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High Density Grove Management A Matter of Planning

by Roger Smith

For decades citrus growers have been planting extra trees per acre to achieve more production in the years right after planting. This is often called high-density or double density planting and has been proven economically viable by many analysts.

The standard planting for many years has been 22' x 22', yet Citrus Industry Vol. III states, "considering all aspects of cost, the 11' x 22' brought the greatest per acre net returns after five years of harvest." And even though the practice is valid, there have always been questions about what to do after five years when the trees start to crowd each other?

This article is an effort to explain some of the management strategies used today to deal with double density plantings and to point out some new strategies that are being tried.

BACKGROUND

In the citrus industry the debate rages as to what the proper spacing for an orchard should be. Common double density planting spacing ranges from 8' x 18' to the traditional 11' x 22.' Commonly today, growers use a 10 x 20' spacing (or 218 trees per acre) which fits most root-stock-scion combinations.

Typically, a grower decides on a double density planting for reasons of extra production. Most growers figure if the trees start crowding in a few years, they can always remove some of the original trees. There really isn't one specific strategy used by California growers to manage these plantings, but the factor that drives most decisions is "illumination," or how sunlight is distributed through the grove. P.R. Cary of CSIRO, Australia states, "the success of high density plantings will depend upon maintaining trees at an appropriate size and shape without sacrificing yield potential."

"APPROPRIATE SIZE" MEANS MANY THINGS.

- The tree is small enough to allow adequate illumination for fruit production.
- There's enough space between trees for proper airflow for effective frost control.
- Picker access is taken into account.
- Spray penetration into the canopy must be achieved.
- Sprinklers must be visible and accessible.

TRADITIONAL MANAGEMENT METHODS

The traditional approach to management is to remove the extra tree in a double density planting to achieve the "appropriate size." This strategy is normally done over a period of years because the cost of removing a tree involves the loss of production as well as the actual cost of the tree's removal. Between years 6 and 8, the grower may decide to take out every fourth tree. This leaves a pattern that is often called a "three-tree set." They will maintain this three-tree set for several years and eventually take the center tree out so the trees will end up at an equal spacing.

Another approach is called "tree fanning." This means that the grower identifies which trees will remain in the grove permanently and which will eventually be removed. The "temporary" trees are not allowed to compete with the permanent trees. As the permanent trees grow, the temporary tree is pruned back so it can't inhibit the growth of the permanent tree. Over a few years, the temporary tree becomes a very narrow tree in the row, but does extend out into the middle like a normal tree, hence the "fan" shape. Eventually, the tree is no more than a few feet wide and is removed. This is considered a means of delaying loss of production while spreading the tree removal costs over a period of several years.

NEW IDEAS FOR MANAGEMENT

Not too many years ago, citrus growers did not view pruning as a mandatory process for their trees. Pruning was used primarily for height and width control and was done mechanically.

As pruning techniques developed over the last 20 years, it has become common for a citrus grove to be pruned annually. Many growers have adopted annual skirting and hedging practices as well. This change in overall management philosophy has opened up other opportunities for managing high-density plantings that may not have been possible previously. Growers are now attempting the practice of never removing a tree in high-density plantings and relying on pruning to make the trees the "appropriate size."

These growers face certain consequences for this approach and P.R. Cary suggests, "if maintenance hedging and topping are not initiated prior to crowding, heavy pruning may be required to maintain inter-row distance for adequate access and to prevent excessive shading of lower parts of the tree canopy. Provided that pruning is not severe, and only a small proportion (<1%) of the total canopy is affected, high productivity can be maintained."

If not pruned early enough, this kind of a planting will not allow for the proper light for uniform distribution of fruit throughout the canopy. Often times, if not properly managed, these kinds of groves may lose their skirts with a lot of deadwood between the trees. The way to avoid this is to be prepared to prune a densely planted grove while it is still at a young age. The philosophy here is to maintain all trees permanently and the decision to do so is made when the grove was planted. When trees begin to touch, the trees are pruned back lightly every year.

This process eliminates the competing branches that would normally grow into each other and opens a "window" between the trees that allows a band of light (see photo 1) to impact the trees across the row, helping to insure canopy development for fruit production. This band of light will move throughout the day as the sun tracks across the sky and helps insure uniform distribution of fruit bearing terminals in the sides and skirts of the tree's canopy.


PHOTO 1

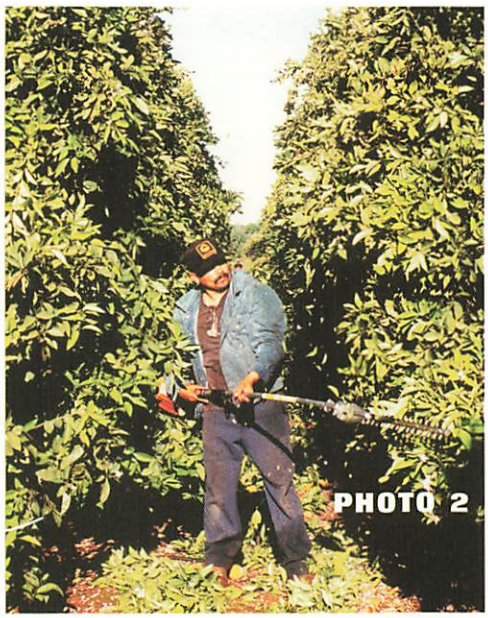
PHOTO 2

ADEQUATE LIGHT VITAL – USE THE "V"

For adequate light distribution throughout the grove, it is important that this "window" between the trees (see photo 2) be cut in a "V" shape. The "V" need not be precise, but just wider at the top than on the bottom. It is also important that the rows of the grove be planted in a north and south direction. This ensures better light distribution throughout the grove.

A common mistake growers make is allowing the trees to grow too close together before they decide to keep the double density planting permanently. They don't have a plan until it is too late. So, if trees grow together then they must approach the pruning as reconstructive and this will cost a lot more initially. However, after the first year of heavy pruning, the cost should not be very much if maintained annually.

When light is being managed, it is also important that the trees not be allowed to grow as tall as they would under a more traditional approach. Although more research needs to be done on this, a tree should be kept as low as 11.5 feet and some growers go as low as 10.5 feet. The light management strategy of the grove determines the height of the tree, which is influenced by the row width. A wider row width such as 22 feet allows for a taller tree than a narrower spacing such as 18 feet.

MECHANIZING STRATEGIES

In recent years, a few growers have mechanized the process of maintaining these high-density plantings. It's not difficult to imagine the open space between trees whose trunks are only 10 feet apart isn't wide enough to accommodate standard hedging machines. As a solution, growers are using hand crews with mechanized pruning tools (see photo 2) that allow them to go rapidly through a grove removing the competing wood between the trees.

This method of annual pruning can be done for as cheaply as 50 cents per tree. In order for this process to work, it is important that the pruning effort start when trees are younger. If the trees are not maintained annually, then the branches to be cut off will become too large for the mechanical pruning tools, and the process slows down.

ISSUES TO CONSIDER

Maintaining a permanent double density planting is not always the best choice for every situation. Rich soils influence vigorous growth and trees outgrow their space rapidly. This is not a good thing for a permanent double density planting. Vigorous rootstock such as Rough Lemon or Volkameriana and vigorous varieties such as Valencias, lemons or pummelo would all be poor candidates for permanent double density planting.

Navels are quite suitable for double density, as are many mandarin varieties. Anything that enhances tree vigor would be a negative to a permanent double density planting. Anything that inhibits vigor would be a positive.

Choosing a suitable rootstock that reduces the vigor of the tree and helps it fit into the smaller space provided can enhance the success of this kind of program. Currently the best rootstocks that fit this circumstance are C-35, Rich 16-6 or Rubidoux trifoliate. Carrizo Citrange is successfully used throughout the growing region for double density plantings, but requires more maintenance pruning than C-35 or the trifoliates.

CONCLUSION

It must be emphasized that not all locations and tree combinations are suitable for double density plantings or permanent double density plantings. Although it makes the nurseryman happy, it is not for everybody. But when you calculate the numbers on planting twice the amount of citrus trees per acre, it is evident that the increased production per acre pays for the extra capitol costs needed to pay for the extra trees. You can expect double production for at least six years. It has been said that a single density planting on a 20' x 20' spacing would take 12 years to pay back all initial development costs (considering average returns). The same variety planted on a 10' x 20' would pay back in eight years.

Because these numbers have been proven valid, many growers today face the challenge of how to manage the double density grove they have planted. If they plan for the consequences of a double density planting prior to planting the grove, they will find that they may be able to efficiently extend the life of the densely planted grove for many more years than they originally expected. The key is understanding what the "appropriate size their tree should be and managing it accordingly.