

Book 1

Chapter 6

Planting the Avocado Tree

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Avocado trees, especially those with rootstocks that are propagated clonally, have rather weak root systems and large sections of the root ball may break off during planting. This problem, along with susceptibility to water-logged soils, and dry soils, makes the correct planting of the avocado tree a crucial step in the successful establishment of the grove.

Site Selection. The first step in planting avocados is to select a site that provides at least a reasonable chance for success. A site should be selected for planting that is not prone to frost in the winter, is protected from the wind, and has good soil drainage (see Chapter 5 for further detail). While most growers of avocados understand the importance of climate, the necessity for good soil drainage is often overlooked.

Avocado roots have few root hairs, making water uptake into the roots relatively inefficient. Therefore, avocados need plentiful soil moisture to grow, but excess free soil water (defined as a state in which drainage is impeded leaving excess water and little air between the soil particles) begins to suffocate roots and provides a medium for the zoospores of the root rot fungus *Phytophthora cinnamomi* to attack the roots. Even without the fungus, avocado roots will begin to die from lack of oxygen after 48 hrs of flooding.

In Southern California, soils should have free drainage for at least 3 feet in depth. This means that, if possible, there should not be any clay layers, hardpan layers or solid rock layers in areas where trees are planted. Most hillsides have rock in the subsoil, but the rock is usually cracked or fissured allowing free drainage. Some slopes, however, have solid, un-cracked rock just inches below the soil surface and the water-logged areas just above the rock have been blamed for the rapid spread of root rot in some groves.

Tree Spacing. The goal in planting an avocado grove is to maximize light interception by the tree canopy as quickly as possible, but this is balanced by the need to maintain a full productive canopy at tree maturity. Generally, in California, tree spacing has usually been set at a 20' x 20' spacing (probably influenced by the fact that PVC irrigation pipe comes in 20' lengths), but many groves were also planted at a 15' x 20' spacing, with the 15' spacing between trees on the irrigation line, and 20' spacing between the irrigation lines. The 20' x 20' spacing will have 109 trees per acre. The 15' x 20' spacing will have 145 trees per acre. The advantage with the closer spacing is that yield would be greater in the early years, and every other tree would be removed when canopies start to crowd. Unfortunately, many growers did not remove the trees at the proper time and the groves became very crowded, with production only in the upper canopy.

It has been suggested by Reuben Hofshi (Hofshi 1999) that Hass avocados might be grown on a high density close spacing, the benefits being improved yield per acre and less costs for harvesting. Hofshi has been experimenting with other avocado cultivars that have a single dominant trunk (Lamb Hass, Reed, and Gwen) on a 7.5' x 7.5' spacing and has dramatically increased yields per acre. Reed yields from Hofshi's planting were reported to be 2-3 times higher in the third to sixth year after planting than has been previously recorded in avocado production (Whiley 2002). Hass with its more spreading growth is difficult to maintain on a close spacing without excessive pruning removing fruiting wood.

Mounding can improve soil drainage immediately under and around the root ball. Mounds are built with about 2/3 cubic yard of soil and the tree is planted into the top of the mound. Trees are irrigated with drippers on the top of the mound, or with 90 degree spitters aimed at the base of the tree. Some growers used small bulldozers to shove soil to one side to build long continuous mounds. Of course, the ground must be relatively flat in order to use bulldozers. Mounding is useful for starting trees, but trees will eventually have their roots into the native soil. For long term health of the trees, it is better to plant a site with good internal drainage.

When to plant

Avocados can be planted any time of the year, except when frost is a problem. Trees are best planted in the spring; roots usually flush in May so it is best to have the trees in the ground in March or April. If trees are planted in the summer, careful irrigation must be maintained until roots grow into the surrounding soil. This means that trees will usually have to be watered every two to three days in the summer, but care must be taken not to over-water.

When the trees arrive

As soon as the trees arrive, examine the bottom of the root balls by removing a few trees from the pots or sleeves (very carefully!). If roots are found that have dark brown discolorations in the interior of a given feeder root, then a lab or a University farm advisor should take root samples and have them examined for Phytophthora. In previous years, on rare occasion, some nurseries had trees that were infected with Phytophthora root rot. This hasn't been the case in recent years, but it is still a good idea to double-check. Once the trees are planted, and trees start to die, the source of the root rot cannot be determined.

If the trees are not planted immediately after arriving from the nursery, keep the trees in a well-protected area and water them daily. If the sides of the pots are exposed to full sun, especially in the summer, the pots should be shaded to keep the roots cool. Do not store the trees on plastic because root rot fungi may spread from pot to pot in the water. It is best to store them on a raised bed of gravel, away from mature avocado trees that may have root rot.

If trees came directly from under shadecloth at the nursery, trees should gradually be moved into stronger light over a two-week period.

Planting procedure

Digging the holes. Holes are dug after the tree spacing is marked out and the irrigation system has been installed. It is best to pre-irrigate the soil to make it easier for digging. On flatter ground, a tractor-mounted post-hole digger can be used. A two-man power post-hole digger is often used on moderate slopes, but these are difficult to use when there are rocks in the soil. On the steep slopes, holes are usually dug with a shovel. If post-hole diggers are used in heavy soils, the sides of the holes should be scratched with a narrow shovel to break up the slick sides before planting. The holes should be dug about the same depth as the root ball. Deep holes that are backfilled with soil will usually lead to the tree settling and the graft union may sink below the soil line. The width of the hole should be about 2-3 times the diameter of the pot or sleeve.

Carrying the trees to the site. It is tempting to carry the trees to the planting site by grasping the trunk and lifting, but trees will be ruined if the scion breaks off at the graft union. Also, with open bottomed sleeves, large chunks of soil and roots may break off. The correct way to carry a tree is to carry one tree at a time, with one hand supporting the bottom of the root ball and the other hand supporting the side of the pot or sleeve.

Placing the tree in the hole. If the tree was grown in an open-bottomed, polythene sleeve, the tree is placed into the hole with the sleeve intact to support the roots. The tree is positioned so that the ball is resting on firm soil to avoid settling, and the top of the potting mix is slightly above the soil line. The sleeve is then slit with a knife and the sleeve removed. (If the tree was grown in a pot with a bottom, the tree is gently pulled out of the pot after rolling the pot on the ground to separate the roots from the side of the pot. Then the root ball is gently placed into the hole).

Filling the hole with soil. Through experience we have found that it is unnecessary to add composts to the backfill mix. In some situations, where manures have been added to the backfill, the salt and ammonia gas emanating from the manure have been responsible for root death and poor tree growth.

Moist backfill soil is packed into the hole to fill 1/3 of lower space in the hole. The soil is tamped down with hands or the end of a shovel handle. Tamping is necessary to remove air pockets and insure that the roots come in contact with the backfill soil. If the backfill soil is dry, the hole should be filled with water immediately after filling the lower 1/3 of the hole, and allowed to drain. When drained, the rest of the backfill soil is added and tamped until the hole is filled, leaving a slight basin to contain water. The upper surface of the ball is left uncovered by soil so it can absorb water readily. A final irrigation is then done which will fill the basin. If a dripper is used for irrigation, it is important to have the dripper placed on top of the ball so that water will run into the ball.

Mulching. The young tree is then mulched with several inches of straw or wood chips for moisture retention and cooling of the soil. Manure is not used as a mulch because it usually adds too much salt to the soil. Straw with some horse manure (fresh stable bedding) is usually acceptable as a mulch. Since mulch cools the soil, mulching is useful in the summer, but not in the winter. Young trees that may be subjected to frost should not be mulched in the winter; this allows the sun to warm the soil around the tree during the day.

Wrapping. A thermal wrap (available from farm supply stores) is placed around the trunk to prevent sunburn in summer and to provide some frost protection in winter. The wrap should be removed after the first year.

Staking. Most trees come with a thin bamboo stake from the nursery, but these are little use in supporting a growing tree in the field. It is best to support the young tree with two stakes, one on each side driven into the soil outside the root ball. The tree is loosely tied between the stakes with 1 inch wide grafting tape. Most growers, however, use one stake per tree (a substantial 2" x 2" stake) and in most cases (non-windy areas) this is sufficient.

Irrigation. Over-watering, and under-watering, are probably the most common reasons for tree failure at planting. The ball should never be allowed to dry out. Remember, trees get watered often in the nursery, but when planted as inter-sets in a grove, they often get watered once a week, usually with too much water. Thus, they are alternately being drowned, and allowed to get too dry between irrigations.

Trees should be watered with enough water to thoroughly wet the ball every few days. Under most conditions, 5 – 10 gallons per week split into 2 – 3 irrigations per week is sufficient. As mentioned, it is important for water to wet the ball. Irrigation should be done by drippers next to the trunk, spitters aimed at the trunk, or a mini-sprinklers in the microspray mode.

Weed Control. Weed control is important because weeds steal water and fertilizer from the young tree. Weed control should be accomplished by mulching and hand weeding. Herbicides are not recommended during the first year of growth.

Fertilizing. Trees are usually not fertilized at planting time, although a cup of a slow release fertilizer in the hole at planting is probably useful. Fertilizing is normally started about four weeks after planting with a half cup of urea every 4-6 weeks during the growing season. Total actual nitrogen for the first year should be about ¼ lb N.

LITERATURE CITED

Hofshi, R. 1999. High Density Avocado Planting - An Argument for Replanting Trees. *Subtropical Fruit News* 7(1): 9-13.

Whiley, A.W. 2002. Chapter 10 - Crop Management. Whiley, A.W., B. Schaffer and B.N Wolstenholme (eds.) *The Avocado: Botany, Production, and Uses*. pp. 231-258.

The Proper Method to Plant an Avocado Tree



Figure 1. The hole is dug twice the width of the rootball; the depth of the hole should be about the same depth as that of the rootball. The depth is measured with a shovel handle.



Figure 2. If the tree comes in an open-bottom sleeve, the tree with the sleeve is carefully set into the hole. If the tree comes in a pot with a bottom, the tree is carefully removed from the pot and set into the hole. The bottom of the rootball should always be supported with a hand to prevent breakage of the ball and loss of roots. The top of the rootball should be slightly above the grade of the surrounding soil.



Figure 3. The sleeve is cut with a knife. The cut should not be deep in order to avoid damage to the feeder roots.



Figure 4: The hole is partially filled with soil while the sleeve is in place. The sleeve is temporarily left in place to support the root ball.



Figure 5: Don't forget to remove the sleeve!



Figure 6: Soil is backfilled into the hole. Mulch and soil amendments are not added to the backfill to avoid problems with excess salinity and ammonia gas.



Figure 7: The fill is completed with tamping of the soil to eliminate air pockets.



Figure 8: When re-planting in root-rot infested soil, it helps to add gypsum around the base of the young tree. Gypsum is applied at the rate of 10-20 lbs per tree.



Figure 9: A wood or bark-based mulch is applied around the tree to complete the planting process.