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HIGH-DENSITY PLANTING SYSTEMS – THE DEBATE CONTINUES?

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At the last three World Avocado Congress' (California, Israel and Mexico) I have been a keen observer and participant in the debate on pruning systems for avocados. In particular I have been interested in the development of thinking on small tree orchard systems and high-density plantings. By and large it was the major points from this debate that were re-visited during the canopy management session at the Avocado Brainstorming workshop.

In 1991, the World Congress workshop on canopy management focused on whether to thin or not to thin trees. Inevitably the conclusion was to thin with courage rather than to leave blocks to become more and more over-crowded and less and less productive. Although the discussion also included ideas on how to restructure large trees – this discussion was still a long way from "small tree" thinking. Gray Martin demonstrated how to promote single leader trees when re-working existing orchards but this was still an artificial situation with major disruptions to tree canopies and root systems alike. Situations better avoided by starting over with new trees.

In 1995, World Congress participants in Israel were flooded with information on the options for mechanical pruning. Once again the focus here was on large trees and the highly attractive "dumbing-down" factor of lower pruning costs and easier grove management with fully mechanized operations. These options are less attractive on the steep hillsides of southern California. The best data on "small tree" orchard systems was the presentation from Chile demonstrating the high yields per acre possible with an upright cultivar such as 'Bacon' planted at high densities. This presentation highlighted the importance of two important orchard system decisions – choice of **cultivar** and choice of **planting density**. California growers have better options than 'Bacon' when it comes to choice of cultivar. In particular, 'Lamb Hass' is an upright growing tree with high expectations of good yields and excellent eating quality fruit. 'Reed' is also an upright cultivar with huge yield potential when planted at close spacing, although with a lower market return on a per pound basis than 'Hass' or 'Lamb Hass'.

The real debate in Israel in 1995 started when Piet Stassen provided an update on his central leader pruning trials in South Africa with 'Hass' planted at high densities. In Mexico, four years later we saw the yield data from these trials. On the field trip for this Congress we also saw some local attempts to train trees into a central leader form similar to the natural growth habit of the wild "criollo" seedlings. The basic procedure in these **training systems** is to remove lateral shoots that are going to overtake the dominance of the central leader. Lateral shoots can also be twisted and bent over to reduce their growth potential, rather than pruned, so that the leaf area is retained to contribute to tree photosynthesis. As trees become larger and begin fruiting, "renewal" **pruning systems** become important to regenerate growing and fruiting points – usually by cutting older fruiting branches back to a stronger lateral shoot. This is designed to promote the long-term viability of fruiting branches and especially their ability to size fruit. Once again these renewal shoots can be twisted and bent over to reduce their dominance.

Obviously this training system is easier to implement if **tree quality** at the nursery is carefully monitored. Not only is a healthy root system required at planting in the field but also a well structured plant with a strong single leader and numerous, less dominant lateral shoots.

The final decision for high-density plantings is choice of **rootstock.** Apart from the obvious need for dwarfing rootstocks for avocados, we saw in Israel the potential to grow small 'Hass' trees on shallow soils. This is a root restriction effect whereby the size of the root system is limited by the physical characteristics of the soil. California growers may wish to consider an alternative approach using root restriction bags. These bags restrict the size of the root system by forming either a physical or chemical barrier to root growth and are commonly used in tree nurseries to prevent transplant shock.

Highlighted in bold are the major considerations needed for implementing small tree orchard systems. They are choice of cultivar, tree density, tree quality, tree training, tree pruning and rootstock. After 10 years of debate growers now have guidelines on each of these choices. What is still missing from the equation is experience – and this is where growers themselves need to be more involved. While scientists can contribute to and in some cases lead the debate, it is for growers to put these systems into practice and confirm the economic benefits in their own conditions. In California, Reuben Hofshi in his articles in Subtropical Fruit News (Vol. 7.1) has provided a good deal of economic information on high density planting systems. Growers can refer to these articles for inspiration and get started on small-tree orchard systems for avocados.