. Chairman, Ladies and Gentlemen: In Los Angeles county we recognized a different condition in the La Habra Heights area where so many avocados are grown. During the freeze we had a fairly low ceiling. The higher ground was considerably warmer than the lower ground. It looked as though they had poured a lot of hot water down the canyons which came up so far, and scalded the trees. The higher ground got through in pretty good shape, especially along the foothills, where different conditions existed—there it was colder in the higher groves. The ceiling was much higher so we had a different situation. Take the case of lemon trees up in the foothill area, the fringe of the San Gabriel Valley, young lemon trees, eight to ten years old, split quite badly.

The first thing that was asked of us and I suppose it was the same in other counties was "what to do with these frosted trees." We immediately got out some one-leaf circulars, advising people to let them alone for some time and especially until we could get some further information. We didn't expect this information anyway until late in spring or summer.

DELAYED PRUNING BEST

This advice was based on our information with regard to citrus. We have many test plots in regard to pruning citrus trees following a freeze and it seemed advisable to leave these avocado trees alone. Citrus trees, which have been left for even a year, have been better off later and known to produce crops sooner than those which have been immediately cut back. The theory, we believe, is that the more green leaves and green bark which are left to manufacture plant food, the better the recovery will be.

In pruning trees in cases of that kind we are bound to cut off a considerable portion of the green surface. The root system will remain just as it was, but with a restricted top. The root system has not been restricted. Where the root system is affected, we have a different situation.

I think a larger proportion of growers followed that advice and let the trees go; many of them have not pruned yet; some did their pruning during the summer months and some in the fall. I believe that those growers who left their pruning until this coming winter may see some benefit as far as future condition is concerned. However, there are quite a

number of growers with a large number of avocado trees who pruned within a months' time, and have produced on their trees some very vigorous growth.

As you look at them now it is difficult to say definitely whether those trees are any worse or any better than trees which have been left alone. We have no check plots in order to determine the difference. It is true we have one orchard on one side of the street and one on the other, but as has been brought out, there is a difference in soils, conditions of trees, brought about by perhaps the physical condition of the tree itself as well as the way the trees have been cared for. However, there is some reason to believe that those who did prune early will have trees which will put on a good bloom this coming year and probably a good crop.

I have been interested in re-building young trees. We have a set of plots on that subject and are trying to determine what is the best procedure in regard to avocado trees. The indications now are that where we allowed all of the growth to come out and selected one leader that the result was a little better growth than where we cut off all the other growth except the selected leader from the old trunk.

SELECT SHOOT NEAREST BUD

One thing I believe should be definitely concluded—what we know about citrus and avocado trees in relation to this particular question is that in bringing up a new shoot to take the place of the original tree, where it comes above the bud union, we should select a shoot which is as close as possible to the bud union, thereby largely eliminating the old trunk and the poor part of the tree which is left. In many cases you may find the trunk may have bark which is frozen on one side and not on the other. Even though you get a vigorous shoot it may make a very poor tree. Therefore I believe those who are building a growth from down as close to the bud union as possible are going to get much better trees than those who have not proceeded in that way.

H. H. Gardner: Any questions?

Blanchard: Just one observation I might add to what Mr. Rounds has said. In Ventura County I established, as I reported following the January freeze in 1922, some plots of citrus and I am very much interested to see how much difference there is in the response of avocado trees and citrus. I noticed where we left them alone the trees determined how far back they were injured. When you try to cut them back early, it is difficult to know where to cut, and we found in our pruning operations that it was possible to do it in the fall. There was then a definite demarcation between the dead wood and the green wood and a lot of removal of dead wood was done by just breaking it off which resulted in a better job than where we tried to use shears.

I think from the standpoint of comparing avocados with citrus, that it is more simple. The responses of the trees were more definite and they were easier to handle, so far as pruning was concerned, than with citrus.

Grower: I feel it is well to comment. I had some trees quite severely frozen in 1922. If you have a heavy new growth and cut back as far as 18 inches, you will still find the deadwood in the heart of the limb. The observation in 1922 was to the effect that after the trees grew, along lines approved, and became heavier, they broke and showed

deadwood in the heart of the limb which should have been cut back in the beginning.

EXTENT OF INJURY

Blanchard: I should have stated that I was referring to where damage was minor and on the outside where the main limbs were not affected— the intermediate type of injury—not the severe type—naturally under the conditions you state we would want to cut back into good green wood.

Q. Won't that freeze go down further—work down—by leaving it?

A. (Rounds) I don't think so. We might refer that to the pathologist, Professor Horne, if he is here. Professor Horne, can you help us out?

Prof. Horne: There are several features involved. In the first place there is the growth response of the tree when it is not disturbed by the onset of a pathological condition. So far as cold injury is concerned, I think the advance of any injury which may be there will very quickly limit itself. Of course there is the possibility of infection by parasitic organisms. In general, I think it is true the frozen tree does not usually become infected with parasites.

It would be my judgment from what limited observation I have made that it isn't necessary to take into account the development of these secondary troubles with the avocado. The gentleman spoke about the dark wood in the heart of the tree. There may be a stain following back in the wood which is not important so far as small or moderate size trees are concerned. Such a stain may extend back quite a distance and yet the tree may retain its strength just about the same.

There is a possibility of wood decay in the tree but we haven't seen very much of that—there are a few cases in which there have been decay in the trunk of avocado trees, but that has not been very frequent. I am inclined to think that for practical purposes we may disregard this until we have more information.

DEAD FOLIAGE GOOD SHADE

There is another point—one thing that has not been brought out with regard to these trees which I believe comes into the picture. It would be my opinion that the avocado is a tree which endures considerable shade; just the same as citrus endures shade without injury. It will probably be all right to let your tree stand there with a load of dead foliage. The leaves which do not drop off right away constitute a shelter and new shoots may push out and develop normally among the old dead foliage. This feature of shade endurance of foliage—it seems to me comes into the picture considerably.

H. H. Gardner: We have with us today a gentleman from San Diego county who doesn't appear here as often as we would like to have him.

JEAN MILLER'S COMMENTS

Jean Miller: Mr. Chairman, Ladies and Gentlemen: I think the first thing that we should

do is to extend to you our greetings from San Diego county. I see ten or fifteen people here from our county. We have a fine representation. I would like to, with your Chairman's permission, ask the Chairman of our Department—Mr. Russell Millar—to take a bow, because he has been active in developing the work in San Diego—Chairman of the Avocado Department, Mr. Russell Millar.

It is going to be difficult to say very much about the freeze situation, or observations on the freeze, or what to do about it, in a few minutes. It is a long subject and you have all gone over it in your citrus meetings.

It is so inter-related with subjects discussed on citrus, it is not perhaps so necessary to dwell on it to any great length. We probably all had, more or less, the same feeling. The morning after the freeze might be described as that sort of sick feeling in the pit of your stomach that you just didn't know what to do: just close up shop and go away—or perhaps the next feeling—"I want to fight it through—there is no other way—so what will I do about it?"

DIFFICULT TO ESTIMATE SO SOON

Our office, like every extension service office in the southern part of the state was swamped with calls seeking advice as to how to proceed. An interesting thing was brought to my attention a day or two ago. We had a newspaper man come down and want to write up the Farm Bureau and its relation to agricultural extension work. "You get a lot of funny questions, don't you?" he asked. The girl said "Yes, we do—about goldfish, canaries, etc., as expressed in various stories but the funniest questions are the ones we get from the newspapers." "Why, how is that?" "Well, the morning after the freeze, all three of the San Diego newspapers called and asked, 'Will you give us a statement of just how much freeze damage has taken place and what is going to be done about it?' " I think that is the climax of questions!

In San Diego county we will admit we didn't have a lot of experience along this line. We heard a small voice crying in the wilderness up around Los Angeles and we recognized in that voice a certain amount of authority— particularly with reference to avocados. It was the suggestions of that man who led us to feel a certain amount of security in the recommendation that we gave to our farmers. This statement was, "Don't be too hasty about doing anything about these avocados; protect them with a little whitewash but leave them alone. They will make a great deal more rapid recovery than you will ordinarily anticipate"—that was our friend Carter Barrett.

Along with that, such men as Henry Wilder of San Bernardino, Mr. Rounds of Los Angeles, Mr. Wahlberg of Orange and Mr. Blanchard of Ventura had gone through this experience with citrus and had given it considerable study and we took bodily the information that they suggested, along with much which came from growers, because most of us farm advisors get a great deal of our information directly from growers.

WHITEWASH, NO PRUNING, RECOMMENDED

We took that information and developed certain recommendations. Out of those

recommendations, I think 95% or more of the farmers have found an answer to those thousands of questions which they asked right after the freeze. They may not have gotten that information directly from us but in one way or another they were satisfied. The information was standardized and the result was that most people did not prune their trees. Most growers did not bother to use whitewash. However, I think we should say that another freeze might be entirely different than this one in regard to the need for protection.

I don't think we should jump to any conclusions because we got by without the use of whitewash this year. Most growers did not fertilize their heavily damaged trees.

We have learned to leave the tree alone and later on take out the dead-wood. We have learned that in this particular year the trees made remarkable recovery, whether we pruned them or not.

There was another factor which entered into this whole picture. It is unwise to forget it for a minute—the factor of excessive rainfall and root damage. You don't know whether the roots are damaged or not and you don't know the extent of damage. Until you know that, you cannot judge how much wood to take off. You have a very difficult problem there and anyone who thinks that he can, as the result of a few experiments, definitely determine the answer to that question, is going to be pretty good. It is certainly beyond most of us.

PRUNING STARTING NOW—(OCTOBER)

In San Diego county most of the people are removing deadwood at this time. In San Diego county the trees have made excellent return to normalcy without any special pruning methods appearing to be any better than any other particular method. The most useful information we have been able to gather together is on the re-training of the younger trees.

In the case of a young avocado tree we have found the same thing that Mr. Rounds has already brought to our attention—that the sucker growth just above the bud makes a very satisfactory growth, leaving on all of the lateral branches possible during its early stage of development but pinching their tips back when they get up to ten inches or a foot, and training that into a growing central leader type of tree as rapidly as possible — never heading it back. So far that seems to answer our need for the development of these frozen one-year-old trees.

H. H. Gardner: We have insisted on Harold Wahlberg taking an active part on this program and he will sum up this part of the program.

H. E. Wahlberg: Mr. Chairman and Members of the Institute: Your Chairman here has been very gracious to allow me the balance of the program. He usually tells me I have two minutes to present and summarize what previous speakers have required several hours to present.

TO PRUNE—OR NOT TO PRUNE

Now as we are discussing this question whether to prune or not to prune —there are two schools of thought here. I didn't have to wait for this meeting to find that out—having been out in the field with some of you folks during the past few weeks. Carter Barrett and I were looking over plots in which this particular question of pruning was attacked. I realize I am between two groups here and I certainly want to maintain their friendship.

One very notable orchard in the lower part of the county which I had the opportunity of visiting the other day and also in which some of you joined us on a tour last June, I believe—where we observed some pruning going on—one block very heavily pruned: the other block had not been pruned, in fact the management had intended to leave it for another month or two to make observations on time of pruning.

Here is the picture I would like to point out to you from our observations. The plot that had been pruned during the early part of the month of May showed very vigorous growth. The pruning crew had gone into that block and pruned heavier than you would have done, because the manager had advised with various authorities and was told that it is difficult to see how far back the deadwood is going.

As a result, we found less weak wood in the early pruned trees than we would under a normal job. Those trees presented dense growth of sucker wood. The color of the foliage was inclined to be fairly light green indicating a heavy demand for excessive supplies of nitrogen and other elements that *so* to make up the leaf growth. We found that block of trees pruned early responded with a tremendous growth of fairly light green foliage.

LATE PRUNED TREES APPEAR BEST

Then we walked over about two or three hundred feet to another block —pruned possibly during the month of August. Now this second orchard presented a darker green color on the trees. It also presented not quite as heavy a growth of sucker wood. The wood seemed to be a little more mature, and as Barrett and I were reviewing that, we felt at the time that those trees pruned in August would have a better chance of developing a heavier production in their next producing season than the trees in the first block that had been pruned heavily. I think Rounds and Blanchard have brought out the fact that the reason is that these latter trees had an opportunity of accumulating and building up because of greater amount of foliage available to the tree in the early part of the season. It appeared that the first group was laboring under a heavy demand for vegetative growth and all the energy and vitality was going into sucker growth. In the second block the trees were going along more normally, building up reserves for fruit production.

I am not going to try to follow the suggestion of your chairman and draw any conclusions from the evidence presented here this morning. I feel the answer will be more clear a year from now. We will reflect on our experiences and observe from now until the next Institute when we may be able to give a real answer.

Now, leaving that lower part of the country and coming up here in the foothill country; specifically in the Yorba Linda district. I had the opportunity the other day to have a

pleasant visit with Mr. Austin Marshburn. Mr. Marshburn and I spent a little time with some of his trees to see what they had to tell us. We wanted to have the trees tell us what to do, so Austin was kind enough to bring some of his trees over here this morning and we will pass them around for they have a story to tell you.

Here is a typical case—Austin didn't wait all this time and leave on all the deadwood—he got rid of that—but did not prune them—just took out the deadwood so the orchard wouldn't look so bad. He purposely left a lot of the weak stuff, in order that he might determine later on in the season just how much of that should come out. I believe he expects to do the pruning next spring. Why isn't he pruning now? He wanted to have the tree build up its reserves for the coming season. Secondly, the foliage acts as a windbreak.

Then third, if we should perchance have a visit from "Jack Frost" this winter, the foliage will act as a cover and protection. So there are really three reasons why he is delaying his pruning until next spring.

Q. Is that a limb or a small tree?

A. This is a weak limb from the top of a five-year-old tree—grown in a very low spot—one of the worst trees in the orchard. It gives a typical example of weak wood which will probably have to come out. You will note in examining the ends of this small log, which we will pass around, the extent of frost injury and how it killed the bark on one side of the limb, and how it has affected the color of the inside wood. Mr. Marshburn expects to remove a good deal of wood which has been weakened by frost in the lower part of his orchard.

ONLY TIME WILL TELL EXTENT

There are several examples of weakness here, interesting to see. We have all observed this, which is along the line Dr. Horne mentioned—how some of these discolored cells recuperate again. Here is a splendid example of cambium layer coming back and the yellow tissue growing under the brown cambium following the freeze. Much of this material is completely dead, judging from color—looked absolutely brown and some of us came to the conclusion that the limb is entirely gone but others of us had observed in previous freezes and knew that much of it would come back; though some will come back very weak. That is the reason for delaying the pruning —to give the tree sufficient time to reveal the true nature of the injuries.

Some theories of the early pruners will probably fall by the wayside as time goes on. The school of late pruners feel that if pruning is delayed, the tree will be given a chance to build up its reserve and come back into production earlier and with heavier yields. It does involve possibly a little bit more care when pruning is done, but the advantages obtained from late pruning will more than compensate for greater care necessary in removing some of the dead and weak structures several months later.

BETTER ANSWER NEXT YEAR

So, in conclusion, I will say that we probably don't want to give a final answer today. We

are going to have evidence during the coming year—tree growth, tree vigor and more particularly in the production following these two methods of handling.

MULTIPLE VS. SINGLE TRUNKS

Q. (Millar) Young trees that have been severely frozen—these suckers that come out—would you care to make any statement regarding training of multiple trunks instead of growing a single trunk? We have several schools in San Diego on this subject. Will you elaborate on that?

A. (Wahlberg) I might be prejudiced on that. I am not personally favorable to the multiple trunk. However, some horticulturists feel that it is a desirable thing. We might hear from Mr. Rounds on this.

Rounds: I don't believe in it either. If you are going to have several trunks there is more danger of breakage. Mr. Barrett has had a lot of experience in orchards—maybe he belongs to a different school?

Carter Barrett: In general I am in agreement. I favor one trunk brought up to a considerable height—a central leader and then spread; but I can see on certain hillside locations where you don't have to consider cultural problems that there may be a place for more than one trunk on a tree.

Millar: The thought I have in mind is to bring these trunks up rather close and perhaps wire them together.

Carter Barrett: I understand, but you should consider the ability of soil that you are going to do this on—to produce a tree of large size. On some soils in this vicinity where the trees are only twelve years old they are crowding at thirty feet. Under such conditions it would be very inadvisable to attempt that, and generally speaking we are trying to get away from wiring as much as possible for reasons which I can't go into here. On more shallow soils not likely to produce such a large vigorous tree it might work out.

WHICH WOULD COME THROUGH BEST?

Q. (Marsh) I would like to ask which of those plots you would say would come through another cold winter, the better?

A. (Wahlberg) The second plot would come through better; the foliage seemed to be hardier and more mature than the earlier pruned trees.

Carter Barrett: Do you think that is because of the dense foliage on the trees?

Wahlberg: Resistance of the foliage on the second plot would be greater. I would judge so from appearance and maturity of foliage.

Gardner: I would like to hear from you, Mr. Marsh.

Marsh: I believe on good deep soil these Fuerte trees are going to grow no matter if you cut them or not. We have been doing lots of cutting and if they are in favorable soil, they are going to grow. On our hillsides we can grow the tree close to the ground. We

don't have as good looking a tree but the fruit is much easier to pick. In good deep soil, I favor the central leader type tree.

Carter Barrett: In speaking of a central leader type tree my feeling is, and I believe you are in agreement, that after we get a clean straight leader it is advisable to spread your top out. You don't want your tree to go straight up indefinitely.

Marsh: No, but you won't always get a central leader tree. They may spread themselves—in some cases they do whether we want them to or not.

Grower: I was told not to touch an avocado tree and I took that advice. I have a row and a half of Anaheims and they grew up so rapidly I was afraid, so I let that central leader grow and if you want to see a tree grow, I wish you would come over—it went up twenty feet and then began leaning over. I don't know what to do but I will let them go—I believe that is the finest idea—now they run over and up onto the next terrace and when the fruit is mature, all I will have to do is pick fruit from the terrace above. Although I headed others at the height of four feet and a half, they made trees that I have to use the ladder on; I don't know which is better.

A PICKING PROBLEM

Gardner: On this subject, I would like to give my experience. I intended to prune my trees whenever I thought they needed it. Some are sixty feet across and forty-two inches in diameter and I haven't found they needed pruning yet.

Carter Barrett: As a matter of curiosity in regard to those "baby trees" of yours down there, Mr. Gardner, I would like to ask if the fruit is sold for seed purposes or whether you can let it drop—or whether you are able to get up and pick it.

Gardner: The apparatus for picking that I have is a 28-foot stepladder and a 20-foot picking pole. I hold the pole sometimes myself but have the fruit picked mostly by proxy.