

PLANNING AND MANAGING MORE INTENSIVE AVOCADO ORCHARDS

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Introduction

Avocado trees have a tendency to grow vigorously and develop into large trees. In certain climatic regions and with fertile soil conditions this situation will be exacerbated. Such trees no longer comply with the economic and commercial realities of the day. The ideal today is more intensive orchards that produce commercial yields at an early age with smaller tree dimensions that facilitate labor and mechanical activities in the orchard.

It is clear that there can be little likelihood of success unless a planned tree manipulation program with the correct planting and tree training system is followed. Tree pruning can be applied mechanically, selectively or as a combination of the two, while bending, cincturing, chemical inhibition, nutrient supply, irrigation and especially yield are contributing “tools” to complement tree manipulation efforts.

Orchard planning

A hedgerow with north/south row orientation is recommended as the most suitable orchard system. Plant spacing must be logically planned. The following general guidelines are given in Table 1.

The avocado tree lends itself to being trained as a central leader. This does not imply that a multiple leader system cannot be used especially where the tree spacing within the rows is 3.5 m or greater.

Table 1. Recommended plant spacing for avocados under normal management situations.

Cultivar	Spacing	Trees per hectare
Fuerte	7.0 m x 3.5 m	408 trees/ha
Hass	6.0 m x 3.0 m	556 trees/ha
Pinkerton	5.0 m x 2.5m	800 trees/ha
Ryan	5.5 m x 3.0 m	607 trees/ha
Edranol	5.0 m x 2.5 m	800 trees/ha

Tree shaping and training

The tree must be developed as far as possible in the nursery by selecting or forcing a strong vertical shoot just above the graft union. If the shoot is allowed to develop rapidly lateral shoots will develop more horizontally with a natural balance relative to the leader. If the trees from the nursery have the wrong structure, early corrections must be made.

The trees should be planted in late winter or early spring to perpetuate strong growth. Fertilize monthly with small amounts of nitrogen to keep the growing rate constant for better shoot development. Initially it is very important to develop the leader. In the case of a mul-

tip leader tree the same basic rules should be followed except that two or more leaders are initially developed. Thereafter, while it is important to protect the leader it is also important to also develop sufficient complexity in the side shoots with lateral branching. The branch hierarchy of the tree must be maintained by developing a wider base with the higher shoots being sequentially weaker and shorter.

The following needs to be done:

1. remove strong growing side shoots that are more than 1/3 the thickness of the leader and other shoots that compete with the leader
2. remove all shoots with acute angles to the vertical axis
3. tip all side shoots each time they have grown 200 mm in length to force lateral growth if necessary
4. ensure that horizontal shoots are evenly dispersed in a spiral formation. For good light penetration into the tree no shoot should be directly above another shoot.

Tree management

Cincturing (girdling) vigorous growing trees in the autumn after the first growing season may help to force the trees into bearing. Continue to remove water-shoots during the second growth season, maintaining the branch hierarchy and developing tree complexity while ensuring good light penetration.

When about 50% of the tree has developed vegetative flushes, approximately 50 mm in length, the young flush can be sprayed with a plant growth regulator which inhibits growth inhibitor, if necessary. Various growth inhibitors are currently being investigated. *(Editors' note: At the current time the use of plant growth regulators for such use are NOT approved for use in California. CAC/PRC is currently funding research examining the potential of PGRs for California avocados.)*

After harvesting, trees are pruned in order to:

1. shape the trees and control tree height (tree height must not exceed 80% of the width of the work row)
2. remove water-shoots and other upright growing shoots
3. selectively remove branches to open up the tree for light penetration.

During the growing season the spring and summer flush should be controlled by very lightly pruning the terminal growth (tree shaving).

Yield results

In Table 2 the yield results are given for the more important cultivars that have been trained according to the above methods and at two plant densities. Significant differences have already been obtained with 'Hass', 'Pinkerton' and 'Edranol', for the different plant densities.

Pruning equipment

Tree pruning must preferably be less labor intensive. Various mechanical or semi-mechanical techniques have been examined to speed the process and make it more cost effective. It will, however, always be necessary to annually make certain selective cuts especially to enhance light penetration into the inside of the canopy.

Table 2. Yield (tons per hectare) over three seasons for five avocado cultivars planted at two spacings in October 1995 and trained to a central leader.

Cultivar	Tree Spacing (meters)	Year (tree age)		
		1997 (19 months) Tons/Ha	1998 (31 months) Tons/Ha	1999 (43 months) Tons/Ha
Fuerte	5.5m x 3.0m	0.00	3.11 a	6.25 a
	4.0m x 1.5m	0.00	3.39 a	5.33 b
Hass	5.5m x 3.0m	0.50	4.87 a	9.34 a
	4.0m x 1.5m	1.20	8.77 b	13.60 b
Pinkerton	5.5m x 3.0m	0.67	7.03 a	8.07 a
	4.0m x 1.5m	1.35	12.37 b	9.26 b
Edranol	5.5m x 3.0m	0.00	6.08 a	17.2 a
	4.0m x 1.5m	0.00	7.54 b	22.4 b
Ryan	5.5m x 3.0m	0.00	4.96 a	11.9 a
	4.0m x 1.5m	0.00	5.80 b	13.8 b

Conclusions

Avocado trees can be shaped, trained and maintained with simple practical manipulation techniques to end up with an effective and labor-friendly orchard. To optimize light utilization and simplify orchard operations, it is suggested that central leader pyramid shaped trees are planted at a density of 600 trees/ha or more in a rectangular pattern with a north/south row orientation. Multiple leader trees with two to three leaders can be developed in orchards with densities lower than 600 if preferred. Harvest data are currently available only for four harvest seasons or less but indications are that there is merit in this philosophy despite errors made during the initial development stages.

Cultivars such as Hass, Pinkerton and Edranol can easily be maintained within spacings of 5.5 x 3.0 m to 4.0 x 1.5 m. The higher densities are at this stage experimental to refine manipulation techniques, but are providing useful information. This information will be used in the future for planning more intensive orchards for certain cultivars.

Pruning is not a one off process and must be carried out at different times during the season but should only consist of light pruning that can be done semi-mechanically for cost efficiency and for saving time. The frequency will be determined by the cultivar and growth vigor. During the spring and summer months attention must be given to water-shoots. A light shaving action will help to bring about a more uniform flush.

Soils with a high nitrogen retention capacity necessitate more drastic pruning actions and this has a negative influence on yield in the initial years if narrow spacings are involved.

Cincturing and plant growth regulators may be of value as additional “tools” to manage growth, especially under conditions that promote plant vigor. In the case of growth inhibitors, registered application recommendations and zero residue tolerance must be strictly complied with. Good nitrogen management and tree fruit load, however, remain the more acceptable ways of controlling growth vigor especially on normal potential soils (less than 25% clay).

Combinations of selective hand pruning and mechanical pruning are currently being further investigated to enhance the pruning process.