Department of Primary Industries
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DPI Primefact

Hand pruning citrus for profit

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Contents

Why prune?

Pruning can give cleaner and bigger fruit, resulting in higher returns. However, it also has many other benefits, including:

- Harvest staff is used efficiently in pruned citrus trees as ladder work is reduced in trees with a lower height
- Harvest staff prefer picking smaller trees loaded with larger-sized fruit.
- Better spray penetration and air circulation improve pest, disease, and albedo breakdown management.

Identify the aims

Before starting pruning, identify the aims and priorities because these will require different types of cuts and the amount of canopy to remove. Some aims include:

- Reducing tree height – ease of harvest and crop management practices.
- Crop regulation – light branch pruning in early summer can reduce an excessive crop load.
- Skirting – pest and disease control.
- Row spacing – access.
- More internal fruiting – quality and larger fruit.
- Reduction of dead wood – reduced fruit blemish and disease control.

Types of pruning

The type of pruning will depend on the aim and the current canopy shape and condition of the tree. In most cases, pruning will done for all the aims listed above, but some might have a greater level of importance than others depending on the characteristics of the tree (vigour, size, yield), management (cash flow, time availability) and market conditions (price of fruit).

There are 2 main phases of pruning: structural pruning (limbs; those that emerge from the trunk and are larger than 40 mm in diameter) and canopy pruning (branches; groups of shoots older than one year). Structural pruning is changing the tree limb structure to give maximum opportunity for optimum fruit growth. If a tree has not been pruned for many years, this will be the main focus in the first 2–4 years. Removing excess limbs will probably remove enough canopy and let enough light into the tree. A structural prune can take 5 minutes per tree on a previously unpruned tree, depending on the size of the tree and the pruning intensity. It is advisable to structurally prune about 30% of the canopy each year to achieve a good limb structure in 2–3 years.

When all the excess limbs and large branches have been cut out of the tree, maintenance pruning is done to manage the fruit-bearing shoots (up to one year old growth) and branches. Maintenance pruning often only needs about 1–2 minutes per navel orange tree annually. The aim is to remove about 30% of the canopy each year in multiple cuts around the canopy so branches are no older than 4–5 years.

Structural pruning

Step 1: identify the desired shape

A desired framework has evenly spaced limbs extending to all directions of the canopy (Figure 1). Tree canopies are variable. Limbs might not be in the preferred position (Figure 1), and compromises are made while pruning. If a tree is missing lower limbs due to poor pruning practices (Figure 2, right), then drastic measures might be required to encourage lower limb growth. Cut an upright limb down to about waist to chest height, which will remove a large portion of the canopy (e.g. 50 %).

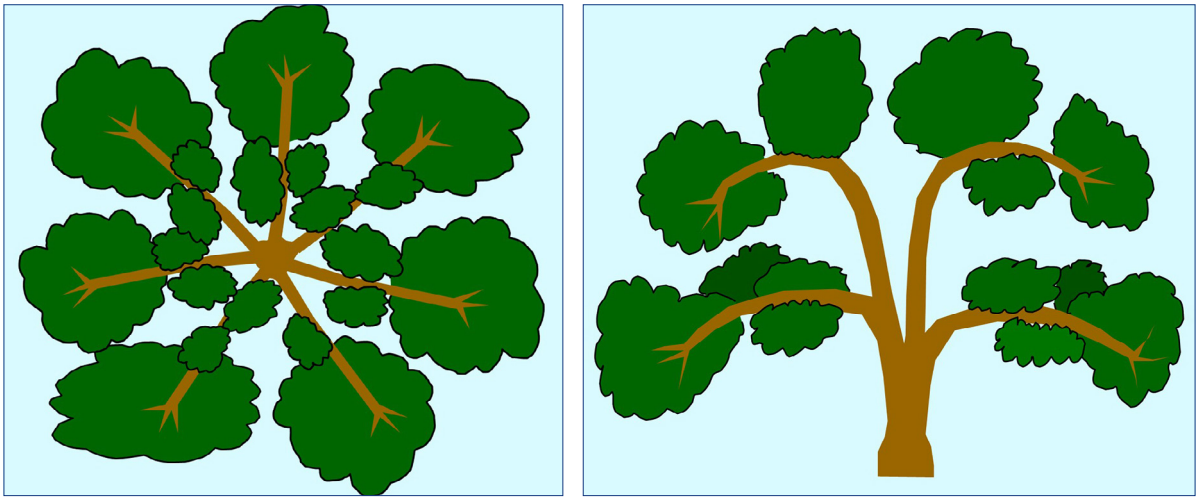

Figure 1. Top view and side view of a desired limb framework.

Figure 2. Left, good structure with lower limbs that are adequately spaced with young branches and shoots. Right, poor structure, there are no lower limbs, and the upright limb might have to be cut at waist height to regrow lower limbs and rejuvenate the tree structure. While this cut will cause a major reduction in short-term canopy volume, it will grow a better-structured tree for long-term yield benefits.

Caution

When structural pruning, avoid removing the lower limbs (Figure 2). Lower limbs are convenient and easy to remove, but they are very important to service the lower part of the canopy. Limbs that are too low, and will later become a skirting problem, must be removed. Trees with too many lower limbs removed tend to take on an undesirable palm tree or weeping willow shape.

Step 2: remove damaged or broken limbs

Limbs that are cracked or broken (Figure 3) are unproductive. If the limb is in a good structural position, then cut the limb back just behind the damage. If the limb is incorrectly positioned, remove the whole limb at its point of origin.

Step 3: remove central upright limbs

Limbs extending to the top of the canopy are undesirable because they shade the lower parts of the canopy (Figure 4). Tall limbs also mean the fruit will be too high in the canopy, making it difficult to manage and harvest. Sometimes the limb can be completely removed, or it might need to be gradually removed in successive stages over several years. Do not remove all upright limbs at once as this opens the tree too much, prompting excess vigour.

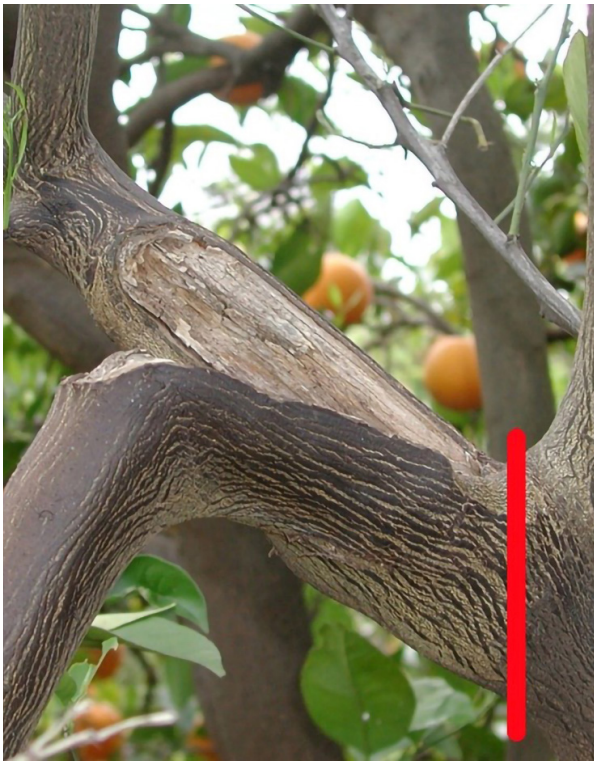

Figure 3. Remove any cracked or broken limbs.

Figure 4. Remove upright limbs and branches.

Note: it is best to remove about 30% of the canopy each year when structurally pruning an unpruned tree so its transformation can be gradual, e.g. over 3–4 years. Do not remove more than 20% of the top of the canopy at one pruning as this can induce an over-vigorous response, reducing crop yields. Occasionally a tree with very poor structure might need undesirable limbs removed, reducing the canopy by more than 40%, but this is rare.

Step 4: remove limbs that cross over

Limbs that cross over other limbs (Figure 5) cause access, rubbing and shading problems.

Step 5: remove water shoots

Water shoots can use tree nutrients and resources that would otherwise be used for growing bigger fruit (Figure 6). Thorns are often present on water shoots and can damage the fruit. It is much easier to remove water shoots while they are small. Water shoots grow to mature and cause access, picking and shading problems.

Note: in some instances, if a water shoot arises from a position where a new limb might be desired, topping and/or bending the water shoot can transform it into a limb.

Figure 5. Remove limbs that cross over branches.

Figure 6. Remove water shoots.

Step 6: remove side-by-side limbs

Two limbs very close together, servicing the same parts of the canopy (Figure 7) cause overcrowding, leading to shading, dead wood, and access problems.

Note: once a tree has been structurally pruned into a desired shape, there is usually no need to remove limbs unless they are diseased, sunburned or broken, or another limb in a better position has grown in its place. Continuing to structurally prune a tree (i.e. heavy chainsaw pruning) after the optimum tree shape has been achieved is undesirable and will reduce productivity. If a good, productive, well-spaced limb is accidentally removed, especially a lower limb, extra time is required to regrow the limb and its branches. Lower limbs are important, easy access, fruit producing limbs; think twice before removing a lower limb.

Figure 7. Remove limbs or branches that are too close together.

Maintenance pruning

Maintenance pruning is removing unproductive branches and shoots that produce small, poor quality fruit. Maintenance pruning aims to remove the oldest branches in the shortest time (e.g. 1–2 min) and removes about 30% of the canopy so branches are no older than 5 years.

Productive branches are young and vigorous, close to a main limb or secondary limb, directionally upright, and contain many leaves (Figure 8, left). Unproductive branches are older and predominately have spindly, downward-pointing shoots. These branches will also have dead wood and not many leaves (Figure 8, right).

Figure 8. Left, a pruned canopy with a young branch growing in an opening made from previous pruning. Right, an old canopy with long, downward-cascading branches and dead wood.

The whole branch is removed from where it forks or emerges from the limb. Usually, a branch will have a mix of good, young canopy and older canopy. The key to strategic pruning is having a quick look and removing branches with the most old wood (dead wood and thin, downward shoot growth, Figure 9). Two to four branches are removed from around the tree to spread the effect of pruning and to allow more light penetration throughout the tree.

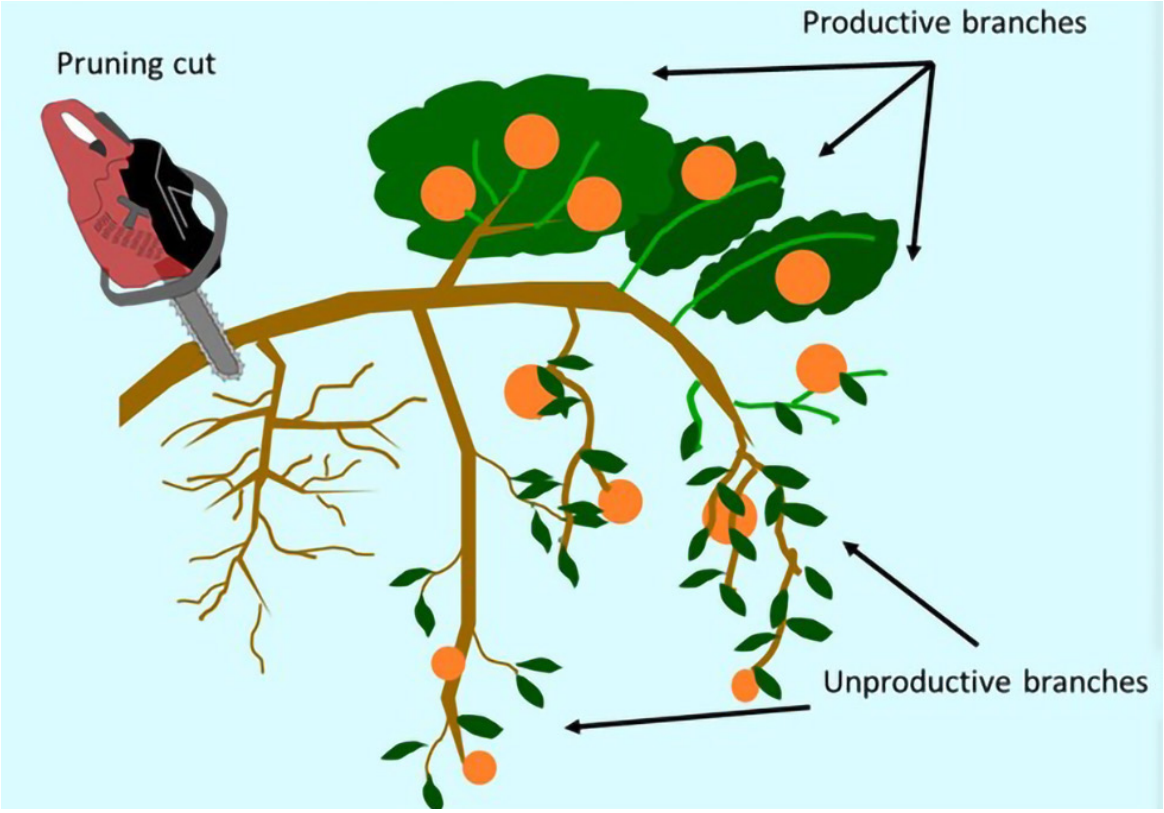

Figure 9. Remove the oldest branches on the tree.

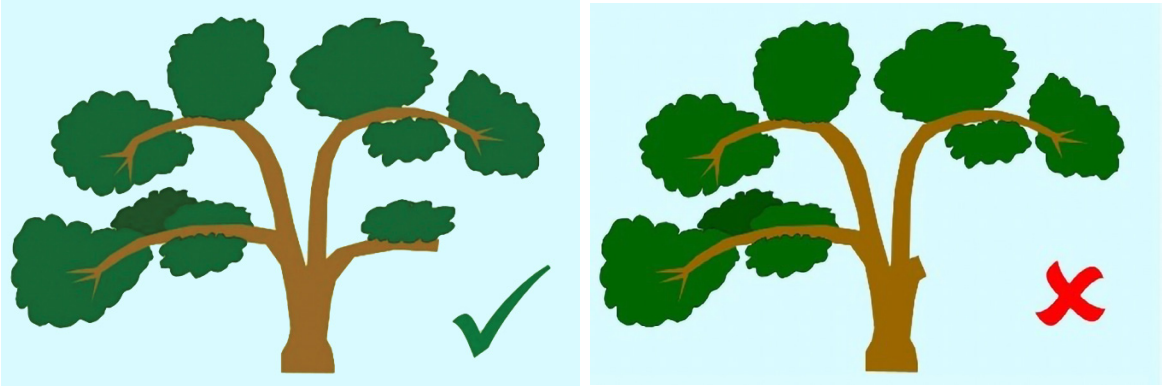

Figure 10. Only prune enough of the limb or branch to remove the old wood and allow enough room for the new branch to grow.

Caution

Do not remove the entire limb when branch pruning because a limb or branch pruned back to the trunk might not re-shoot. Prune enough of the limb or branch to remove the old wood and allow enough room for the new branch to grow (Figure 10).

Step 1: remove and thin out unproductive branches and shoots

Figure 11. Left: a branch with unproductive wood can be removed where it begins to fork or is attached to a limb (red). Right: a young branch (2–3 years old) with vigorous shoots and no dead wood should not be pruned. After another 2–3 years, this branch will be older and need to be removed.

Step 2: remove water shoots and other undesirable branches

Remove water shoots annually. Removing a one-year-old water shoot is easier (Figure 12, left) than waiting several years and removing a large unwanted limb that has shaded the lower canopy (Figure 12, middle). Continue to remove other undesirable branches and limbs as they appear, e.g. those that are too tall or broken (Figure 12, right).

Figure 12. Remove water shoots (left), uprights (middle), and broken limbs and branches (right).

Note: trees should be pruned annually to remove unproductive branches, allowing younger, more productive branches to grow. Always target the oldest branches, removing about 25% of the canopy each year, resulting in a tree with branches no older than 4–5 years old.

Final result

A well-pruned tree should have well-spaced limbs with a thinned-out canopy so that branches are not overcrowded. Enough light should reach the inner parts of the tree to maintain shoots within the canopy. In the middle of the day, filtered light should reach the ground (Figure 13, left) and not completely shade below the canopy (Figure 13, right). There should be gaps in the canopy throughout the tree to let light in and allow access for picking and pruning.

Figure 13. Left: a well-pruned tree with good spacing between branches and predominantly young growth; some dappled light reaches the orchard floor. Right: a dense, over-crowded canopy with no light reaching the orchard floor.

References and further reading

A companion video for this factsheet is available from the NSW DPI citrus website (https://www.dpi.nsw.gov.au/agriculture/horticulture/citrus/content/canopy-management). More detailed videos also show the different pruning styles for navels and mandarins.

Acknowledgements

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