



**Citrus trees are pruned in order;**

- to allow light penetration into the canopy;
- to prevent crowding of main scaffold branches and to remove branches which cross;
- to remove or shorten water shoots to prevent them from becoming too dominant;
- to remove diseased, dead, weak or old growth;
- to improve spray coverage;
- to allow air circulation and access under trees (skirt pruning);
- to reduce tree height or width;
- to increase fruit size;
- to prevent fruit damage due to limb rubbing.

## **PRUNING STAGES**

### **YOUNG TREE PRUNING**

Young tree formation pruning normally starts when the trees are 18 months to 2 years old. At this stage pruning is used to develop the trees structural framework. The aim is to have 3-5 main limbs, with the lowest branch starting at least 65cm above the ground.

### **HAND PRUNING**

Initial heading at planting will balance top growth in relation to the root system. Branching should not be allowed to occur on young trees until they reach a height of 500 to 600 mm. Young trees should have 200 mm of straight trunk above the bud union before branching occurs. Heading at this height will reduce the amount of time spent on skirting in later years. Main scaffold branches should be staggered as too many branches initiated in one spot can cause crowding and weakening in later years. Aim to maintain about eight main scaffold branches as dominant limbs, once established. Prune subsidiary shoots from the main scaffold branches to reduce competition. Select the more horizontal shoots as fruiting wood.

### **MAINTENANCE PRUNING**

Maintenance pruning of bearing trees (a more regular program of pruning) starts when the trees start to regularly crop. The aims of pruning now are more diverse. Thinning out of branches as trees get older allows light to penetrate into the centre of the tree. This helps to maintain fruit production inside the canopy, as well as on the periphery of the tree.

Chunk pruning on older trees allows light into the centre of the tree. In hedgerow plantings, remove a whole scaffold limb on opposite sides of alternate trees. This allows access for pickers into the inside of the tree. The extra light also improves the colour of internal fruit. Some growers remove a large scaffold branch from a different section of the tree every two to three years. In other areas where trees are more widely spaced, a large scaffold branch on the north side of every tree is removed to improve access and to increase light penetration.



***Vigorous new upright growth after pruning. Followup pruning to thin out the new growth should be undertaken about 8-12 weeks later.***

## **REJUVENATION PRUNING OF OLDER TREES**

This type of pruning is normally undertaken on old trees which are still healthy with the aim of reinvigorating the tree to improve cropping potential. With this type of pruning major limbs are normally removed (skeletonizing) to encourage replacement with new young branches. This type of pruning should be undertaken over a number of years. Typically trees are pruned initially on one side so that some crop yield is retained; the other side is then pruned 1-2 years later or alternate rows are done over a period of two or three years.

Skeleton pruning is normally a last resort with old trees to get a few more years from them. Prune in autumn and cut back all shoots, leaving only the main scaffold branches. The scaffold branches should be whitewashed with a lime mixture or watered down white acrylic paint to protect the bark from sunburn until the tree refurbishes itself.

## **SKIRT PRUNING**

Skirting is the removal of the lower tree branches up to a height of between 0.5-1m from the ground. Skirt pruning has the following advantages:

- better air movement under the trees;
- easy application of below-tree herbicides and fertilisers;
- reduced access into the tree for insects and pests such as Fuller's rose weevil and snails;
- clear throw of irrigation water from mini sprinklers and ease of checking on the operation of mini sprinklers and drippers;
- no splashing of soil borne fungi into the canopy from rain or irrigation (eg brown rot);
- better access when harvesting.

Mature trees should be skirted to a height of at least 75 cm to allow for branches dropping when the fruit is on the tree. Machine skirting is quick and easy.

Skirting is necessary only every two to three years and should be carried out straight after harvest on navels and mandarins. Skirting of Valencia's is more difficult due to the time the trees are carrying two crops. Some crop loss is inevitable whenever Valencia's are done. Skirting in October or November after fruit set is probably the best option.

## **OTHER PRUNING TECHNIQUES**

### **HEDGING**

Hedging is normally undertaken by mechanical hedging machines. Hedging removes the outer canopy shell of trees and is normally undertaken after fruit set to remove crop load or after harvest if crop load is adequate. It is also used to reduce the tree canopy in the plant row to improve movement of equipment and reduce damage to fruit caused by passing equipment.

With increased plant density and hedgerow plantings, machine pruning is becoming more necessary to save time. There will always be some crop loss from hedging. The benefits of improved access and increased fruit size have to be weighed against the crop loss and the cost of the operation.



***A hedging machine***

Light hedging removes about 30% of the bearing canopy and takes wood up to 8-12mm in diameter. The cutting angle is about 15-20 degrees. Heavy hedging is used when you are rejuvenating trees. Branches up to 40mm in diameter are removed.

If trees are hedged at the same point each time the trees will develop a "thatched" or "witches broom" effect at the cutting site. This makes fruit more difficult to pick and the site holds dead leaves and small twigs which in turn harbour pests and disease and reduces light penetration. Therefore the hedging site on trees should be varied each time.

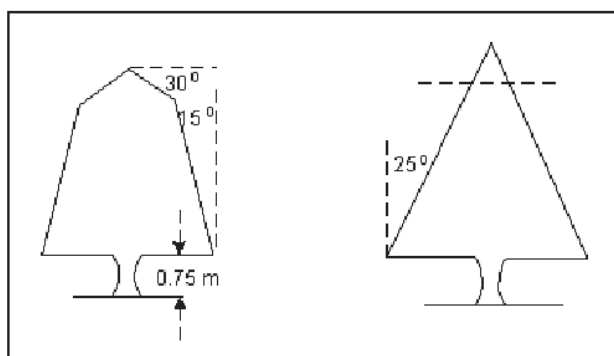


***"Witches broom" effect from hedging at the same site.***

Topping is done mechanically to reduce tree height. Topping is normally undertaken after harvest. If done in late spring or summer topping can result in unwanted vigorous upright growth. It is best to top trees in winter. Topping is the most invigorating form of pruning. Heavy topping if done at the wrong time can result in excessive upright vegetative growth which causes shading and uses the tree's water and nutrient reserves. Topping, like hedging, if done at the same height each time will cause trees to develop a "witches broom" effect.

Therefore the height at which topping is done needs to be varied. The tops of trees should be cone shaped at an angle of 30 - 40 degrees. If trees are topped flat they are difficult to harvest and tend to cause excessive vegetative regrowth which is non-productive.

Side hedging can be done at an angle of 15 degrees to 25 degrees from the vertical to allow better light penetration to the lower parts of the canopy. Trees can be hedged at 25 degrees to form a triangle shape and then flat topped (Figure 1).



*Figure 1. Two styles of side hedging and flat topping.*

If side hedging at 15 degrees from the vertical, the trees also need to be topped from both sides at 30 degrees from the horizontal to allow light penetration to lower parts of the canopy (Figure 1). Machine pruning can be carried out over a three-year period - prune one side one year, the other side the following year and the top the year after. This reduces crop losses in any one year. Alternatively, hedging of entire trees can be carried out in one year, on every second row.

Some growers carry out side hedging and topping on the entire block in the on-crop year and skirt pruning in the off-crop year. It is important to begin machine pruning in good time, otherwise, the cuts will be too large and crop losses too high.

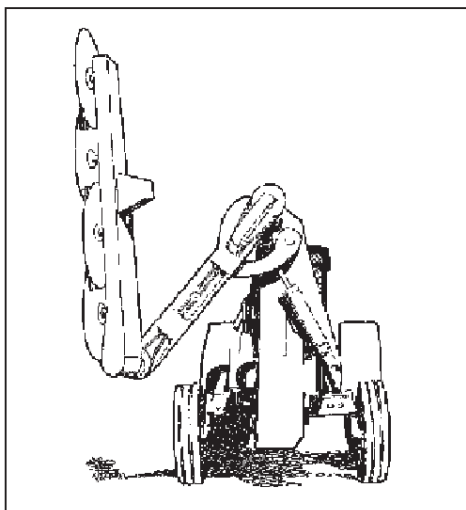


Figure 2. A bank of circular saws for hedging.

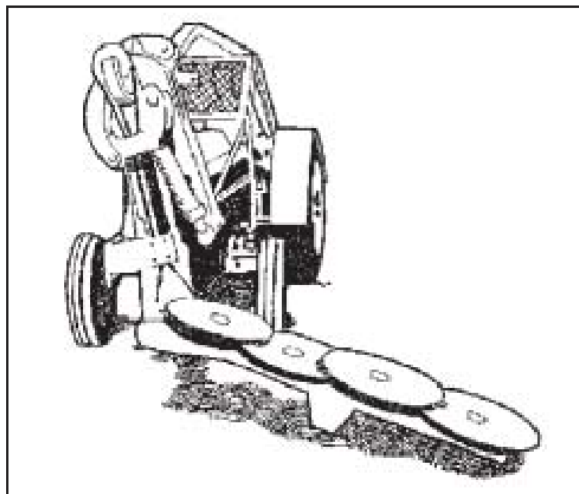


Figure 3. A bank of circular saws in the skirting position.

## PRUNING TIPS

- Pruning should be a regular part of tree management.
- When hand pruning sterilise your pruning equipment after each block to reduce the spread of disease. When using mechanical pruning machinery, the blades should be sterilised after each block or variety. (A sterilising solution of 3% sodium hypo chloride can be used.)
- In areas where there is the potential for frost, pruning should not be done at a time when the resulting young flush growth will be susceptible to frost damage.
- Heavy pruning at the wrong time can result in excessive vegetative growth.
- Pruning during bud break or flowering will impact on crop load.
- The heavier you prune the longer it takes for the tree to recover and therefore crop.
- Avoid over pruning. The leaves are the manufacturing part of the plant - removing too much of the canopy will reduce tree growth and crops. Citrus bark burns easily if over exposed to the sun.





Photo by Greg Moulds  
***Hedged trees***

### **Pruning is used for a range of reasons including:**

- to manipulate tree form, shapes and growth;
- to manipulate flowering, fruit set and crop load;
- to reduce tree height and width;
- to remove dead, diseased, broken, weak or old branches;
- to open up the tree canopy;
- to remove unwanted regrowth or strong suckers;
- to rejuvenate old trees;
- to reduce biennial bearing.

### **TREE GROWTH**

Lemon trees typically have 3-5 growth flushes a year depending on growing conditions. Each new growth flush is added onto the previous growth flush, resulting in a drift of the young bearing wood to the outsides of the tree canopy. Over time this results in larger trees with increased shading inside the

canopy resulting in most of the fruit being carried on the tops and outsides of trees. Light is critical to tree and fruit growth and development. The green leaves harvest the sunlight to produce carbohydrates and sugars which are then transported to the sites where they are needed – these are the buds, flowers and fruit. Improving light penetration into the tree canopy improves tree growth, productivity, yield and fruit quality.

The density and orientation of plantings also impacts on light penetration in the orchard. Generally the closer the planting the quicker shading will become a problem. An east-west row orientation results in more shading to the western and southern sides of trees.

Strong bearing branches tend to produce larger fruit. They also transport water and nutrients more efficiently throughout the tree. Pruning aims to encourage this new strong growth.

Citrus trees exhibit apical dominance, meaning that the top bud suppresses the shooting of buds below it. One way to stop this effect of apical dominance is to prune off the shoot tips (tip pruning).

In some areas lemons grow almost continuously throughout the year producing multiple leaf flushes and crops. The new leaf flush in lemons tends to be a reddish purple colour which changes to green as the leaves mature.

The best time to prune is normally after harvest and before bud break.



***The new growth on lemons is typically reddish***

## LEMON TREE GROWTH AND STRUCTURE

Lemon trees tend to have a more willowy or weeping tree structure than that of most orange and mandarin varieties. The branches and limbs tend to be more easily broken in strong winds and when the crop load is heavy. Overall lemon tree branches tend to be longer, thinner and more flexible than those of orange trees. Pruning should aim to shorten these branches.

In some varieties, such as Eureka and Meyer, the fruit tend to be borne in clusters at the ends of branches, which then bend downwards under the weight of the fruit. When the fruit are removed the branch normally springs back into position. Sometimes the crop load is so heavy that these long willowy branches can break. Fruit produced on the outside of trees and in clusters on the ends of branches are more prone to wind damage. Pruning should aim to encourage fruit on the insides of trees where it is more protected from wind.

Lemons also have a tendency to produce strong, vigorous upright water shoots that are usually thorny. These are normally unproductive and should be removed as early as possible. Sometimes these water shoots can be used quite effectively to replace old unproductive structural limbs when rejuvenating trees.



***Structural pruning of young trees***