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Protecting Avocados by Heating

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Carter Barrett: At this time we are going to take up another phase of this subject—of very great interest to all of us. Many of us have contacts with citrus growing and we know something of the picture from that angle. The reason why a great many avocado growers are in as bad condition from frost is because the avocado has largely been planted where the grower thought he was reasonably safe from frost damage. What has happened has been sufficient proof that that is not necessarily so, and I take pleasure in presenting the University's expert on the subject of "Frost Protection for Groves."

Most of his experience has been with citrus, and most all experience in this state in protecting groves from frost has been on citrus, but there are so many lessons to apply to avocado growing that have come out of the citrus industry, for it is the background upon which we largely work, that I think the person with a thorough background on this subject of citrus can speak with a great deal of wisdom on our problems with the avocado. Many of us may not need heaters or frost protection but others are seriously considering it. This involves considerable expense. I take pleasure in introducing Mr. Warren Schoonover of the University of California, who will address us on "Frost Protection."

Warren R. Schoonover: Ladies and Gentlemen: I am glad to be here to discuss this subject although it is a little difficult to advise you exactly what you should do because of lack of experience with frost protection in avocado orchards and because of locations where frost hazard is relatively light from the standpoint of its occurrence. You don't have frosty years very often but the locations are such so as to make it difficult when we have those kind of atmospheric conditions which bring a freeze.

FIRST—WILL HEATING PAY YOU?

I have tried to get together information and be prepared to make recommendations which should be adequate and give you some basis for making a decision as to whether you can afford to heat your groves. Sometimes I think what I have to recommend to you will be more than adequate and unnecessarily expensive and then when I think of some experiences I have seen, I have about decided that I have not recommended enough protection. Since we don't exactly know, it will have to be taken as a tentative suggestion and will give some idea of what would be adequate and what it will cost.

The first question for the avocado grower to consider is whether or not frost protection will pay. We can safely assume that, so far, no satisfactory method of frost protection for

severe conditions has been developed other than the liberation of heat at a relatively large number of locations per acre over the area to be protected.

The most practical means developed to date for doing this is the use of orchard heaters burning either oil or solid fuel.

I do not consider the present pipe-line heaters well adapted to heating avocado orchards because of the nature of the growth of the trees. This type of heater, as at present developed, would burn trees where they come close together and with the ordinary number of heaters would not be likely to permit sufficient spread of heat through the dense trees. This would result in hot spots near the heaters and cold spots some distance away. It may be that this type of heater could be considered for certain individual locations but the industry, as a whole, should probably depend at present on oil heaters of relatively low-burning rate or on small solid fuel heaters.

COSTS—DEPRECIATIONS

The cost of equipment and fuel reserves will be approximately $2,500.00 for a 10-acre unit with either type of equipment. Depreciation is difficult to figure because the depreciation rate depends upon the amount of burning. The depreciation on solid fuel heaters is much more rapid than on oil heaters during actual firing operations. On the other hand, evaporation of oil from heaters standing in the field represents a fuel loss which is greater than the depreciation on solid fuel.

I have assumed that a 10 per cent charge-off on the total cost of equipment will be a fair figure to cover both depreciation and interest. Growers may increase this figure if they like. This would give an overhead cost of approximately $25.00 per acre per year, to which should be added an annual cost of from $5.00 to $10.00 for handling and caring for equipment, whether or not it is used.

It will be seen from these figures that it will cost an avocado grower from $30.00 to $35.00 per acre per year to be equipped for orchard heating, even though it is not necessary to use the equipment.

HOUR AND ANNUAL COSTS PER ACRE

The cost of operation will run about $1.25 to $1.50 per acre per hour for oil-burning heaters, and about $2.50 for solid fuel heaters. I have no figures as to average number of hours burning required. I think that we may safely assume that, when the operating costs are added to overhead costs, the average total cost will not be very far from $50.00 per acre per year. The grower needs to compare these costs with his average losses in order to reach a decision regarding the profitableness of orchard heating.

EQUIPMENT, FUEL COSTS

Detailed specifications for equipment and approximate costs are as follows:

A. Solid Fuel Heaters. Equipment and Costs for 10 Acres

1000 Medium-sized heaters @ $1.25	$1,250.00
1000 Apple boxes for storing fuel @ 10c	100.00
75 tons fuel @ $15.00 delivered	1,125.00
Kindling	25.00
5 Thermometers @ $3.00	15.00
Lighting torches	10.00
	$2,525.00

These costs do not include a storage shed for fuel reserves. The fuel would be distributed as follows: 25 Ibs. in each heater; 50 Ibs. in each apple box. The remaining half of the fuel should be sacked and stored under cover.

B. Oil Heaters. Equipment and Costs for 10 Acres

600 Heaters @ $2.50	$1,500.00
10,000 gal. storage tank with pump for handling oil	350.00
Tank wagon for distributing oil	100.00
Torches	5.00
5 Thermometers	15.00
Pails for filling	12.00
15,000 gal. oil	600.00
	$2,582.00

While heaters vary in price from about $2.00 to nearly $4.00, I assume that satisfactory heaters can be obtained for about $2.50.

The oil would be distributed as follows: Approximately 5,000 gallons in heaters in the field; approximately 10,000 gallons in a 250 barrel storage tank.

CONCLUSIONS

If the grower is attempting to heat an isolated location, the amount of equipment, as shown in the above tables, should be increased 10 to 15 per cent to provide for extra protection around the borders.

This may seem like an unduly large amount of equipment but it should be remembered that avocados are mostly planted on high ground and oftentimes on rolling ground where heating is difficult under freeze conditions. I believe the equipment will be found adequate especially if the recommendation for a 10 or 15 per cent increase is adhered to in all places where heating is not general. There will be many freezes when the grower will find it necessary to use only about half of the equipment.

Fairly large fuel reserves have been provided but we feel that is necessary because at all times when avocado growers will find it necessary to heat, heating of citrus orchards will be general. Under such conditions it is difficult to get prompt delivery of oil and practically impossible to get delivery of solid fuel.

We cannot recommend the kind of heater to buy. Some growers have come to see me and asked, "Now confidentially, what is the best heater to buy?" So far I have successfully avoided answering those questions, I think, although I had one man tell me that he bought a certain heater on my recommendation. I was naturally greatly surprised because it was not the kind of heater that I would have recommended. In fact, I would have condemned it. He drew the conclusion that, because in order to seem fair, I didn't condemn it quite as much as I should have, my remarks constituted a recommendation. But, after all, his heater did work. All these heaters work. It is hard work to light and tend some of them but when you learn how to work whatever kind you buy you will get results with them if they produce heat and distribute it.

Carter Barrett: Thank you, Warren. Now that's a subject on which there is probably some argument. There will be plenty of opportunity this afternoon to submit your questions.