

Avocado Tree Decline! So What?

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President Hardison, Members of The California Avocado Society, Ladies and Gentlemen:

Do not be deceived. The title of this paper is not meant to be facetious. There is nothing amusing about the premature death or decline of trees in your orchard and it is my intention to treat the subject with the seriousness that it deserves. I am not, however, drawing a long face and weeping with you, either. A disaster has struck many of your trees and orchards, it is true, but there has been enough weeping and wringing of hands (figuratively speaking, of course) but now it is time to bury the dead, clean up the debris, and make a fresh start.

Let the investigation to fix the blame go on, of course. Some day you may take satisfaction in knowing whether your trees died of Melan-or-hiza, Phy-top-thora cinna-momi, denitrification or arrested nitrification, respiratory poisons, the effect of various toxic materials, or, of some soil technological problem of solid, liquid, and gaseous relationship. You will find all of these suspects listed and discussed in the current issue of the Yearbook of the California Avocado Society now in the hands of its members. Suppose we let the big words rest in that volume, where they can be found when needed, take down our hair, so to speak, and admit a few obvious facts. Not for publication, of course—perish the thought—but for purposes of discussion. If we will admit that we have tried to raise avocado trees on some soils unsuited to avocado culture, and that some bad mistakes in management, particularly irrigation management, have been made, we will be near enough the truth for all practical purposes. Once in a while perhaps we can take refuge in the fact that the trouble may have been due to "an act of God" or a neighbor, but not often. Let us state the case as simply as this: most cases of avocado tree decline have been the result of a combination of soil and water—"too little available soil, and, or, too much water."

I am free to admit that I have not had much patience with all the talk and ideas that the so-called avocado tree decline problem is due to some new and mysterious causes. Most of us who have been students of the avocado before, and since it became an important economic crop in California, have noted many failures of trees and orchards due to "too little available soil, and, or, too much water," and have issued many warnings of what could be expected to happen under such conditions. Personally I made enemies among the promoters of avocado subdivisions by predicting the probable failure of their projects and saw my predictions come true. There is little satisfaction, I assure you, in being able to say "I told you so." Every publication or article written on avocado culture by qualified persons, that I have read, has stated plainly that "the avocado will not thrive on soils of inadequate drainage." The most widely

distributed and read publication on Avocado Culture in California, the bulletin of that title issued by the University of California, stated in its first edition over twenty years ago, "The avocado is extremely sensitive to poor drainage." The many revisions and reprintings of that publication have made no change in that statement except to print it in italics and elaborate on it. Perhaps we have been at fault in letting the statement stand by itself instead of backing it up with case histories with names and dates, for the benefit of those of you who have come into the industry since the dead and dying orchards of that earlier date have disappeared and been more or less forgotten. However, no one particularly likes to dig up unpleasant memories and there is also the matter of local pride to be considered. Be that as it may, the fact remains that entire orchards and almost entire districts, and thousands of individual trees of avocado plantings sickened and died with what now would be called "avocado decline," without the recorded fact appearing in the Yearbooks of the California Avocado Association, as the Society was then called. Not until the 1939 issue of the Yearbook is there any mention or use of the term "avocado decline." Since that date the subject has been obtaining increasing space, reaching an all time high, I hope, in the latest Yearbook, with six articles and fifteen pages devoted to it, plus another twelve pages to show what the trouble has not been caused by a lack of boron in our Southern California soils. It is to be hoped that from now on the subject of Avocado Decline will itself go into a very definite decline, and in its place will be more information on drainage and the intelligent use of irrigation water.

If a careful study of the causes suggested for avocado decline is made it will be found that the factors of inadequate soil, poor drainage and too much water are always present. The "too much water factor" may be caused by your own over irrigation and also by that of a neighbor located at a higher elevation, or by the so called "act of God" factor of excessive and long continued rainfall. Just as all orchards in a district might be damaged by a severe freeze, it is also well established that some orchards in the district are more liable to damage than others. The same thing holds true in regard to injury from excessive rainfall. It is conceivable that rainfall could be so excessive and continuous that some damage would occur on the best drained of our orchards. In fact we had a good start toward that situation in December of the past season. Such a situation actually existed in one of the old established avocado sections of Mexico in 1936 as the result of a rainfall three times the normal. It is just as conceivable that all of the orchards in Southern California could be damaged by a freeze. However, neither situation seems imminent enough to be any great source of worry.

The use of the term "Avocado Tree Decline," while being descriptive of the slow death of avocado trees, has been unfortunate in that it gives no clue of the underlying causes, and has added to the air of mystery and doubt prevailing in the minds of many avocado growers. If you still feel that some mysterious and hidden causes beyond the scope of inadequate soil and too much water, and the conditions engendered thereby are causing the decline and death of your trees, this paper will be of little help to you and you will go home from this meeting, as you have from others on the subject, unconvinced and content to wait for some unknown and outside power with a secret formula to solve the difficulty for you. If, however, you will go along with me on the premise of "too little soil, and too much water," at least to the extent that you will agree that the idea has some merit, the following suggestions may be of some small value to

you in working out your problem yourself. This brings me to the "So What?" portion of the title of this paper.

The first thing that I would suggest and urge upon you is to pull out all dead and near dead trees and also all trees that have been in a severe state of decline for a period of two seasons or more. The possibility of their recovery is slight indeed and they will continue to be a source of economic loss, unsightly, and an encumbrance to the land. Also you may learn something of value as to the condition and adequacy of the soil for successful avocado tree growth with good irrigation practice, before you replant. If the depth of the surface soil and subsoil suitable for good root growth is two feet or more in depth it is probably adequate if other conditions are satisfactory. If, however, the surface soil is shallow and underlain by impervious rock or a subsoil through which water will not pass with any degree of readiness, the situation is hopeless and the orchard or spot in the orchard should be abandoned for avocados. Another angle to this shallow soil condition is that as it usually occurs on the higher elevations the usual application of irrigation water will produce seepage lower down in the orchard and cause injury to trees that otherwise might not be injured.

When seepage actually does occur and it can be clearly demonstrated as the cause of waterlogging, it is very good evidence that your trouble may be solved by the use of sub drains. If water will move to a tile line quickly, then a properly constructed tile line will carry it away. If, on the other hand, water moves too slowly through the soil to a tile line to reduce the water content of the soil below the saturation point in a relatively short time, a tile drain may be of small benefit. Also if a tile line cannot be laid at a depth of two feet or more it is doubtful if its cost would be justified. There are indications that a lot of dollars are about to be put into avocado orchards in the shape of tile and crushed rock. I urge you to make a careful study of our conditions and secure the best advice obtainable before making a too extensive and expensive an investment.

Where soils are shallow or lateral movement of water is slow it is probable that a sufficient number of furrows deep enough and steep enough to carry water off at a reasonable rate would be a decided help in preventing the accumulation of water in excess from over irrigation or excessive rainfall. Not that I am recommending such soil types for profitable avocado culture, however. One way to find out whether tile drains are indicated for your conditions or not without going to too great an expense would be to dig the drain ditch to the proper depth and grade and leave it open for one season for observation. If it does not work you will at least be spared the expense of tiles and rock. Personally I am not sold on the use of crushed rock with tile drains. If water will move several feet through the soil to the rock, then it certainly will move the remaining few inches taken up by the rock fill and at the same rate it has moved through the soil to that point. Thousands of miles of tile drains have been installed where drainage is an established practice and without the use of rock. If the use of rock can be avoided a lot more tile could be installed for the same money.

One additional factor in the cause of tree decline and the difficulty in getting replacement trees to grow, particularly where seepage has been a factor, is the possibility of the accumulation of soluble alkali salts in those areas. I respectfully toss this question to our friends at the Experiment Station. If it is a factor, a period of time will probably be required to reduce the quantity of salts after drains are installed.

Our semi-arid soils and the irrigation water at hand contain naturally rather more deleterious salts and substances than we would choose. There is certainly no justification for us to add such harmful substances as borax and salt of our own volition.

Water injury, or probably about 95 per cent of what we have been calling avocado decline, is one of degree ranging all the way from an unhealthy yellowing of leaves, slight dieback, extreme dieback, to sudden collapse and death.

The symptoms frequently show up very suddenly after just such a period of high temperature and low humidity that we have experienced the last few days. The milder cases of injury may be helped over the period of stress following the loss of roots by heavy pruning. At least 50 per cent of the leaf surface should be removed, and more may prove better. If the tree can be saved it will respond quickly following this treatment. If it responds feebly, as most of them will do even without pruning, you will probably be money ahead to pull it out at once. If a tree has not shown good recovery in one season it should be removed and not allowed to suffer along for some years. Be suspicious of the trees now in heavy bloom but without leaves.

The decline and death of all avocado trees cannot be justly laid to too much water. Not enough water is responsible for some of the trouble. I know one orchard where the roots of the trees have been drowned on one side and are thirsting for a drink on the other. The owner will probably install sprinklers sooner or later and drown the rest of the roots. That sounds fantastic, but it has been the history of a number of groves now in a state of decline. Entirely aside from too much or too little water; field mice, gophers, oak root fungus and other diseases, incompatibility of rootstock and scion, all take their toll. Some trees decline and die for no readily explainable cause, just die. The livestock producer expects what he calls a normal mortality in his herd or flock each year, but the orchardist refuses to admit such a thing as normal death loss and perhaps he is right.

Recently, at the insistence of a number of avocado growers, backed up by their money, the Experiment Station has undertaken some additional study of the movement of water in soils, and other factors incident to the decline and death of avocado trees under poor drainage and waterlogging of soils. We trust that some usable information will come out of this study and that drainage and irrigation practice will be improved thereby. We hope that conclusions will be arrived at quickly so that growers who are waiting to have their minds made up may put improved practices in operation, and that the Experiment Station staff may be able to devote more of their very valuable time to other, and in my opinion more pertinent problems of the avocado industry. If a grower subsidy is needed to institute and prosecute experimental work on rootstocks, fertilization, and a more intensive study of avocado diseases, including sunblotch, I could give it enthusiastic support even though being a farmer and a Republican I am just naturally against subsidies.

When new and better information is developed we should make use of it in our orchard practice, of course, but in the meantime let's get going with the information on soils, drainage, and irrigation practice which we already have. It is pretty good stuff, really, and is readily available to you through your Agricultural Extension Service. If the information which we already have is accepted and put into practice, the present indications that we have of water injury in our orchards due to "too little soil and, or, too

much water" will soon be another chapter in the history of the development of the great avocado industry of California.

This is **my** answer to the "Sixty-four Dollar Question," Avocado Tree Decline! So What?