

## **Training and Pruning Avocado Trees**

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In considering this subject, I wish to emphasize one point above all others. That point is that those now listening to this presentation should remember that any suggestions made must be interpreted in the light of their own individual conditions, and not taken as set rules to be applied anywhere, regardless of conditions. All of the facts available today point to the conclusion that most of the methods of training the heads of avocado trees are applicable under some conditions but none of them are suitable to all conditions. I make it a point in giving advice to my own clients, to do so only after a careful study of the factors affecting the growth of the trees in their particular groves, and I would urge all growers to determine with great care the adaptability of a system to their own conditions, before applying it to the pruning of their trees. It is the old story, "what is one man's meat is another man's poison."

When setting out young avocado trees and deciding on a policy for heading them and forming the permanent structure of the limbs that will have to carry the great loads of fruit hoped for and generally realized at some time, the owner should sum up all the factors that will affect the trees, particularly in their formative years. Some of the most important of these factors are depth and character of soil, cold, wind exposure, severe hot spells, ease of picking the fruit; type of irrigation and cultivation to be used, convenience of spraying and fumigation, and the fruiting habits of the variety.

Much consideration should be given to the effects of soil conditions on the eventual size of the trees. Trees planted on deep open types of soil, with fine drainage, will, with adequate care, be very large and vigorous. By large trees, I mean trees that will be forty to sixty feet high, and with a thirty to fifty foot spread at twenty years of age. On the other hand, trees grown on soils ranging from eighteen inches to three feet in depth, and often with rather poor drainage, will never attain great size, even granting that their health may be normally maintained. There are, of course, many variations between these extremes. It is hardly necessary to say that the large tree will need different treatment from the small one, not only because of the problems inherent in such size, but because the more rapid growth of the wood will give it a different tensile strength.

Cold and wind are two factors that will require rather similar treatment. Experience seems to indicate that a low-headed, compact tree with the limbs so spaced as to eliminate split type of crotches will stand the terrific punishment by some of our desert windstorms much better than high headed, more open trees. A compact foliage would seem to offer more protection from frost, also, because the latent heat of the tree is more closely held.

In certain inland districts the severe hot spells should also be taken into serious consideration. In such districts it is important that the limbs be well shaded by foliage to avoid the disastrous sun-burning that will otherwise result. If this burning does occur, the burned spots must have detailed attention not later than the following spring

pruning. The smaller twigs and limbs so affected should be removed. The work of termites on many of these scarred limbs, where they have not been carefully treated, is often responsible for severe breakage and the opening up of large holes in the foliage which cause even greater damage of like nature. If severely burned, the smaller limbs will become very droopy, and such a condition endangers the well-being of the tree.

The question of picking ease is a very vital one in determining what type of head is to be employed. From this standpoint, the ideal tree is low-headed and spreading, which is quite practical where the trees are being grown on poor or shallow soil and will remain relatively small. However, trees that are grown on deep, rich, well drained soil will eventually become so large, in spite of almost anything that can be done, that picking becomes a real problem, even with the best tools and aids that can be devised. Trees of this sort, with their tremendous spread and more brittle wood will have to be considered primarily from the standpoint of mechanical strength, as it becomes impossible to confine them to any height or space that will allow of picking from the ground or with simple tools and low ladders. At present there is really no satisfactory answer to the picking problem of a tree twenty years old with a height of from forty to seventy feet. The fruit in the tops of such trees, is practically inaccessible for economical picking. If such trees are headed back, unless the work is very carefully done and followed up at short intervals of at least every three months during the growing season, the result will be worse than leaving them alone; because the natural tendency of the tree to restore the balance of the foliage with the root system will cause shoots of great vigor to spring up in the tops of the trees, rising straight and slender into the air with little or no side branching for twenty or more feet. This is obviously an impossible situation, as such shoots cannot even be safely climbed.

The general type of irrigation and cultivation is also to be taken into consideration. If no cultivation or very little is to be done, and the water is to be applied by means of sprinkler heads or some system not requiring the movement of tools through the orchard, then, if properly spaced to avoid crotches that break easily, the limbs may be allowed to spread more widely from a point low on the trunk. A low vase type of head may be formed that will facilitate picking and be more resistant to high winds. Where much cultivation is to be done and the water run in the conventional furrows, it is generally necessary to plan a head that will allow the lower limbs to clear the tools used. This usually means that a modified central leader type of tree will be the strongest and most easily controlled.

Along the coast, low headed, compact trees are very desirable, for in those areas latania scale and other pests call for fumigation, dusting and spraying. So far this problem can usually be met, in the foothill or interior areas, by keeping the trees well opened to the filtration of air and sunlight. As it is in these areas that the trees attain great size, this is a most fortunate situation.

Finally, the physical condition and health of the tree must be considered. Unless a tree is growing normally and vigorously, the best plan will fail, and cutting is dangerous and useless. Soil deficiencies or the excess of some mineral element such as boron will immediately upset any pruning system.

It is also well recognized that the effects of pests and diseases cause drains on the

trees that will defeat any pruning work. In this connection, I want to say in regard to the Fuerte variety, which constitutes the main body of all of our plantings, that I am inclined to believe a very large percentage of the trees are affected with sunblotch or a very similar trouble in a latent or incipient stage. This accounts for the sprawling, unmanageable type of growth so often encountered which gives the Fuerte variety such a bad name from the structural standpoint. This opinion is the result of many observations in many different areas and over a long period of time. It explains why so few of the trees are unable to make an upright, well balanced head. In many cases, particularly in the earlier years of the Fuerte variety there are practically none of the recognizable symptoms of sunblotch. Afterwards, when under some severe stress the type succumbs to the trouble, one wonders how it was infected when no transplantation of tissue has taken place. In nearly every case this occurs in trees that have sprawled in unnatural positions. Most groves have a few Fuerte trees spotted here and there which have grown upright and have a well balanced head without undue attention. I am inclined to believe that if we are very careful in the securing of rootstocks and buds that are really free from this trouble, that many of the structural difficulties associated with the Fuerte variety would be overcome. It is certainly quite as important to the prospective grower that his trees be free from this taint as to know that they are from record trees.

From this point on, I propose to offer you such suggestions and theories as have been developed in a rather wide and long experience. I will make these suggestions under the headings of young trees, older trees and topworking.

## **PRUNING YOUNG TREES**

I believe in moderate staking for the first three years under average conditions. By the end of that time the tree should stand by itself and have a well developed central leader. In the fourth year, this leader will have reached a height that will probably call for heading in such a manner that the tree will thicken in the trunk, but the leader will be able to carry the trunk upwards. It must be recognized in the beginning that the young tree arriving from the nursery has not only suffered a great shock, but in cutting off the major portions of the top and root system, it has also suffered the loss of much of the stored up food materials that enable the tree, normally, to make its next period of growth. The first growth that it puts out after being planted is made entirely by means of such stored up materials as are left in the tree. Necessarily this growth is limited. After the first thrust of growth, the new foliage has to manufacture and store a new supply of food before next thrust of growth can take place. This will be a little longer and more vigorous. This cycle must be completed a number of times before the tree regains the equilibrium which it had before being balled. Consequently, in most cases, the full period of recovery takes from, one to two full seasons. In the meantime, unless all conditions are very favorable, the trunk and branches that have come from the nursery are very much hardened and the bark is very tight. This does not allow for normal expansion when the tree has accumulated sufficient reserve to really start growing. The first signs of recovery from the shock of moving are the strong shoots that inevitably appear somewhere on the trunk, generally from a point close to the bud union. Right here is where the average grower gets into trouble, for he does one of two things, either

of which is wrong. He either neglects the shoot altogether, allowing it to run out horizontally and absorb most of the tree growth in a very poor position, or he promptly cuts it off entirely. What he should do in the majority of cases is to head the old top back, gradually removing it altogether as the new shoot develops and lightly staking the new shoot in an upright position until it is safely started. This is necessary because of its soft, rapid growth. It will soon make a fine head with the minimum of difficulties to be overcome, and will then make consistent growth without the pauses which cause further hardening of the bark.

If young trees are treated in this manner, there should be light staking during the first year or two after planting as otherwise the old top will wind whip too much. There should be practically no pruning during these first two years as every leaf counts in the building up of the new plant food reserve. The new shoot started into a new top during the second or third season will need light staking for a short time only. No staking should be necessary by the fourth season. By that time the trunk should be thick and sturdy enough to carry the top, but the main leaders will need to be shortened to reduce weight and allow them to stay in an upright position. At the third pruning or at the beginning of the fourth season it is also advisable to head the central leader in most cases.

In pruning and forming the heads of trees grown according to this method there are three elementary considerations—the removal of low spreading limbs that will trail on the ground; the cutting in such a way that there will be light and air filtered throughout all portions of the tree, and the avoidance of such undue exposure of trunk and limbs as will cause serious sunburning. Before any cutting is done the pruner should walk entirely around the outside of the tree, getting a thorough idea of its contour and balance and then should step inside the tree and study its framework. He is then ready to proceed with the actual cutting. Limbs growing from the trunk at a low level should be gradually removed after the second season so that there will be no great loss at any time. Heavy laterals that seem properly placed to make permanent framework should be cut so that they will not be carried down by weight on the ends or twisted over sidewise. If a vigorous secondary limb is shading and bearing down with its weight on a primary lateral, it should be at least partially removed, otherwise it will cause the loss to the permanent framework of this primary limb. Limbs that are crossing the tree out of their proper position in the framework should be removed, or controlled so that they will not cause the other side of the tree to be shaded out or borne down by weight. The removal of such limbs often solves the light and air problem. Often when the main terminal or leader carries a heavy load of fruit it bends down across the tree and has to be shortened. Sometimes heavy growth on the side of the tree getting the most sun or away from the strong desert wind will have to be lightened to preserve balance. If it is desirable to slow up the growth of a limb, cut to a group of small limbs or twigs, but if you wish the growth to continue rapidly, cut to the outermost of several strong internodal buds. Because of the heading that is necessary and the tremendous growth of the trees, it is vital that the spring pruning be followed up in midsummer and the excess shoots removed.

There is another system that is followed successfully under some conditions. Recently we saw some very good specimens of trees handled in this fashion at Dr. Coit's ranch at Vista. The trees are headed back low as they are set out, being cut to the top of a

series of strong internodal buds. The strongest of these buds will throw out new shoots, and with a little pinching here and there, will form a new head with little or no staking. This system is more practical on soils that do not force too rapid growth. As soon as the young trees are well started into real growth, the decision has to be made as to whether the vase type or the modified central leader type of head is to be used. The choice will depend on how large you think your trees are going to grow under your conditions, and the consideration of the other factors already discussed. If the tree is likely to attain great size, I would certainly favor the central leader type as a general rule, i.e., a central trunk with the limbs radiating from it. It has greater structural strength. Once you have definitely formed the head, a little light pruning as it is needed should be all that is required, and no heavy limbs should have to be removed.

Where a certain system of pruning is followed year after year, certain limbs or portions of the tree will often be left one year with the full knowledge that they will have to be removed later on. This allows the tree more leaf surface with which to elaborate plant food, and yet does not interfere with the formation of the framework ultimately desired. Thus an annual pruning towards a set objective conserves the growth of the tree. If the pruner is working on a long neglected tree, and expects to have only one chance at it, he will, in the nature of things be forced to cut more heavily than he otherwise would.

Unfortunately, many of the trees in the older groves are suffering from the fallacy held by many growers that avocados should not be pruned. When the grower is finally forced to do something, to correct the neglect of years, he has to cut too heavily. If avocados are started right, I believe that a little light pruning consistently administered, as the need is shown by the tree, is all that is necessary. Such cutting as is done should remove any dead wood that comes from shading in the interior of the tree, remove any limbs that are crossing out of their proper position in the tree, and keep the tree open to the filtration of light and air, without exposing sections of it to sunburning. This opening up of the foliage is vital to fruit production and pest control. Limbs should be sufficiently cut so that they will clear the ground, for much the same reasons given above and to allow free passage through the grove. If trees are consistently well treated from the beginning, there should be no need for heavy pruning save through accident. Needless to say, all wounds made on an avocado should have the most careful treatment, as the wood is soft and readily decays. Such decay is usually followed by termite infestation.

Light correctional pruning should be done whenever the owner sees the need for it, but a long experience would lead to the conclusion that the main pruning of the year should be done in early spring. The exact time will vary with the seasonal growth and with the location of the trees. Roughly this time is between March first and April fifteenth. The reasons for this opinion are as follows: It is necessary to wait until the danger of frost damage is passed. Heavy pruning should be done before any great amount of spring growth starts, or the flowers open to any great degree, so that the full thrust of the spring growth will be used to the best permanent advantage. It should be as early as the other limitations allow, so that the uncovered limbs will have opportunity to cover themselves before the severe hot spells of the later season occur. In the Fuerte variety most of the crop can be picked by this time, or at least removed in a mature condition from the cut limbs, so that there need be no crop loss. Apparently heavy removal of wood has least effect on the setting of the new crop if done at this time, and may act as

an actual aid in eliminating a considerable portion of the heavy drain of the blossoming period.

Older trees (ten years of age) pruned for the first time last year, about April first, and which had to be severely cut, showed no ill effects in the amount of crop set, and the quality of fruit was well above the average for the surrounding unpruned groves. It is very essential that trees heavily pruned in early spring be gone over in mid-summer to thin out resulting excess shoots and to make such other corrections as will be readily apparent. If this is done it will save a considerable waste of growth in the next season's pruning.

### **PRUNING OLDER TREES**

Older trees which have become very flattened and exposed in the top, without any upright leaders, and are not diseased may have the top rebuilt in one of two ways. Either a strong shoot which may be used as a central leader, may be forced from the trunk by opening up the top to light and girdling the trunk, or much the same treatment may be applied to well balanced and spaced laterals to force up a new leader on each of them, later to be tied together with wire into a center ring.

### **PRUNING TOP-WORKED TREES**

And now we come to the forming of new heads on top-worked trees. In the first place, while I use all of the methods suggested at one time or another, I prefer a side graft that does not destroy the old top, until one is certain that the grafts are going to grow, and that does not entail such a severe shock to the tree. Formerly most topworking was on seedlings, but much of it today is on budded trees which have shown themselves to be unsatisfactory to their owners. I feel that it is wiser to graft below the original bud union, if not too difficult, especially if there is any sign of lack of congeniality, but I would not say that it is absolutely essential. A great many topworked trees having two bud unions are making fine vigorous trees and bearing good crops. If the tree is not too large, I very much prefer to grow the new top from one scion placed in the main trunk, though usually more scions are placed for the sake of insurance. If the trees are as large as some that I have in my care at present, about two feet through at the ground, I believe that, even in a windy country, it is better to go up into the main limbs to place the scions because of the size of the cuts to be cared for and the need for feeder limbs. I am still unconvinced that it is wise to cut a two foot tree off close to the ground and place scions there, as I am afraid that no matter how carefully the work is done, or how closely followed up, that fungus troubles will develop due to the length of time before such a large wound is completely healed.

In reference to the very large trees mentioned above, I have pursued a policy which appeals to me as being reasonable but still needs time to prove. The trees are located in a very hot and windy district. My idea has been to put the grafts in, get them thoroughly established, but not to force them too rapidly during the first season. By leaving a great deal of top on the old tree the grafts were better protected from the heat of late summer and have withstood the winds of late fall and winter better. This spring

we are cutting the old tops practically back to the grafts, which will get the full advantage of the flush spring growth, and be able to care for themselves in any weather. The grafts are so placed on the major limbs that there will be a minimum of staking in the early stages and of wiring later on.

There is a final point that I wish to make about these trees. They are located in a district subject to great heat and high winds. We had two days of 115 degree weather last summer and three winds as bad as any I have seen. A year ago the trees were a miserable sight, due to three years' neglect, but they were on deep soil and survived, and under exceptionally good care the physical condition improved remarkably in six months. So much so in fact, that I am going to state that trees in thriving condition need not lose their crop in such severe heat. With the exception of a few weak trees, these did not. As for the wind, it left no noticeable traces and dropped very little fruit.

The tools most commonly needed in pruning avocados are: hand pruning shears, California folding saw, pole pruner, 8 or 10 foot picking ladder, walnut pruner saw blade in two handed handle, pruning knife, mallet and chisel or gouge, steel brush for cleaning saw cuts, scraper, pliers, melter for grafting wax. The most satisfactory covering for wounds is hot grafting wax, composed of beeswax and resin in about equal parts, perhaps a little more resin than beeswax. Fairly satisfactory results can be obtained with the better asphalt emulsions.