Pruning

Apple & Pear trees

Turning wood into profit

Bas van den Ende

About the author

Bas van den Ende was a research scientist with the Victorian Department of Agriculture for 30 years, specialising in the management and production of fruit trees. He was responsible for the development and commercialisation of the Tatura Trellis. In 1989 he moved to the USA where he worked as a technical consultant. He returned to Australia in 1995 to become a private consultant.

Disclaimer

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Where to find it

Contents

Why train and prune young trees?

- A young tree that is not pruned will become a shapeless tree.
- A shapeless tree does not fill its space in the orchard and we cannot maximize light interception and light distribution.
- Growing fruit means trapping (intercepting) as much sunlight as possible and converting it into a high quality product that we can sell.
- To shape a fruit tree and give it a good structure we must train and prune young trees.
- The best shapes to intercept and distribute sunlight are the Christmas tree-type (Central Leader) and V-type (Tatura Trellis).
- Any pruning during the early years is dwarfing, the trees cannot fill their space quickly and it delays fruiting.
- Trees that are trained well and pruned minimally, grow fast and come into production soon.
- Fruiting reduces tree growth. If we allow fruit trees to crop heavily too soon, the trees will be in full production before they have filled their allotted space.
- Training and pruning young trees allows us to regulate tree growth and fruitfulness so that we can maximize the production potential of an orchard.

Why prune mature bearing trees?

- To keep the trees in their space. This is called containment pruning.
- To renew the fruiting wood. This is called renewal pruning.
- To trim the spurs to keep strong buds. This is called spur pruning.

Containment, renewal and spur pruning are practised to keep the trees productive and are parts of maintenance pruning.

- To remove diseased, dead or damaged wood.
- To allow access to all parts of the trees.
- To keep the trees open for good light penetration and chemical coverage.
- Initial step in thinning the crop.
- Trees that have been neglected or pruned and trained incorrectly may need to be cleaned up, opened up and their shape restored.

This is called renovation pruning.

- Sometimes the trees are too high and cause shading, Trees that are too high are difficult to prune, thin and harvest.

Trees can be pruned in winter, spring & summer

In the winter

- To renew the wood and trim the spurs.
- To regulate the crop.
- To remove diseased, dead and damaged wood.
- To renovate the trees if necessary.

In the spring

- To avoid blind wood.
- To devitalize the heads (tops) of the trees if necessary.
- If you are not sure about the amount of flowers the trees are going to have.

In the summer

- To remove sucker growth to let light into the trees.
- To get well-coloured fruit.

Eight different pruning cuts

1. Dormant heading cut

With this cut you remove part of a shoot, branch or limb in the winter.

It is most invigorating and new strong upright shoots usually develop immediately below this cut.

Heading cuts are most disruptive to the natural growth and shape of the trees, They should be used with care, especially on young, vigorous trees.

New shoot growth will be very strong when heading cuts are made into one-year-old wood. These shoots grow straight up and create shade, have little fruiting potential and are costly to remove.

If you head a strong shoot in the winter, only the three buds directly under the cut will break and form new shoots with narrow angles. But if you make this heading cut in the spring, more buds will break and form shoots with wide angles. This is called *delay-heading*.

Delay-heading is done on strong one-year-old shoots to force breaks and avoid the development of blind wood.

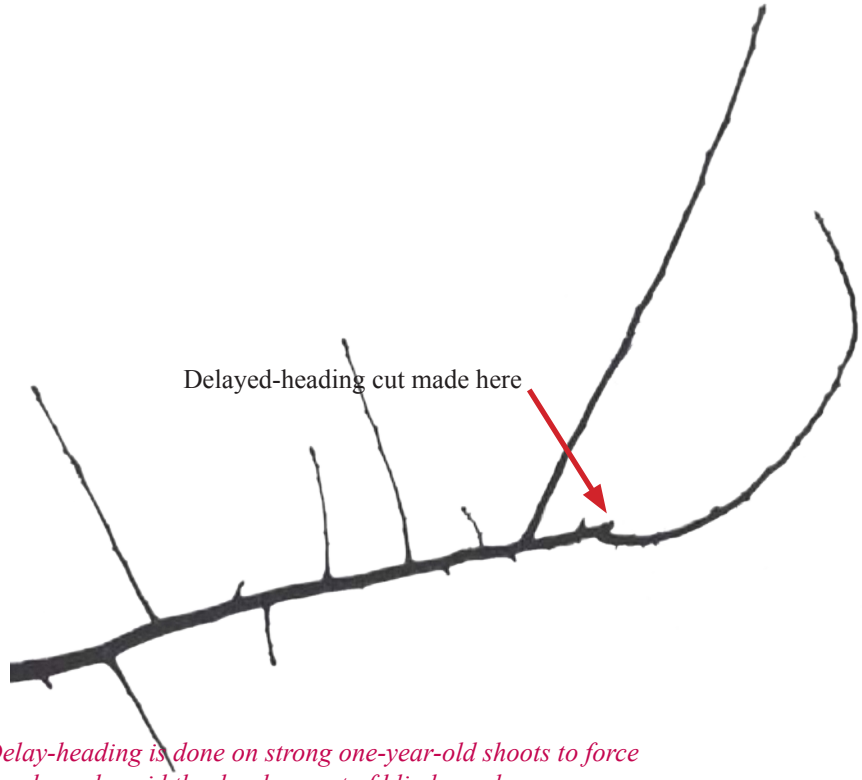
Delay-heading can be done at different times. Early delay-heading is done at “green-tip” and late delay-heading at full bloom plus two weeks. The later the date of delay-heading, the greater the number of buds will break, but the resulting shoots will be short.

The response to delay-heading is restricted to no more than 450 mm below the cut and the shoot must be at least pencil-thick where the cut is mode.

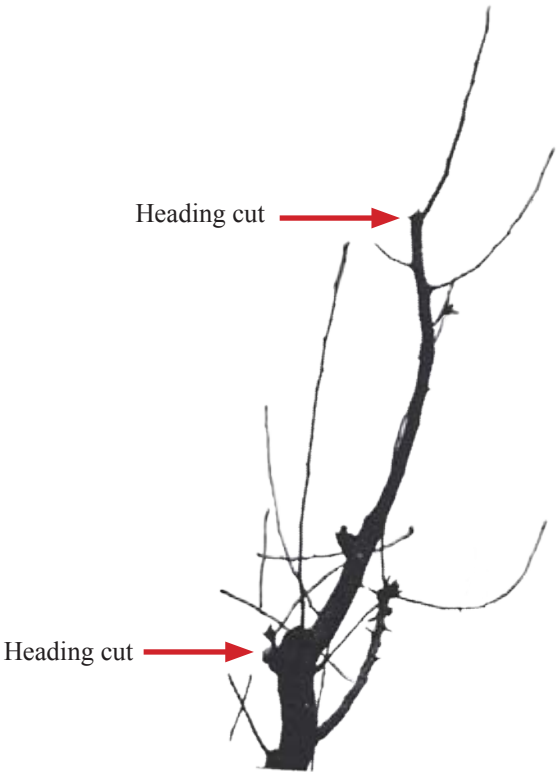
Avoid making major heading cuts. New shoot growth will be very strong when heading cuts are made into one-year-old wood. These shoots grow straight up and create shade, have little fruiting potential and are costly to remove.

Eight different pruning cuts (cont)

1. Dormant heading cut (cont)



Delay-heading is done on strong one-year-old shoots to force breaks and avoid the development of blind wood.



Avoid making major heading cuts.

Eight different pruning cuts (cont)

2. Thinning cut

With this cut you remove an entire shoot, branch or limb in the winter.

Thinning cuts do not disrupt the natural growth and shape of the trees. No strong upright shoot growth results from thinning cuts.

Thinning cuts have less of an effect on the crop than heading cuts.

They control the light distribution in the canopy and eliminate vigorous, unfruitful growth.

The most important application of thinning cuts is to alleviate crowding and shading.

Eight different pruning cuts (cont)

2. Thinning cut (cont)

Before

After

Eight different pruning cuts (cont)

3. Bench cut

A bench cut is a type of thinning cut that is made in the winter

This cut, which leaves a small horizontal seat, can convert a strong shoot with a narrow angle into a more manageable shoot with a wide angle.

Bench cuts are used especially on young trees when they have strong shoots with narrow angles.

A bench cut is a short horizontal cut.

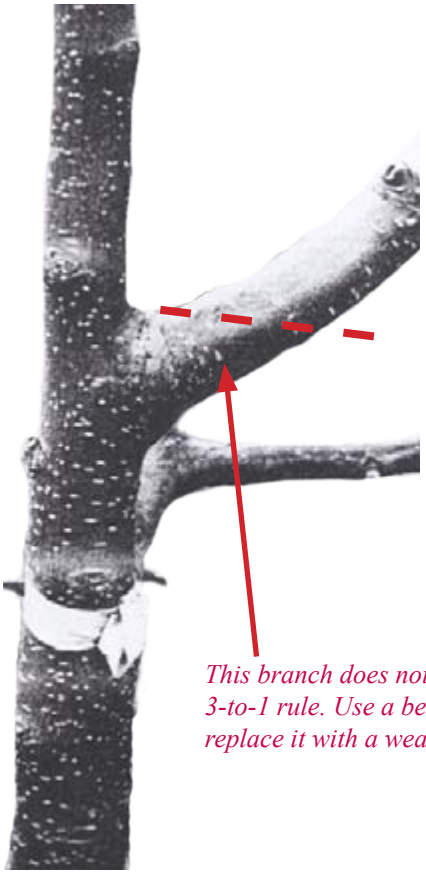
This branch does not obey the 3-to-1 rule. Use the bench cut to replace it with a weaker shoot.

More manageable shoots have replaced the strong shoots when bench cuts were used.

A bench cut is a short horizontal cut

Eight different pruning cuts (cont)

3. Bench cut (cont)



This branch does not obey the 3-to-1 rule. Use a bench cut to replace it with a weaker shoot

More manageable shoots have replaced the strong shoots when bench cuts were used.

Eight different pruning cuts (cont)

4. Spur cut

This cut is used to trim or shorten long spur wood.

Apple and pear trees can become “spur-bound”. They develop many old, weak and multi-branched spurs.

Trees with many old and weak spurs have few new shoots. They tend to be very fruitful but produce many small fruit.

Since shoot leaves contribute more to fruit growth after midsummer than do spur leaves, the fruit size problem is usually due to not enough shoot leaves. Shoot growth can be stimulated if the old branched spur systems are cut back to one or two upright spurs each.

If spur pruning is combined with pruning to let more sunlight into the trees, fruit quality will improve, especially fruit size.

Eight different pruning cuts (cont)

4. Spur cut (cont)

Spurred-up branches

Before

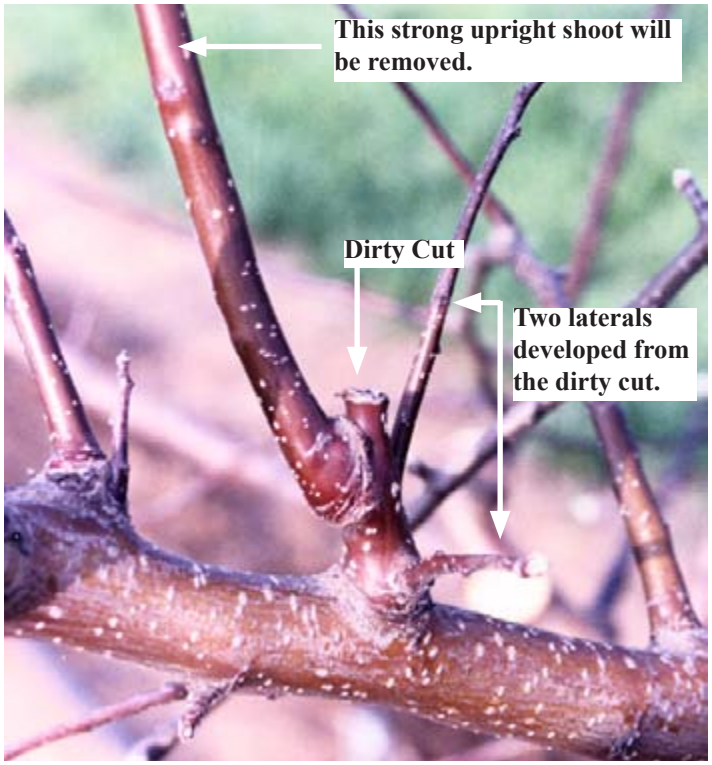
After

Eight different pruning cuts (cont)

5. ‘Dirty’ cut

If limbs or branches have many strong upright shoots and very little or no fruiting wood, some of the strong upright shoots can be cut back to short stubs. Sometimes these stubs develop fruiting spurs and/or weak laterals.

Dirty cuts or ‘coat-hangers’ should only be used if you cannot afford removing strong upright shoots.



Eight different pruning cuts (cont)

6. 'Klik' cut

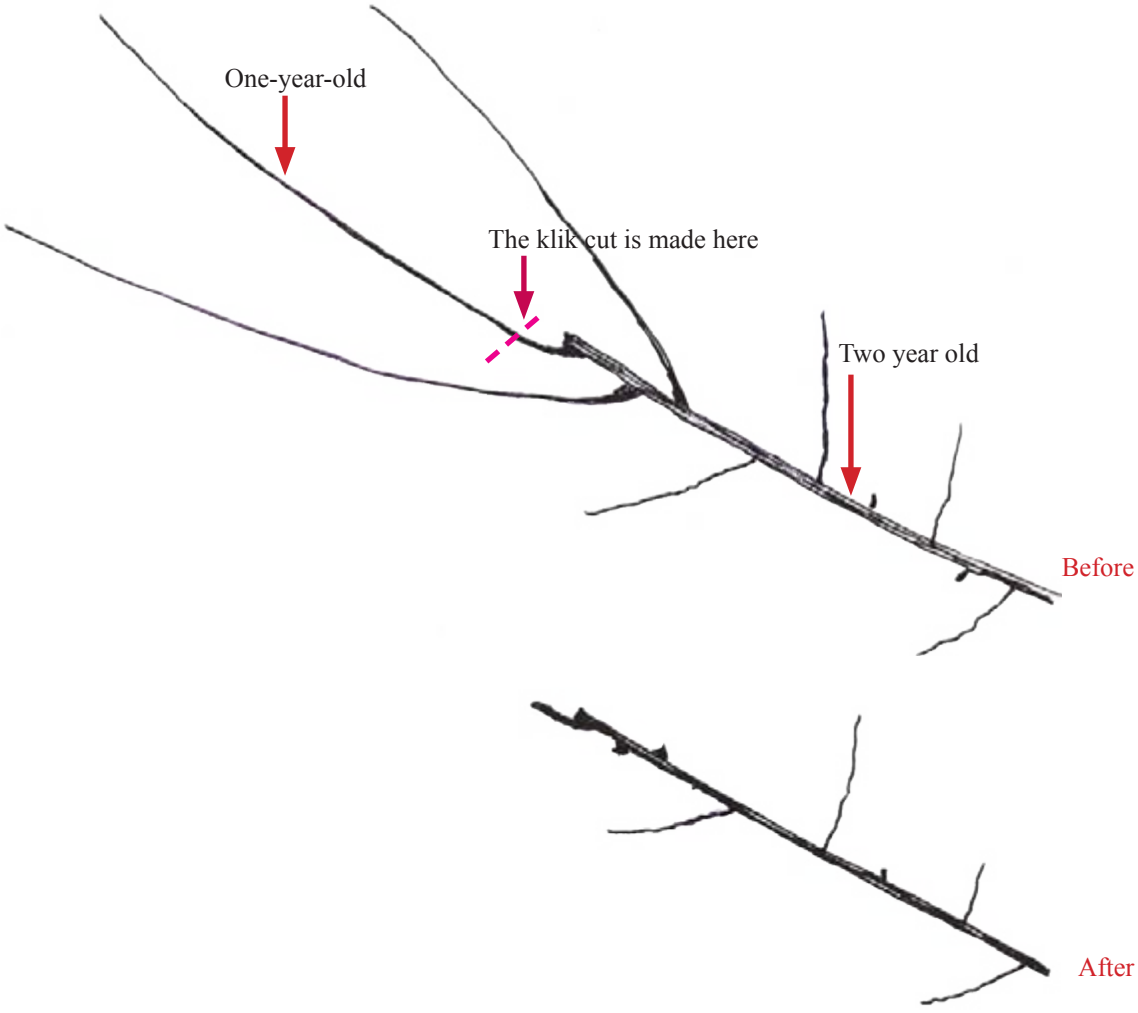
This is a new cut and is used on pear trees, but may also work on apple trees.

To keep growth of a leader or branch calm, you must create a growth-point at the tops of the leader or branch. This growth-point will quickly restore apical dominance and therefore control the rest of the growth on the leader or branch.

Apart from the dominance that the active growth-point will exert, it will also draw nutrients that benefit the entire leader or branch. Active growth results in active root growth in the spring and early summer. Active root growth means that nutrients are taken up for tree growth and fruit production.

Pear and apple wood must grow in order to get good fruit size and keep the fruiting wood young. The klik cut directs growth and maintains good balance between growth and fruitfulness.

The klik cut can be applied to all branches and leaders in a tree, but should only be used when the trees have filled their spaces.



Cut back to 2 or 3 leaf buds; never to a fruit bud.

Eight different pruning cuts (cont)

7. December cut

You can use this cut to control vigour in the heads of your trees and prevent excessive thickening of the leader(s).

It is also used to get breaks on the leader(s) and thus avoid blind wood.

As the name implies, the December cut is made around the longest day (21 December), when extension growth in the head(s) is well advanced. You remove all the new growth and also some of the stronger shoots on last year's section.

If necessary, you can also tip some new shoots that develop lower down the december cut.

Before

After

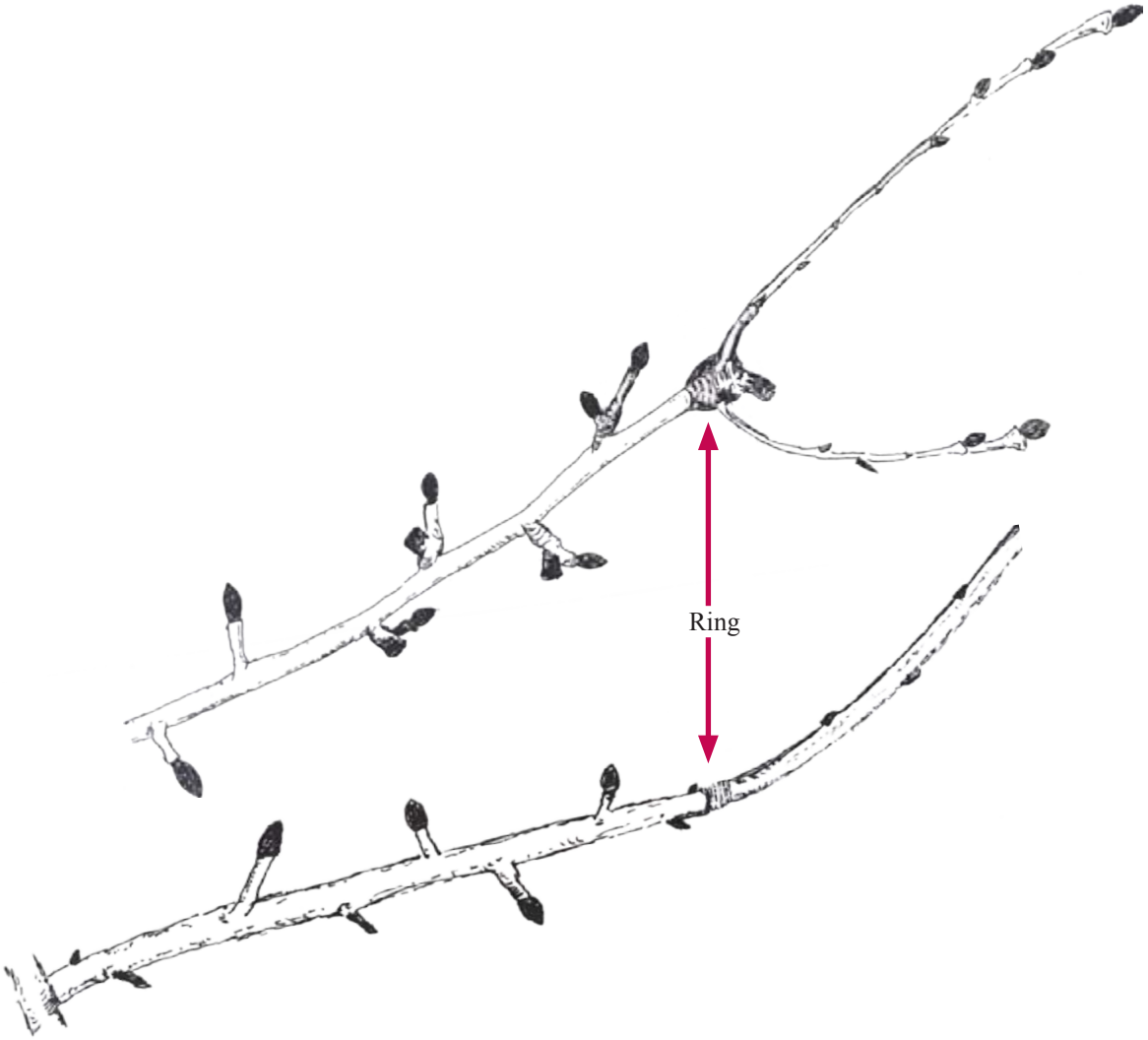
Eight different pruning cuts (cont)

8. Ring Cut

This cut is part of the 1,2,3 rule of renewal pruning (see Page 28).

The cut is made through the ‘ring’, which is the division between the one and two-year-old wood.

The ring cut, also called fertility cut, enhances fruit set on the two-year-old wood and keeps the fruiting wood short and rigid.



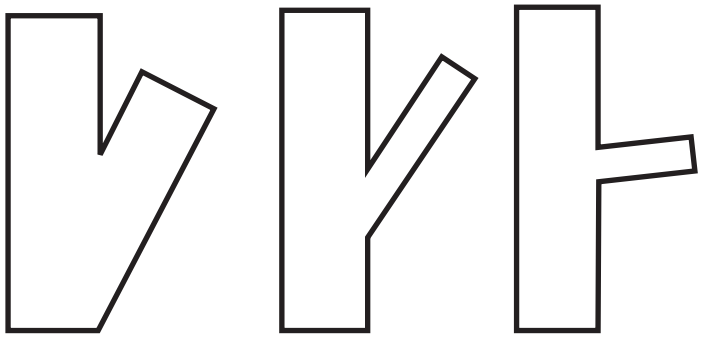
Maintain a balanced tree structure

Use the 3-to-1 Rule

This rule refers to the relationship between the diameter of the trunk and the diameter of branches where they join the trunk.

The 3-to-1 rule ensures uniform vigour in the trees.

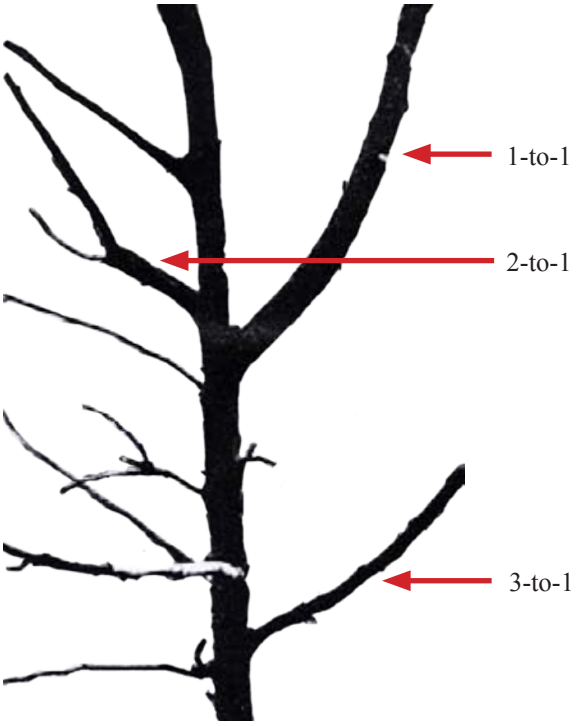
This rule is applied to newly-planted trees and also later as the trees develop. Branches must have a diameter at their points of origin of one-third or less of the diameter of the trunk. The 3-to-1 rule also applies to any limbs and the fruiting units that develop from them.



1-to-1
Wrong Ratio

2-to-1
Wrong Ratio

3-to-1
Correct Ratio



Maintain a balanced tree structure (cont)

Avoid forks

Forks cause crowding, shading and irregular growth in the trees.

By removing shoots that compete with the leader, you create limbs and branches that can maintain their dominance and you keep growth and fruiting in balance.

Before

After

Before

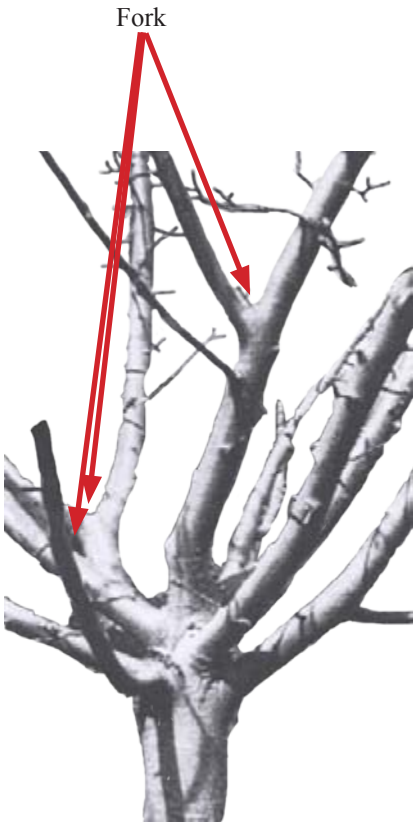
After

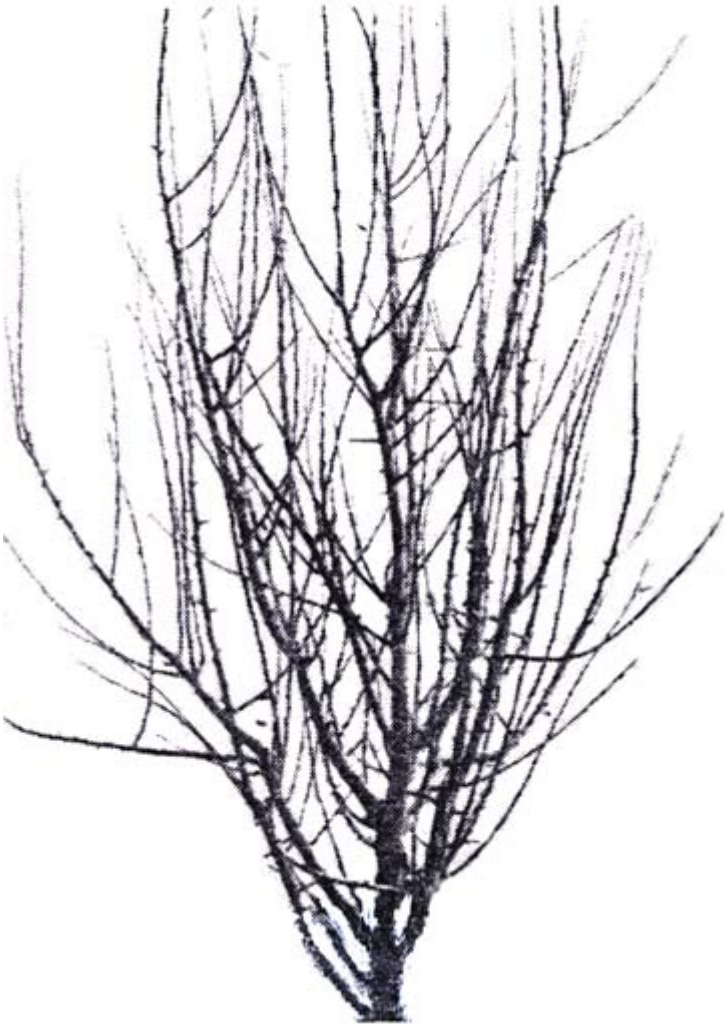
Maintain a balanced tree structure (cont)

Avoid crowding of limbs—keep trees open

Crowding trees with limbs and branches is the main cause of shading and poor tree performance.

By removing some limbs and branches, you open up the tree and allow sunlight to penetrate the tree canopy. Strong healthy fruiting wood can then develop.





Too Many limbs and forks!

Maintain a balanced tree structure (cont)

Spread branches

Spreading branches divides vigour uniformly over the whole tree, slows down growth and makes the branches fruitful.

Spreading branches 45–70 degrees from vertical, reduces the vigour of shoots near the tips of branches and increases the number of shoots formed and the length of those lower down the branches.

More fruit buds are formed and flowers will set fruit better when branches are spread.

Branches of apple varieties that are strong in the base, like Fuji, spur-type Red Delicious, Cripps Pink (Pink Lady™ apples) and Braeburn, should be spread wider than branches of varieties that tend to be stronger in the heads, like Granny Smith, Gala, Crips Red (Sundowner™ apples) and Golden Delicious.

Pear trees grow very upright and the lower branches should not be spread too wide.

Apple: Scaffold branches are nicely spread and tree is open.

Pear tree.

Maintain a balanced tree structure (cont)

Keep the ends (tips) of the branches up

Branches should curve up to keep growth in the tips and avoid strong upright sucker growth.

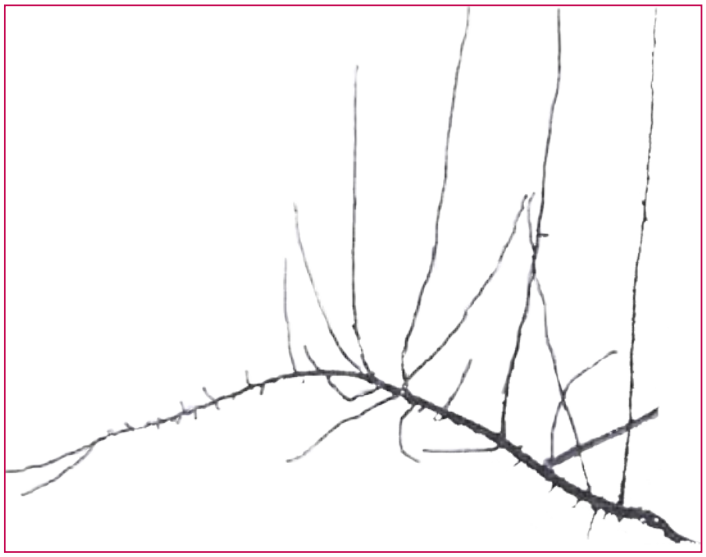
Branches that have been spread and curve up nicely, are calm and develop good fruiting wood.

Growth is calm. Scaffold branches have developed good fruiting wood.

Maintain a balanced tree structure (cont)

Keep the ends (tips) of the branches up (cont)

Wrong



Bowing the branch forced the development of strong upright shoots.

Maintain a balanced tree structure (cont)

Control growth in the heads

If you manage the heads of your trees well, you manage the whole tree well.

Heads can sometimes become very vigorous and dominant and sometimes they can become weak and runt out.

Some apple varieties, like Granny Smith, have the tendency to grow strongly in the heads and form 'umbrellas' which cause a lot of shading. Pear trees also do this and their branches are very upright as well.

Apple varieties like Fuji and Red Delicious can develop weak leaders. If you are not aware of this, the trees will not fill their space, and you lose out on production every year.

You should not head your leaders until the trees have reached their maximum permissible height. Heading the trees too soon disrupts the pattern of growth and upsets the balance in the trees.

Once the trees have filled their spaces and reached their maximum permissible heights in the summer, you should treat the heads according to the growth habit of the variety:

- Heads of apple varieties that tend to have weak leaders should be trimmed in the winter, not headed. We refer to this growth habit as basitonic.

- Heads of apple varieties that tend to have strong leaders should not be pruned in the winter (acrotonic growth habit). Prune the heads between three weeks after full bloom and the longest day (21 December). Make the heading cuts into two or three-year-old wood that is surrounded by fruit and ends in weak young shoots. This way the trees cannot respond with strong regrowth and the heads remain calm.

- The heads of pear trees need to be managed very carefully. You should not prune the leaders until they have reached their maximum permissible height in the summer.

Maintain a balanced tree structure (cont)

Keep your leader(s) straight and at the correct height

Make sure that your leaders can continue to extend until they have reached their maximum permissible heights. This is for:

- Central Leader and multi-leader trees: 80% of row width. Example: If rows are 5 m wide, tree height in the summer should be 4 m.
- Tatura-type trees: 60% of row width, measured vertically. Example: If rows are 5 m wide, the canopy should not be higher than 3 m.

Don't allow your leader(s) and branches to weep. The 'crop and flop' method ruins the structure of your trees and causes fruit to sunburn. The trees cannot fill their space and you lose production every year.

You will avoid inter-row shading, if you keep the correct height of your trees.

Sunlight comes from above. Trees that are too high block a lot of sunlight. If this happens, the fruit buds and fruit will move to the upper part of the trees and disrupt the vigour/fruiting balance of the trees.

Wrong

Correct

Different Buds

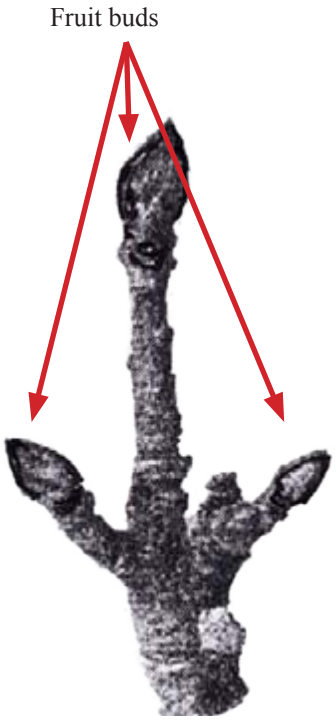
There are three different types of buds in the winter. When you prune apple and pear trees, you must know the difference, because some buds will have flowers that can become fruit, others become vegetative spurs and some buds turn into shoots.

Each type of bud plays an important role in the growth or fruitfulness of the trees. By pruning the trees, you can regulate the crop and direct growth.

The three different types of buds are:

Fruit Buds

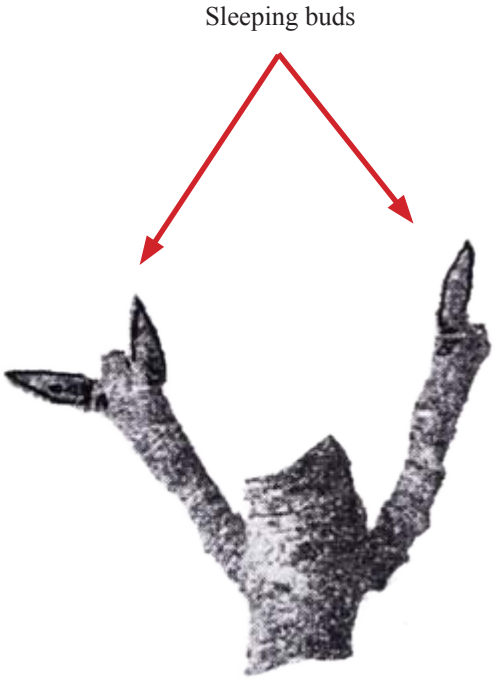
These buds have a cluster of flowers. Directly under the flowers are also two vegetative buds that can become shoots. We call these shoots bourse shoots. Because these buds contain both flowers and shoots they are also called mixed buds.



Different Buds (cont)

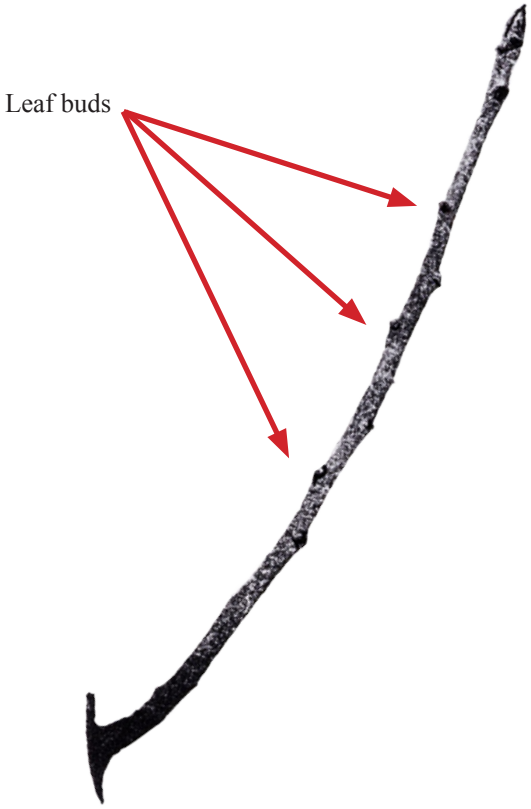
Sleeping buds

These thin, pointy buds will turn into flower buds for next year's crop. They 'sleep' for a year. If all buds become fruit buds, you would have a crop every second year. We call this biennial bearing. By pruning the trees correctly, you can maintain a good balance between the number of fruit buds and sleeping buds you leave on your trees. When you have mastered this pruning skill your trees are well on the way of producing a good crop of high quality fruit every year.



Leaf Buds

Leaf buds form shoots and laterals that are necessary to keep the fruiting wood young and replace older branches if necessary.



Renewal Pruning—the 1,2,3 rule

The 1,2,3 rule of pruning apple and pear trees has been developed to ensure, that the fruiting wood always remains young. It is well known that the best quality apples and pears are produced on two-year-old wood and young spurs. This is how you do it:

Rule 1

The first rule deals with the one-year-old shoots. These shoots are about 300 mm long (one foot) and a little thinner than a pencil. The buds at the tips are fruit buds. We call these shoots laterals or pencils.

Suckers and thin long shoots without fruit buds are not suitable and must be removed.

About one-third of the renewal wood on your trees must consist of these one-year-old pencils.

You must NEVER cut these pencils.

If you have too many, you can space them out and keep the ones that are mostly horizontal.

These pencils are the foundation of your fruiting wood —make sure you always have plenty to choose from.

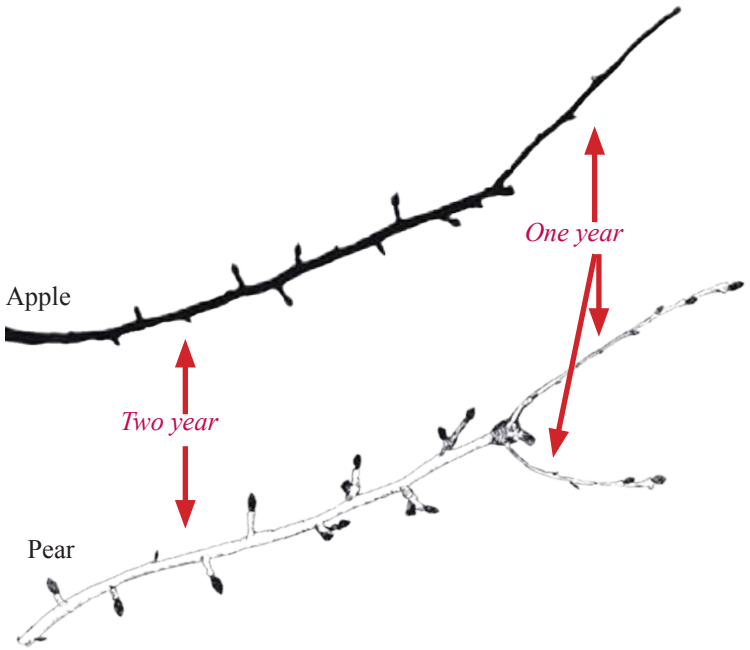
Pencil (Apple) *Pencil (Pear)*

Renewal Pruning—the 1,2,3 rule (cont)

Rule 2

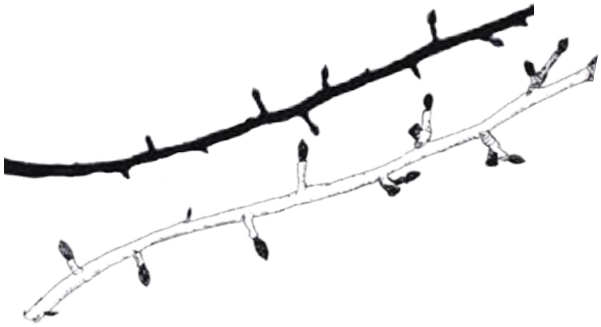
When the pencils are a year older, they often have had fruit at the tips. They also formed a number of fruit buds and sometimes one or two bourse shoots.

How you prune this wood depends on the number of fruit buds and the vigour of the trees.



Option 1

Cut back to the 'ring'. This is the division between the one and two-year-old wood. This is called the ring cut or fertility cut.



Option 2

Cut deeper than the ring to reduce the number of fruit buds. Some apple and pear varieties set a lot of fruit buds on their two-year-old wood, others don't. Very often you find differences in the fruitfulness of this wood on the same tree. Use your discretion in this case.

The fruit buds on this two-year-old wood will produce the best size and quality fruit, if it is positioned horizontally and has space for its fruit to hang free.

About one-third of the renewal wood in your trees should consist of this two-year-old wood.

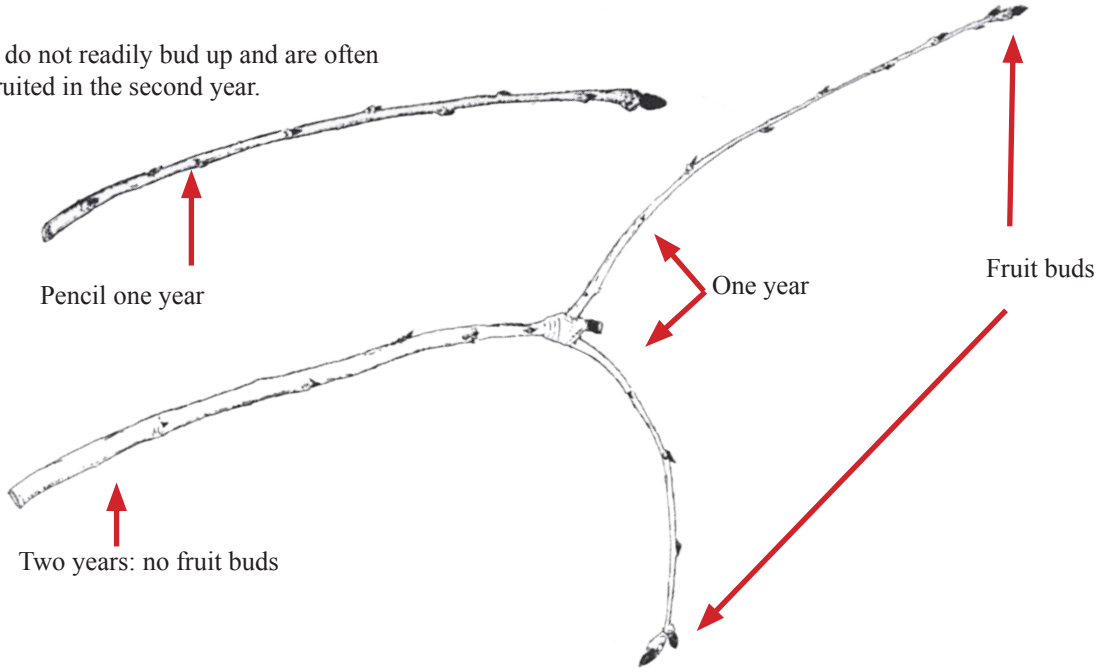
There are exceptions:

Renewal Pruning—the 1,2,3 rule (cont)

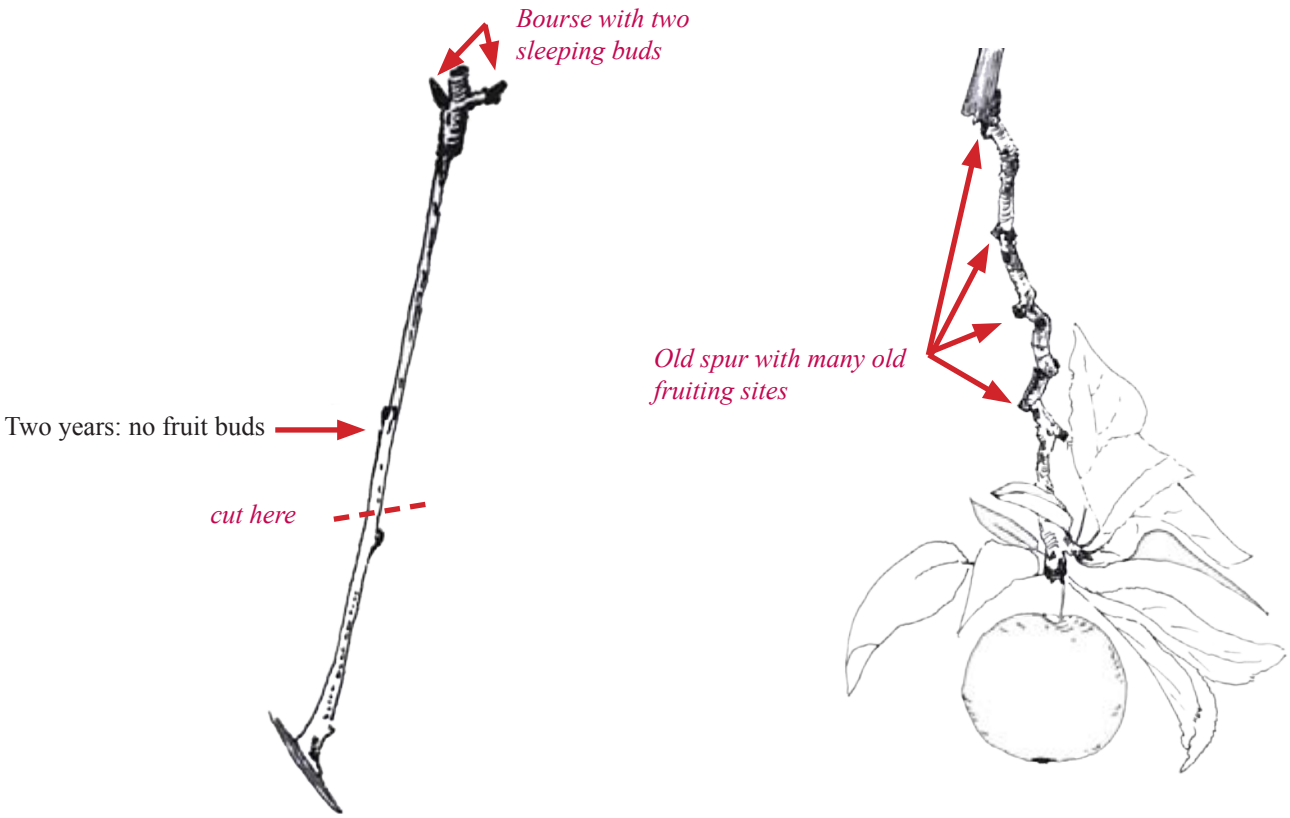
Rule 2 (cont)

There are exceptions:

(a) Pencils of WBC pears do not readily bud up and are often removed after they have fruited in the second year.



(b) Granny Smith can also produce many pencils that do not bud up in the second year. They continue to extend and can become long, thin spur systems. Fruit set and fruit size are usually poor on these spur systems. To avoid this, cut the two-year old wood back to a leaf bud.



Renewal Pruning—the 1,2,3 rule (cont)

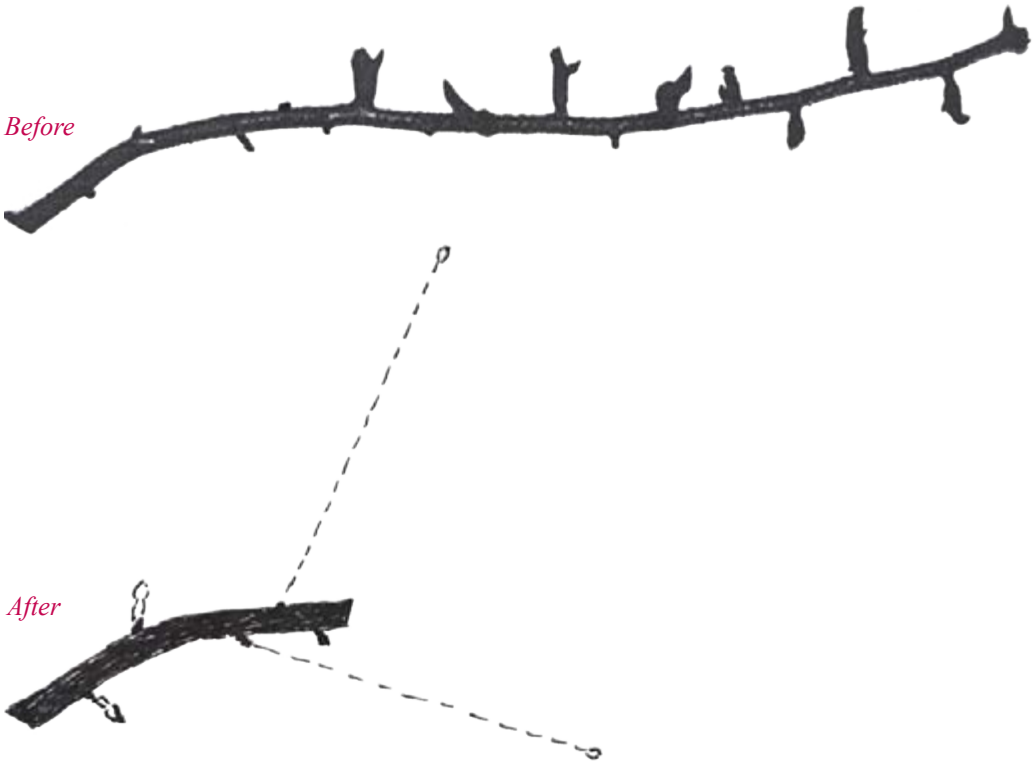
Rule 3

When the two-year-old wood has cropped and the trees have gone dormant, this wood has become three years old.

It is now time to renew the three-year-old pieces by cutting them back hard.

This way you will generate pencil growth and the cycle starts again. Some sleeping buds may also exist on these short pieces of three-year-old wood that you have pruned. These sleeping buds can turn into good young fruitful spurs.

About one-third of the renewal wood in your trees should consist of this three-year-old wood.



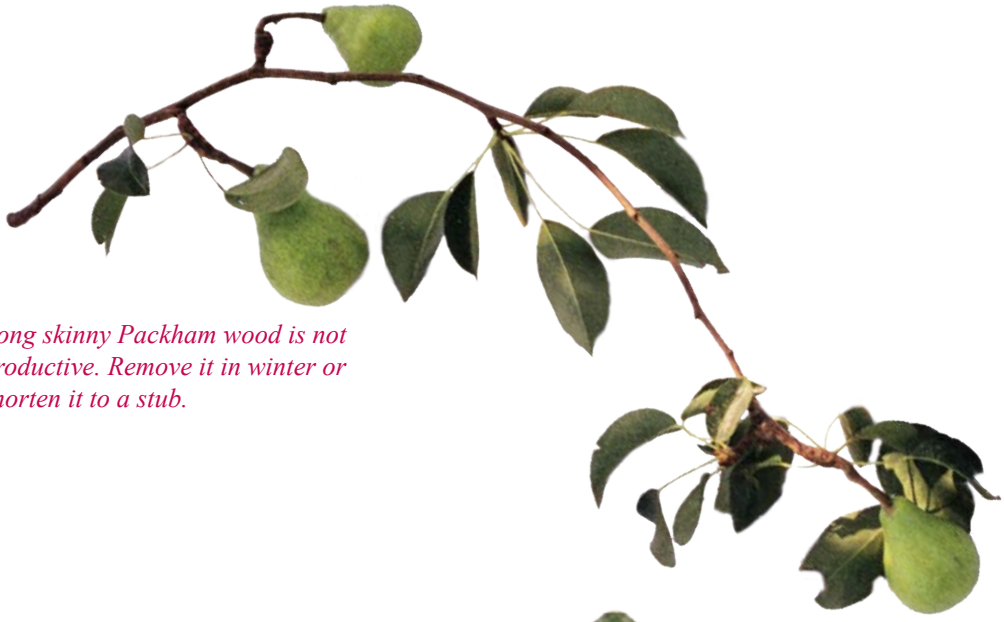
Importance of one and two-year old wood

A large proportion of Williams' pears are grown from the terminal fruit buds of strong short pencils. The leaves of the bourse shoot contribute a lot to sizing the fruit.

The buds of old spurs are not productive. Many of these buds are weak, get small flowers that bloom late, set poorly and have small fruit.

Lots of good quality Packhams are produced on short strong wood that is at least 10 mm thick.

Importance of one and two-year old wood (cont)



Long skinny Packham wood is not productive. Remove it in winter or shorten it to a stub.

Wood that is thinner than 5mm produces small Packhams.

The best Packhams come from short wood that is at least 10mm thick.

Importance of one and two-year old wood (cont)

Correct pruning means better yields and better quality

You can improve both Yield and Fruit Quality of Packham pears by pruning the trees correctly.

Packhams from two-year-old wood.
Average weight: 155 g= 100–110s

Packhams from terminal buds of pencils
Average weight: 150 g = 100s

Packhams from old long spurs
Average weight: 80 g = 165–180s

Importance of one and two-year old wood (cont)

You can grow good quality apples by keeping the fruiting wood YOUNG.

Weak spurs that have not seen much sunlight are unproductive

The best apples are grown on two-year-old wood that has lots of leaves.

Weak spurs produce small apples.

Spur pruning

Detailed spur pruning of pear trees has become expensive and is therefore rarely practiced these days.

Instead, many spurs have been left untouched for years. In some orchards, pear and apple trees have become completely spurred-up.

Despite the large number of flowers, fruit set and fruit size have been poor on these trees. This is because the spurs became too old, there were too many weak buds on the spurs and the spur systems became long and pendant.

When trees have too many old spurs, they often do not have enough pencils and shoots. It is well-known that the leaves of these pencils and shoots contribute more to fruit growth from mid-summer on, than spur leaves. This explains why spur-bound trees have trouble sizing their fruit.

Therefore it is important to have a balance of short spurs and shoots along each limb and branch to produce the large high quality fruit that you want.

To put life back into these spur systems, it is necessary that you cut them back hard and cut them back to an upright bud.

Spur systems that are very old, long and hanging down, should be removed.

W.B.C. is not a spur-bearing variety. A large proportion of its crop is borne on pencils. Short, thick pencils with large fruit buds at their tips produce the best Williams'.

Before

After

Spur pruning (cont)

Before

After

Before

After

Spur pruning (cont)

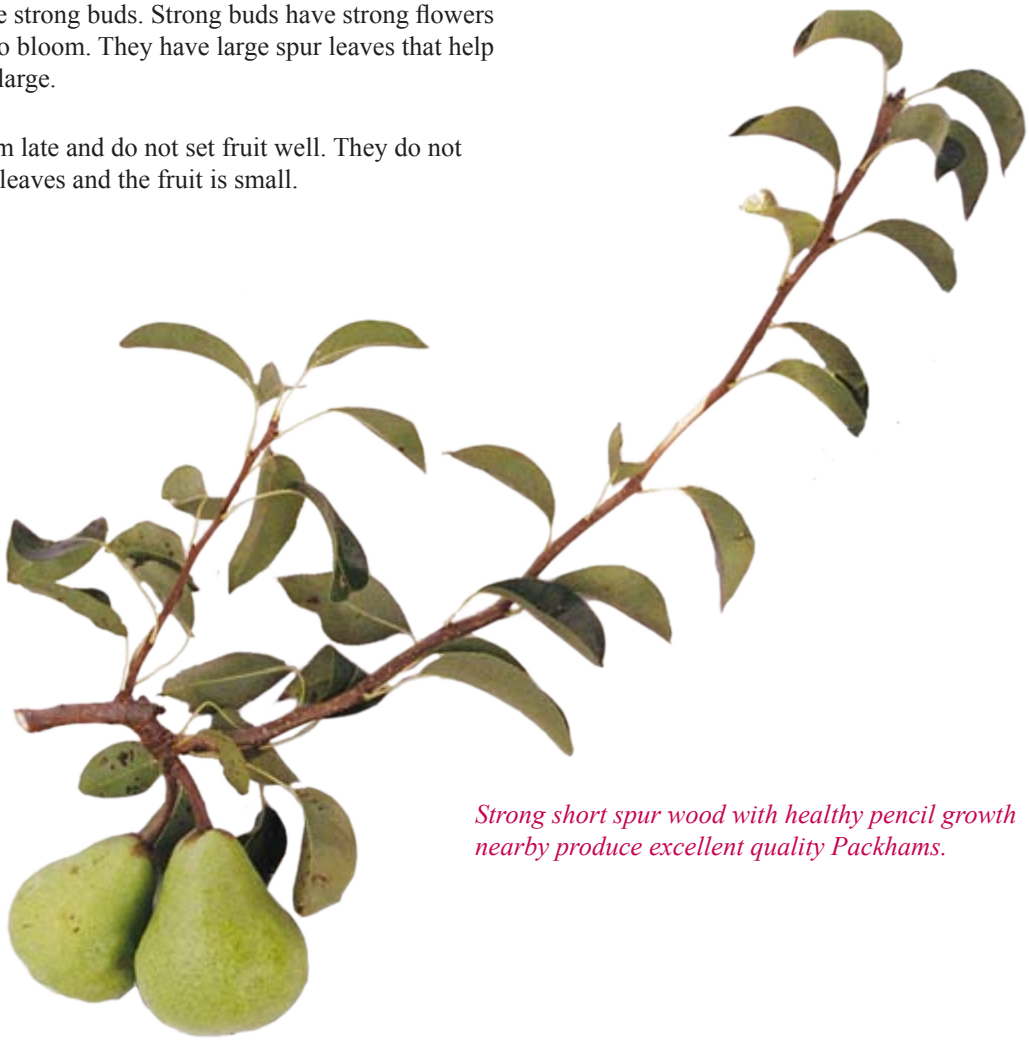
Young spurs can produce excellent quality Packhams

High quality spurs = high quality fruit

You can keep the spurs in your apple trees strong and young by having the trees open to let more sunlight in and by pruning the trees correctly.

Strong spurs have strong buds. Strong buds have strong flowers that are the first to bloom. They have large spur leaves that help the fruit to grow large.

Weak spurs bloom late and do not set fruit well. They do not have strong spur leaves and the fruit is small.



Strong short spur wood with healthy pencil growth nearby produce excellent quality Packhams.

Spur pruning (cont)

Strong spurs have strong buds. Strong buds have strong flowers that are the first to bloom. They have large spur leaves that help the fruit to grow large.

Weak spurs bloom late and do not set fruit well. They do not have strong spur leaves and the fruit is small.

Containment Pruning

When your trees have filled their spaces in the rows and between the rows, you have to maintain their shapes without invigorating them.

One way to control tree vigour is to crop the trees. The other way is to prune the trees correctly especially the tips of the scaffold branches.

Two examples of how to keep the scaffold branches productive

Before the scaffold branch is pruned.

After the scaffold branch has been pruned.
To keep vigour in the branch, prune to a weak upright shoot

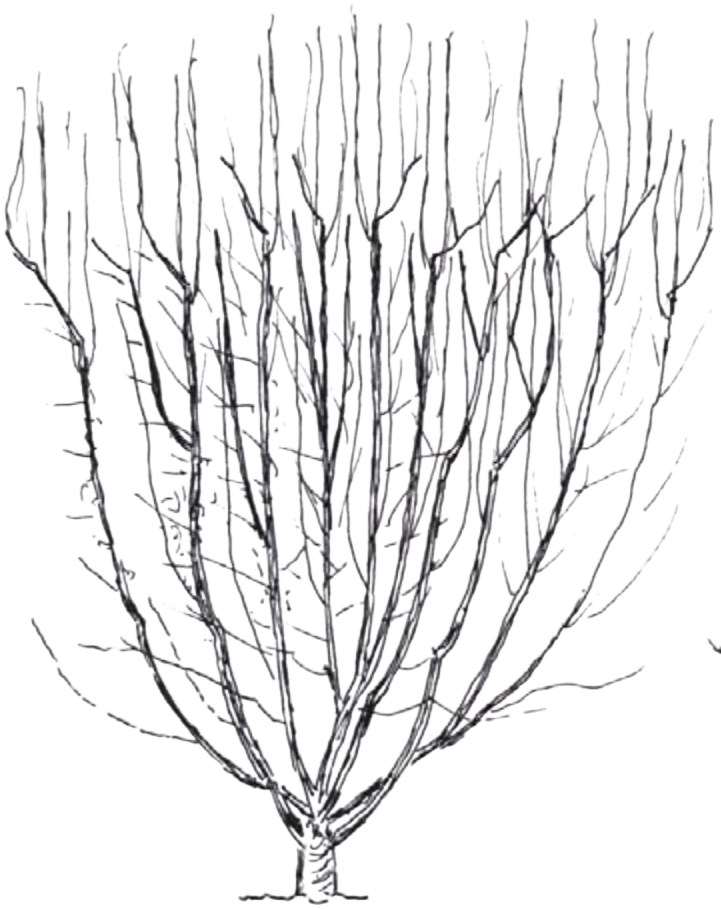
To calm the branch down, prune to a fruiting spur facing downwards. Make sure that there are also plenty of fruit buds around the upper part of the branch.

Renovation Pruning

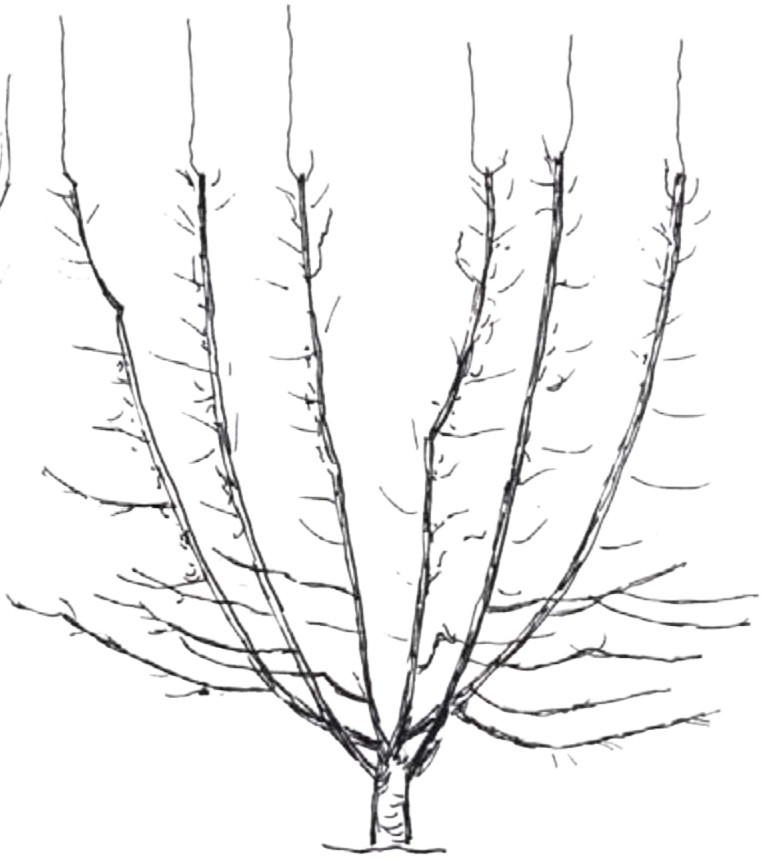
It is not uncommon for orchardists to run into fruit quality problems after about seven years. The reasons are usually that not enough sunlight is getting through the trees and that the fruiting wood is getting too old.

It is better to avoid these situations, but if you have run into these problems, you will have to open the trees up by doing some heavy cutting.

You will have to remove whole limbs, take out the forks, reduce tree height and do some branch spreading.



Before renovation pruning



After renovation pruning

Root pruning

With root pruning the roots of fruit trees are cut by dragging a cutting blade down the row near the trunks .

Root pruning is done with a sharpened blade mounted on a tool bar such that it extends out beyond the rear tires of the tractor. Tractors in the 40 to 50 horsepower class have proven satisfactory.

The blade cuts the roots that grow into the rows and reduces root volume, thereby reducing the root/shoot ratio.

First, the supply of water, mineral nutrients and hormones from the roots to the tops decreases as a result of the smaller root system. This causes a decrease in shoot growth.

But then a larger percentage of assimilates is transported to the roots, which lead to the development of new roots. These new roots stimulate the supply of growth-promoting hormones to the tops (more shoot growth).

Compensating root growth then takes place in order to restore the normal root/shoot ratio. Root pruning for growth restriction will have to be done regularly (annually)—that is, before the root/shoot ratio has been restored

Opinions on the effectiveness and risks of root pruning are still divided, especially in countries that have long hot summers.

It is claimed that correct root pruning:

- Reduces vegetative growth and promotes development of flower buds
- Can have a negative effect on fruit set and fruit size by slowing down cell division
- Reduces pre-harvest drop
- Increases pre-harvest drop
- Lessens biennial bearing
- Gets better return bloom
- Gets better skin colour
- Makes fruit firmer at harvest
- Produces higher fruit sugar content
- Lowers fruit magnesium and increases calcium levels.

Root pruning (cont)

However, you can expect a wide variation in response to root pruning. Different crops react differently to root pruning. This is due to method used, growing conditions, tree vigour, climatic conditions and varietal response.

Best time to prune roots

The best time to prune roots is from full bloom until two weeks later. Prune roots only when flowering is sparse, or to break a biennial pattern (in the off year).

If flowering is not sparse, but the trees still have had too much vigour, prune roots in late November or early December—after the fruit has set and cell division has ended. Do not prune roots when there has been a good fruit set for fear of affecting fruit size.

Problems you may run into

- Trees that have been root pruned are easily stressed and need careful watering and feeding until their roots have re-grown. A heat wave after root pruning can be disastrous.
- Trees may die if too many roots are pruned particularly during a warm dry year. If not enough roots are pruned, excessive root development and shoot growth will be the result.
- The blade cutting through the soil has a tendency to pull the tractor into the tree row, particularly the first time. If the going is tough, even at 300 mm, start pruning the roots at a shallower depth.
- Root pruning in heavy sod is much more difficult than in an herbicide strip and almost always will require a second pass to finish the job.
- Low hanging branches or limbs can get damaged by the machine.
- Large roots just under the soil surface can catch on the blade instead of getting cut cleanly. When this happens the root will be pulled off the tree and often a good chunk of the bark on the tree will be stripped off with it.
- You have to make the right judgement in regard to where you are going to make the cut first time, because the cut roots will slide past the blade when you want to cut them closer to the trunk.
- For root pruning to be effective, the block of trees need to be uniform in growth, crop load and tree vigour.
- Pruning wounds are potential points of infection for fungi and bacteria.

Root pruning is best done using one of the many machines available. As long as the machine can cut to a depth of 800 mm and perhaps have the ability to cut on an angle into the soil and away from the wheel track at 45 to 90 degrees.

Root pruning (cont)

The amount of vegetative growth can be controlled by adjusting the depth of the cut and the distance from the cut to the trunks. The closer to the trunk the greater the effect.

Root pruning must be done on both sides of the tree within 500 or 600 mm of the trunk, and to a depth of 300 mm to 800 mm depending on depth of roots and soil type. Root pruning is effective when topsoil is shallow, and does not work well in deep fertile soils.

Root pruning eventually results in more root growth closer to the trunks and near the cuts as the trees regenerate after pruning. This is why root pruning is an on-going practice.

Root pruning should only be carried out as a last resort on trees that are out of control and yield poorly. But you need to ask yourself first, why the trees are out of control and/or yield poorly.

It has been reported in Australia, that pruning of roots with a machine has adversely affected leaf calcium. This is not surprising since root pruning can cut a significant amount of roots, particularly when it is done on both sides of the tree, leaving fewer roots with root tips to take up calcium.

Root pruning (cont)

Root pruning would not be necessary if you:

- train and prune your young apple and pear trees in summer to fill their spaces in the orchard quickly
- develop a hierarchy in the tree's framework
- crop the trees as soon as possible
- use drip irrigation
- use, as a back-up, growth regulators, i.e. Ethephon, paclobutrazol (Cultar, Payback), Regalis, Cytolin (Promalin, Perlin), gibberellic acid.

For many European apple and pear growers root pruning is an essential tool to control tree vigour. They prune roots early in the orchard's life and continue with it until the very end.