

Planning and managing new avocado orchards

B Snijder, J M Mathumbu and P J C Stassen

ARC-Institute for Tropical and Subtropical Crops, Private Bag XI7208, Nelspruit 1200

E-mail: Bram@itsg2.agric.za

ABSTRACT

Square planting of avocado orchards was normally practiced until very recently. With the vigorous growth habit of certain cultivars, high potential soils and favorable climatic conditions, these orchards reached an overcrowded stage before economic crops could be harvested from the trees. This condition does not comply with the economic realities of the day. It is therefore suggested that a different approach should be applied to new orchards. Rectangular configurations with a proper tree training system to develop a hedgerow system has given better results in terms of tree size control and more efficient light penetration into the orchard. A north-south direction of the rows is very important.

It was also shown in the research conducted by the ARC-ITSC over the past five years that avocado trees could be trained into a central leader. These trees give rise to higher initial yields, while tree size and light interception and penetration by and into the tree could easily be maintained. In this paper the basic principles and practices regarding the planning and managing of new orchards are discussed. Additional practices such as cincturing, use of bio-regulators and nitrogen management are also briefly discussed as manipulation tools to control vigour and induce yield. The most important and effective manipulation tool is yield.

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 labour 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 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. The avocado tree lends itself to being trained to a central leader. This does not imply that a multiple leader system cannot be used especially where the tree spacing within the row is 3,5 m or greater. Plant spacing must therefore be logically planned. The following general guidelines are given in Table 1.

Table 1 Recommended plant spacing for avocados under normal management situations

Cultivar	General spacing	Trees/ha
Fuerte	7 m x 3,5m	408
Hass	6 m x 3m	556
Pinkerton	5 m x 2,5m	800
Ryan	5,5m x 3m	607
Edranol	5 m x 2,5m	800

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 tree 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 multiple leader tree the same basic rules should be followed except that two or more leaders are initially developed. Thereafter it is important to protect the leader but to nevertheless develop sufficient complexity of 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
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 vigorously growing trees in the autumn after the first growing season may help to force the trees into bearing. Always use a spiral cincture to avoid breakage at the point of cincturing. Continue to remove watershoots during the second growing 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 growth inhibitor if necessary. Various growth inhibitors are currently being investigated.

After harvesting the 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 watershoots 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 flushes should be controlled by very lightly pruning the terminal growth (shaving).

YIELD RESULTS

In Table 2 the yield results are given for the five commercial 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.

Table 2 Yield results (t.ha⁻¹) over three seasons for five avocado cultivars planted at two spacings and trained to a central leader.

Cultivar	Spacing planting date (Oct 1995)	Yield (t.ha ⁻¹)		
		1997 (19 mnths)	1998 (31 mnths)	1999 (43 mnths)
Fuerte	5,5m x 3m	0.00	3.11 a	6.25 a
	4m x 1,5m	0.00	3.39 a	5.33 b
Hass	5,5m x 3m	0.50	4.87 a	9.34 a
	4m x 1,5m	1.20	8.77 b	13.60 b
Pinkerton	5,5m x 3m	0.67	7.03 a	8.07 a
	4m x 1,5m	1.35	12.37 b	9.26 b
Edranol	5,5m x 3m	0.00	6.08 a	17.20 a
	4m x 1,5m	0.00	7.54 b	22.40 b
Ryan	5,5m x 3m	0.00	4.96 a	11.90 a
	4m x 1,5m	0.00	5.80 b	13.80 b

PRUNING EQUIPMENT

Pruning actions should preferably not be labour intensive. Various mechanical or semi-mechanical actions have been examined to speed up the process and to 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.

CONCLUSIONS

Avocado trees can be shaped, trained and maintained with simple practical manipulation techniques to end up with an effective and labour friendly orchard. To optimize light utilization and simplify actions, it is suggested that central leader pyramidal shaped trees should be 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 or three leaders can be developed in orchards with densities lower than 600, if preferred. Harvest data are currently only available 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 5,5m x 3m to 4m x 1,5m. The higher densities are currently at an experimental stage of refining manipulation techniques, but are providing useful information. This information can be used in 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 vigour. During the spring and summer months attention must be given to watershoots. 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 growth regulators may be of value as additional 'tools' to manage growth, especially under conditions that promote plant vigour. In the case of growth inhibitors, only registered application recommendations should be used and zero residue tolerances must be strictly complied with. Good nitrogen management and tree fruit load remain the more acceptable ways of controlling growth vigour, especially on normal potential soils (less than 25% clay). Combinations of selective hand pruning and mechanical pruning are being further investigated to speed up the pruning process.