

Future Orchards Article for the Australian Fruitgrower June 2012

Pruning – Getting the Job Done Well

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Last month in this column I explained the key role pruning has in orchard performance and discussed some pruning principles, objectives and techniques for managing tree canopies through pruning.

This month the focus will be more about getting the job done.

Do not be scared to spend money on getting the job right. In the Future Orchard 2012 notes for the March 2010 orchard walk, in which Ross Wilson and I addressed the topic of “Keys to Success”, we made the following comment: “Upper quartile growers spent more per hectare on pruning – attention to detail gives higher orchard performance”. These comments referred to the first grower survey on orchard costs and returns. The second one, done two years later, showed upper quartile growers had per hectare pruning costs similar to the panel average.



Figure 1: High yields come from a full and uniform canopy. This M9 Galaxy orchard planted at around 1,750 trees/ha regularly produces 80 tonne/ha of high packout fruit. Note the uniformity of the canopy.

This change towards average pruning costs among the upper quartile performers may well be due to the efforts made in earlier years to improve pruning.

One of the things about pruning we have noticed over the years is that once good systems of tree management, including pruning, are implemented, costs of doing the job tend to fall because the approach is systemized and the orchard becomes more uniform.

Furthermore, orchard staff has a clearer picture of where the pruning style is heading, become more confident in their work, so become more productive.

In one of the earlier orchard walks, June 2007, Steve Spark summarized pruning and training to maximise marketable yields as:

- Start with the end in mind.

- Recognize that you are harvesting light in the form of high quality fruit.
- The key is quality fruiting wood and attention to detail.
- Understand how much one year wood is required.
- Communicate what you want, monitor that it is happening.

Systemisation

This is one of the keys to efficient pruning.

Orchard performance is maximized when the fruiting canopy is full and uniform over the whole block.

In general, pruning practices can be described in four or five simple rules, and once established and adhered to its not long before every tree in the block looks and performs the same.

Some of the key rules are:

- Maintain a pyramid shape for the tree form, whether two dimensional or three dimensional canopy. The gap between the trees allows light penetration into the lower canopy and addresses the problem of apical dominance leading to upper tree branches becoming dominant.



Figure 2: In the absence of a pyramid form to control apical dominance upper branches will always become excessively strong and vigorous as the top branches of this young 2D tree show. Upper tree branches need to be weaker and pendant to avoid this problem.



Figure 3: Maintain a pyramid shape. The gap between the upper half of the trees allows light to penetrate into the lower tree as this picture shows.

- Keep fruiting units simple.
- Only leave upright shoots or branches where a new leader is required.
- Control tree shape by branch removal or manipulation, not by shortening cuts.
- Maintain sufficient separation between branches and laterals to allow the passage of transient light through the canopy.

- Eliminate high vigour branches, or manipulate them into a pendant position that will devigourate them.
- In the more intensive orchard systems, systemization can go as far as prescribing branch numbers per tree, their length, and even bud numbers.
- Have pruning targets. Here are examples from the June 2009 Future Orchards 2012 “Pruning” notes:
 - 35 km fruiting wood/ha with one fruit every 8 cm = 80 tonnes/ha
 - 2850 tree/ha, 18 branches/tree, 65 cm long = 33 km fruiting wood/ha, and at one fruit every 9cm = 66 to 73 tonnes/ha.

Start With The End in Mind

When commencing the pruning job it is important to view the whole tree and visualize how you want to finished product to look.

With mature canopies this is very important because often these are pruned on a piecemeal basis. Perhaps a ground team doing what they can reach in the lower tree, and another team doing the upper tree. If one of these teams is perceived by the other to have taken too much out, they back off and do not do enough for instance.

In my view, your thinking about the pruning job needs to start with the top of the tree, because this is where shading and light problems often start. Then work your way down through the tree, visualizing which branches need to come out to restore good light conditions within the canopy.

Even if pruning is starting with a ground crew, they need to be aware of what will happen in the upper tree.

One strategy that is often used for pruning is to split the task into two passes. The first pass is a quick flick through by very skilled pruners using power saws to target structural cuts that need to be made, such as branch removal. They are then followed by a team focusing on detail such as unwanted annual growth and spur thinning. This crew can be given very simple instructions, so here it is possible to get a good pruning result from relatively inexperienced pruners because they are not involved in making key tree structure decisions.

My strategy for structural branch removal is to prioritise which branches need to go. If the canopy is relatively dense and populated by many branches, the first priority is to establish the number to be removed. Experience over the years shows that up to a third of the branches in a busy canopy can be removed in any one year without throwing the growth/ cropping balance out, eg, if a tree has 25 branches up to eight could be removed. Growers are often too timid to go this far and frequently limit pruners to removing only two or three branches a year. With dense canopies that are in trouble with shade, taking only a couple of branches out really just has you on a treadmill, because this will not open up the canopy enough to make sufficient difference to light within the canopy for improvement.

Once the number to be removed has been determined, my priority for removal are first large, high vigour, shading branches in the upper tree, then any low branches that interfere with mowing and weed control, or other ground work. Finally, thin out any dense canopy areas in the mid tree.

Incidentally, the idea that pedestrian orchards are easy to work with and harvest is a myth. Our experience is that orchard workers are reluctant to thin or pick from any branches they have to bend over to get at. Furthermore, fruit that is growing near to the ground in the soil splash zone is much more prone to latent fruit rot infections than fruit above that zone.

A frequent mistake we have seen in the past is for pruners to clean out the mid-tree area to improve light penetration onto large lower branches that should not be there anyway. This practice severely limits future restructuring options, because if you want to remove these low branches the next branches up the trunk are often between two and three metres above the ground.

In the modern orchard the position of the lower canopy branches rise as the lowest ones are removed to be replaced by pendant branches arising in the lower middle tree area. This strategy addresses the excess vigour problem we often see in the large lower tier branches, and also improves machinery access.

Managing Mature Standard Plantings

The main emphasis of the Future Orchards 2012 programme has been on orchard intensification, which is clearly the way of the future. However, established orchard businesses usually do not have the necessary resources to change all their orchard plantings to new intensive orchards rapidly, so still need to farm some of their older, less intensive orchard blocks.

Well managed, these establish standard semi-intensive orchard plantings can have many years of profitable production life, and with their establishment costs already funded do not carry the huge capital costs of new intensive plantings.

With appropriate canopy management, and the adoption of modern pruning techniques aimed at improving fruiting wood quality and light management yield, fruit quality can be lifted.

These older plantings were often developed with very formal, distinct tiered fruiting arm structure with the concept that the branches were more or less permanent. In recent years we have found that as these trees and their branches age, the branches become larger, stronger and much more expensive to maintain. Due to their excess vigour, aging fruiting wood within-branch shading increases along with declining fruit size and quality.

The concept for improving these older orchards is to progressively remove the old, heavy, high maintenance branches and replace them with weaker, lower vigour, more fruitful pendant branches.



Figure 4: These older style semi-intensive trees are being developed with a formal tiered structure. Note the large gap between lower tier and middle tier branches. As the orchard ages, the permanent branches will strengthen and eventually need removal. Because of the absence of good replacement branches above the lower tier, replacing them will be difficult.

The first step is to take out particularly low branches that interfere with machinery access, and allow pendant branches from higher up to grown down into their place. The weaker, younger wood on these branches will be much more productive than the old high vigour low branch that has been removed.

Where between row spacing is a bit tight for machinery access and there is a vigour problem in the lower tree, taking out the branches that grow into the between-row space completely is a good option. In this situation fruiting laterals coming from the branches that run along the row will easily provide the lower tree fruiting canopy, provided there is enough light falling onto them. Even with this approach the long term objective should be to replace all the larger branches, including those running along the row, with calmer, more pendant fruitful branches from higher in the canopy.

Whatever your pruning technique, it is always sound strategy to make the large branch removal cuts before you consider launching into detailed pruning of smaller wood. It is much more cost effective to saw out large, troublesome branches, rather than try and prune them into shape with lots of detail pruning.



Figure 5: Excessively vigorous branches should be removed irrespective of their position. Removing this large lower branch will leave a gap, but it will not take long for more fruitful wood from above to take its place.

Biennial Bearing

Pruning off-crop trees is always tricky because you are unsure of return bloom levels. Where orchard blocks show biennial tendencies and are coming off a heavy crop year, the chances are you will need all the flower they have for the off-crop. In this situation the winter prune should be light or delayed until the level of return bloom becomes obvious. Often all that is needed after the on-crop is removal of any excessively vigorous water shoots and little else.

Conversely, if the block has just come out of the off-crop season, fruitful bud for next season will be excessive, so this is the winter pruning when it is possible to do heavy thinning and pruning without risk of compromising next season's crop.

One strategy worth thinking about for biennial blocks is pruning only every second year in the winter preceeding the on-crop. Many years ago East Malling Research Station in England investigated annual versus biennial pruning. They found little difference in cropping or fruit quality, however, pruning every second year almost halved the pruning cost.

Wound Protection

Whether or not painting pruning cuts is necessary is rather debatable. There is general agreement that where trees are being topped the pruning cut made on the top of the main leader needs a wound

protectant to prevent moisture loss and entry of wood rotting diseases. Addition of naphthalene acetic acid (NAA) at 1 to 2 % concentration to the paint is often done to suppress sucker growth from this cut.

Applying wound protectants to side cuts on the trunk and main branches is much less critical, as is treating smaller pruning cuts. Whether going to the expense of treating these pruning cuts is worthwhile depends on the variety, weather conditions at the time of pruning and disease risk from wound infecting pathogens such as silver leaf. As a general rule, pruning in dry weather minimizes pruning wound infection, so avoiding pruning under wet, humid, slow drying conditions is an effective way to minimize pruning wound infection. Timing of pruning, relative to growth stage also affects infection risk. In the case of pomefruit, silver leaf infection risk is lowest in the late autumn/early to mid-winter period.

Where wound protection is practiced, to be effective it needs to be done immediately after pruning, and definitely before nightfall on the day of pruning.

Where branches are being removed the position of the cut influences the healing process. At the base of the branch there is a swelling of the bark on the trunk around the branch which extends 5 to 10 mm out from the trunk. Making the pruning cut immediately outside of this swelling leaves a smaller wound which will heal more rapidly.

Where regrowth is required from the leader, a slanting cut, sometimes referred to as a “dutch” or “toilet seat” cut will improve the chances of stimulating new shoot growth at that point.

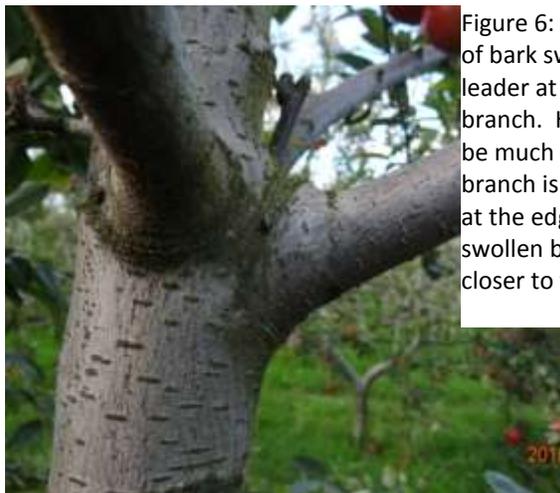


Figure 6: An example of bark swelling on the leader at the base of a branch. Healing will be much quicker if the branch is cut off just at the edge of this swollen bark than closer to the leader.



Figure 7: An example of new shoot growth arising from a “dutch” or “toilet seat” cut.

Communicate and Monitor

Finally, make sure the pruning team understands what is required of them in regard to pruning style and technique.

Then check their work on a regular basis, particularly until you are confident with their work. Often individual pruners tend to drift off target, so it is important to maintain regular checks to make sure they remain on target.