# **Olive Grove Canopy Management**



# Fact Sheet 1

## Olive tree growth and flowering habit

Olives are an evergreen stone fruit tree and have the same flowering and fruiting habit as stone fruit like peach and nectarine. These species all require sufficient new annual vegetative growth to provide the wood that produces flower buds in the next season. Any factor that significantly inhibits annual vegetative growth has a direct influence on reducing the capacity to flower and fruit in the next seasonal cycle. Key factors that reduce annual shoot growth in olive include: poor leaf health causing leaf loss; excessive crop in one year reducing growth causing an off year in the next cycle (biennial bearing); large shady senile trees with no renovation of the grove canopy; environmental factors such as poor drainage (excessive rain/water) and conversely, drought-related lack of water.

### Why should we prune olive groves?

Olive groves, like all orchard tree crops require control of tree structure and size so that the trees and the grove can fulfil their fruiting function to the most efficient and productive degree. If left unmanaged, olive trees will grow to exceed their available space and become very tall, crowded and mutually shaded, causing reduction in growth, poor leaf health and loss of cropping potential. This is the visible reality of many NZ olive groves at present.

The horticultural reason for pruning olive trees is to maintain them within their allotted space defined by the tree spacing planted in the grove. Like all orchards, this function is to allow control over the health and productive potential of the trees/grove. Pruning reduces the tree size and at the same time stimulates new growth. Pruning is used to control the height of olive trees. Pruning configures the olive tree in a form that enables efficient harvesting whether by tree-shaking machinery or by hand harvesting methods. Pruning shapes trees to enable easy access by people and machinery for management functions especially for disease control spraying and harvesting.

The biological reasons for pruning olive trees are to achieve the conditions that enables the tree to fulfil its reproductive functions (flowering and fruiting) every annual cycle. The provision of healthy new shoot growth annually requires adequate sunlight to reach all parts of the tree. When light can reach all zones of the tree, new growth will occur throughout the canopy. Pruning is used to achieve an appropriate tree shape and branch population to enable light to reach all parts of the tree during long periods of every day. Light is also required to stimulate the induction of development of flower buds on new shoot growth. So management of tree shape and size to ensure a 'good' light environment is fundamental to achieving highly-productive olive groves in New Zealand.

How can we describe a 'good' tree canopy for the desired light environment? It is a tree with considerable porosity in branch and leaf texture, meaning that light is easily filtered among branches and foliage creating a dappled pattern with many scattered light flecks amongst small shade patches within the tree. This can also be observed in the shade pattern transmitted to the ground on sunny days, beneath well-structured trees (Figure 1).



Figure 1. Olive tree in a hand-harvested grove, pruned to an open-centre, vase shape for control of tree size, annual renewal growth, branch number and size for light distribution within the tree and fit for hand harvesting. Note the shade pattern at noon, showing dappled light distribution through the canopy (Sienna, Italy).

#### Tree structure and disease control

Trees that are pruned to be well-structured for light management have the added benefit that the same branch and canopy structure enables enhanced spray penetration, faster foliage drying and greater permeability of wind through the tree canopy. These features greatly improve disease control and management, essential to maintaining a healthy leaf canopy as the foundation to improved productivity.

#### Tree structure for harvesting:

The benefits of pruning are extremely influential in simplifying and improving harvesting efficiency and crop recovery.

For trees harvested by mechanical trunk shaker and umbrella catcher, a clear trunk section beneath the branching zone is necessary for the shaker grip mechanism; ideally a minimum of 0.75 m in height. Secondly, the spread and height of the tree must be contained within the area that can be spanned with the umbrella for fruit capture when shaken. Pendant limbs on the canopy periphery harvest poorly by tree shaker. Excessive tree height causes fruit to be propelled and lost, beyond the umbrella. Main tree limbs (typically four to six) should be kept as single axes, avoiding secondary branching that divides the branch higher up the limb, to enable maximum shaking efficiency.

For trees harvested by hand devices, the essential features of the canopy are the same as for mechanical shaking harvest with several variations. Because of hand harvest, a shorter trunk will enable a greater area of canopy to be reached by hand from the ground and a shorter overall tree size. The size (diameter) of branches should be kept to a smaller scale that fits with hand-harvesting

equipment like limb shakers. It is possible therefore with smaller branch units to have somewhat more branches per tree, provided that the overall light environment in the tree is still optimised, as described above.

#### How we prune

Overwhelmingly in the NZ Olive industry, there is the need to introduce regular tree management with pruning with the first priority to re-establish an appropriate shaped and size canopy from the current over-grown, unmanaged trees in groves. We call this 'restructuring', which involves significant intervention with large limb removal to encourage new replacement growth. It is a process that is done over successive years so that the trees are not taken out of production during the restructuring process.

The initial process is to identify the one or two major problem limbs for total removal (cutting down to a short 50 to 100 mm stump at their base) to open the canopy for light and begin creating the development of an open centred, vase-shaped, multi-leader tree. Typically the largest limbs are chosen for removal which begins the process of reducing the tree height.



Figure 2 Olive tree before pruning



Figure 3 Olive tree after pruning

The early experience with the Focus Grove Project has been that it is common practice to be removing limbs that are 10 to 15 years old. Equally the immediate stimulation of new shoot growth low in the tree in the following year has been observed, in response to improved light in the tree and the effect of pruning in stimulating new growth. Figure 4 shows the regrowth on a Frantoio tree after a major limb removal.



Figure 4 Regrowth from a major cut on a Frantoio tree

There is one exception to the general restructuring method that applies just to the cultivar Leccino. To ensure shoot regrowth, which is slow with this cultivar, a longer stump of 200 mm is left when large limbs are removed from the tree. Figure 5 illustrates the stump on a Leccino and regrowth.



Figure 5 Regrowth stimulated from large limb removal from a Leccino tree

No detailed cosmetic pruning is done during the early phase of restructuring tree management and pruning, other than if the occasional pendant limb is identified as clearly out of the umbrella catching zone.

The practice of pollarding whole trees (cutting down all limbs to stumps at one time) takes them out of production for a number of years and does not ensure a well-structured new canopy unless pruning intervention is used to manage the new resurgent growth. In most cases we do not recommend this approach.

The second annual cycle of pruning removes the next most problematic old limbs, in the same way as done the previous year. The choice of limbs for removal relies on studying where the new growth is occurring and which limbs remain the most problematic for tree height, tree shape, light distribution within the whole tree (the limbs causing the most shade) and harvesting efficiency.

The restructuring process continues over multiple successive seasons until the whole tree has been renovated into new limb structures. During the restructuring phase pruning, there may be periods eg years 2, 3, or 4 that it is best not to do any more major limb removal until the new growth stimulated from earlier cuts has grown for 2 - 3 years and is becoming productive. In this way, the productivity of the tree is kept as high as possible during its restructuring phase. There will be added benefits of new vegetative growth occurring in areas of blank wood on remaining older limbs in response to the improved light within the tree, adding further to production.

#### Time of pruning?

Pruning, in theory, could be done any month of the year. Our preference is to do the major pruning in spring after winter rains are over (September onwards). There is some merit in waiting until the emerging floral structures become visible in the trees so that pruning intensity can be balanced against the likely indicative flowering for that year. To benefit from the summer growing conditions for new shoot development it is preferable to have major pruning completed by December.

#### How do I control tree height?

The process of restructure pruning of old trees by whole-limb removal will effectively reduce tree height. Whole limb removal regenerates growth back at the tree base so that new limbs have 4 - 5 years of extension growth before reaching the preferred maximum tree height of 5 to 6 metres. There is little point or value in 'topping' trees at 6+ m height as an alternative to limb replacement. Firstly it is difficult and dangerous to do! Regrowth will occur in the zone of cutting, causing a dense bushy top high in the tree, and more shading.

If a grove is being managed for hand harvesting by encouraging smaller limbs, additional detailed pruning is justified to make harvest management practical. In such situations, trees are probably already shorter than most machine-harvested groves. In these circumstances, the upper zones of the tree can be pruned with more detail using a forestry pole saw to reduce the number and density of branches in the top of the tree (Figure 6).



Figure 6. An example of detailed secondary pruning to manage height and canopy density for hand harvested olive trees. In this case the tree is a three-limbed vase with obvious management of the number and position of secondary branches on each limb to achieve an open texture for access and light penetration (see shade pattern).

#### The 'ideal' olive tree

Once restructuring is completed, an ideal olive tree should be the result. This is a tree 5 - 6 m in height comprised of 4 - 6 inclined upright structural limbs arranged in an open-centred vase configuration. Limbs are well furnished with smaller lateral branches bearing good foliage coverage and health. The tree has lots of gaps and spaces within the canopy so that light is accessible throughout the main body of the tree. The tree fits within the space required for successful mechanical harvesting.

Once trees are in this condition it is possible to reduce the frequency of limb removal rotation and substituting with well-focused secondary pruning to keep the canopy open and well illuminated. Removal of secondary branches is also aimed at maintaining good structure for efficient machine harvesting. The preferential removal of pendant limbs that are hard to shake is recommended as these types of branches can also be the oldest in the canopy and weakest in growth and productivity.

The rotation of structural limbs for regulation of trees size and volume is continued on a regular basis, always focusing on removing the tallest, most dominant limb. Depending on growth and canopy health, it may only be necessary to remove large limbs every second year, which would transpire to being a complete cycle of limb renovation every 10 years. In this way tree height and volume becomes controlled as the by-product of the rotation of limb management.

#### **Additional Reading:**

Riccardo Gucci, Claudio Cantini "PRUNING AND TRAINING SYSTEMS FOR MODERN OLIVE GROWING" (available from CSIRO, Australia)

Mike Ponder, "THE GOOD OIL" (available from Olives NZ or the author)

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