

## More water for increased tree growth

By Steven Spark, AgFirst

Hopefully by now you have had a chance to read many of the Focus Orchards (FO) reports posted on the APAL website about last year's trials across the districts. Quite a number of these FO trials investigated ways to increase canopy growth of newly planted trees and how to get older trees, which have stalled, growing again. Upon reviewing these trials and after visiting some of these sites, many treatments had limited success. In some cases the most limiting factor was that not enough irrigation water was applied to the trees either at the right time or in the right quantity to sustain satisfactory tree canopy growth.

Water is the most important tool available to growers for maximising tree canopy growth, whether in a young or older tree.

Any water stress to a young tree (even for a short duration) can be enough to provide the tree with a growth check that cannot easily be undone. Often the tree may only start growing again the following spring. Craig Hornblow and I wrote a list of the five most important tools required to maximise young tree growth and they are:

- 1) Water
- 2) Water
- 3) Water
- 4) Nutrition/pest & disease/soil fumigation/ training/ weed control/crop load
- 5) Water

Clearly we rate water highly as a critical success factor for tree growth (whether young or old). The reason there are several factors listed at number four highlights that on any particular orchard, any one of these could be the next limiting factor to tree growth, behind water. But water is by far the most important.

### **What is satisfactory young tree canopy growth?**

OrchardNet provides a pretty good insight into what some Australian growers have achieved. 50cm plus of leader growth in one year is acceptable to some. Anything less can be disappointing. However, we are aware of some growers achieving 80cm of leader growth which is fantastic.

## So how much water is required?

In the 'Guidelines for irrigation management for Apple and Pear growers' it states *"the amount of water that should be applied to an orchard in each irrigation will depend on the wetted root volume and soil type. The wetted root volume is the volume of roots that are wet by the irrigation system. These are the effective roots that provide water to the tree. The soil type will determine how much water is readily available to the tree. The maximum amount of water to apply in one irrigation will be the difference between the readily available water in the root zone, and the "full point" for that soil type.*

Early on in the life of a newly planted orchard, the effective root zone of the young tree is about the size of a ten litre bucket at planting. This means that the tree will acquire the majority of its water from this area (bucket) only. As the tree grows, then its effective rooted area will increase, and therefore increase the soil area it can draw water from.

In this situation, sprinklers throwing water in a 2.5 metre diameter may only be applying effective water to a very small area (bucket sized) accessible to the new tree. Often growers think they are applying plenty of water, but in reality 70-80 per cent is not accessible to the young tree because there are no tree roots in that wetted zone to uptake this water. So the amount of water applied per hectare can be misleading.

The better question to ask is how much water is applied to the effective root zone of the young tree? Ignore the water that is going everywhere else.

Over time the water in the sprinkler wetted zone will be better utilised as the tree grows and the roots spread further out into it, but not initially (providing the tree roots have not been checked by drought).

In my experience, no matter what you think the right amount of water to apply is, increase it to 150 per cent. In fact, I have a saying that you should irrigate until you see 'ducks landing in your orchard'. Only then do we stop (for a day only). Of course, this is assuming unlimited water is available. Plants can suck out the first drop of water much more easily than the last drop.

There are many examples across orchards of how effective unlimited water is for increasing tree growth. Take a look across an undulating block of young trees and look at how much taller the trees are in the hollows than those growing outside the hollows. This increase in tree growth is often because when the irrigation is turned off; water left in the pipe runs back down into the hollows and provides additional water to those trees. It might also reflect the increased soil moisture holding capacity of the soil in hollows. Either way, more available water equals more tree growth.

Also, some of the best years for achieving good tree growth are when a wet spring is followed by a wet early summer period. The trick is to replicate these conditions in a not so wet spring/early summer. The best way is to irrigate often and extensively.

Many of the new plantings now are on Dwarf rootstocks such as M9 and M26 which do not like the roots drying out, even for a short period. This characteristic can be useful once the trees are older, because deficit irrigation can be used to slow tree growth down, without impacting adversely on fruit size. We have found that once dwarf roots become dry, the resultant tree growth will also stop, and it is very difficult to start again and often that is all the growth you will get until next spring. It can be difficult, even if conditions improve later to restart some dwarfing root stocks once they have dried out, even for a short period. Not impossible, but difficult. Therefore to maximise canopy growth, never let your trees dry out for a moment.

The older, more vigorous rootstocks most growers are familiar with such as MM106 and MM116 tend to have a larger root area and strong growth habit that can often draw water from a far greater soil area, therefore are less affected by short periods of water deficit. The difference is they can usually be restarted growing again by simply applying more water. Dwarf trees have a smaller root area and this is a lot more difficult to do.

## Monitoring

Growers are making more and more use of soil monitoring devices that capture the soil moisture levels. Care must be taken when interpreting these as they are only a guide and can provide false hope. Let me explain: Many monitoring devices are often placed midway between trees. In the early stages of young tree growth, sometimes no roots are anywhere near the soil moisture monitoring device measuring zone (especially if trees are planted at wider in-row spacing's).

This can mean the soil moisture monitoring device may only be measuring the soil moisture which is lost to evaporation or leaching from the soil. They are often not accurately measuring the moisture removed from the soil by the tree, which is greater than moisture lost solely from evaporation or leaching. When irrigating solely according to your soil moisture monitoring device, a young tree can quickly come under a moisture deficit if the monitoring device is not situated correctly and this results in a reduction in tree growth.

As root growth increases, it will often be matched by an increase in tree canopy growth and vice versa. The irrigation strategy should always be concentrated on keeping the effective root zone of the tree well supplied with water and never left to dry out once shoot growth has commenced.

Dripper irrigation systems, under the right soil conditions, can supply adequate water to young trees to ensure satisfactory tree growth, but they too need careful management to get the best results. Often we see more blocks performing poorly when irrigated with

drippers than those irrigated with sprinklers. The main reason being that sprinklers can provide a lot more water faster; therefore problems can be averted quickly - not always easy with drippers.

In lighter soils, irrigation timing and frequency must be carefully managed. Sandy or gravelly loam soils with low organic matter usually have a very low water holding capacity and often water can run quickly straight down out of the soil profile into the subsoil. Managing drippers becomes so much more critical on lighter soils. Little and often, more frequent applications of 3 or 4 times a day or more. Every day may best suit some orchards soils.

The biggest mistake I have seen with drippers is only irrigating twice a week on light granite soils. If trees dry out even for short interval between water events that could be the end of this year's shoot growth. To understand what's happening under your drippers and how the irrigation water is moving in the soil, get a spade and dig to check if your tree roots are wet. They cannot be allowed to dry out.

Drippers are often best on heavy soils that have better water holding capacity that can spread the water outwards in the soil like a big football. This increases the soil area wetted and therefore as long as young tree roots are active in this wetted area, more water will be utilised by the tree and this will promote tree canopy growth.

Remembering that a newly planted tree has an effective root area the size of a bucket, you should be concerned with how much water from the drippers is going into that bucket (young tree rooting zone). In some cases, if drippers are spaced too far away from the tree, they may simply not be providing enough water to the tree roots. Again, the volume of water supplied per hectare is less important than the volume of water supplied to the tree roots.

### **Checking irrigation effectiveness**

Whether using drippers or mini-sprinklers, get a spade and dig a small trench down alongside the new tree and see how the irrigation water is being dispersed in the tree's root zone.

I won't go into irrigation system design and its efficiency, but checking sprinklers or drippers by placing a measuring jug under them for a set period of time and measuring flow rates can be equally important. Not all systems are delivering the desired amount of water or delivering it evenly across a block.

Improving soil organic matter or supplying additional soil mulch to newly planted trees will help conserve soil moisture and may assist with the water spreading outwards to create a larger wetted zone. Soils low in organic matter and with poor water holding capabilities often act as a pipe and can run water straight out the bottom of the soil. Organic matter can be improved by side throwing mowers that allow cut grass to be distributed onto the

herbicide strip close to the tree. As this green mulch breaks down, soil biology and earth worms become more active, thus improving soil organic matter. Additional mulch can also be introduced but this should be done in late winter/early spring so it can conserve soil moisture.

The importance water plays in young tree growth can start even before a tree is planted. Rehydrating trees before planting by placing the roots in a dam or pond of water for several hours before planting will assist the trees to better handle planting stress and provide some cover while the irrigation is being installed.

Before a tree is planted, make sure the irrigation components are onsite and ready to roll out as soon as the trees are planted. The most important job after planting is not to install posts and wire, or apply fertiliser but to get the irrigation system up and working quickly, preferably no longer than 3-5 days after planting, the sooner the better. Then turn it on. Sometimes this interval can be extended out to seven days if Mother Nature is kind and has provided 25-30mm of rain shortly after planting. But this shouldn't be relied on.

### **Reducing tree stress as soon as possible**

Once you have the irrigation sorted, removing stress from young or older trees as soon as possible is important to realising increased tree canopy growth. Flowers should be removed as early as possible either by hand or chemically thinned with a spray that will not induce more stress on the tree. A well timed ATS application with low water volume and with Gro-Wet can do this.

Rubbing out shoot tips early on the leader, and on any branches where you want to promote more growth, will help assist apical dominance which also promotes canopy growth. With older trees, removing fruit early and possibly sacrificing a crop for one year has proved moderately successful for a Queensland FO block and another Victorian block.

Apply fertiliser little and often, mostly nitrogen will also encourage tree growth. Keep a good pest and disease spray program up and maintain a weed-free herbicide strip. Only use sprays that are recommended. Make these tasks a priority and complete early whenever possible as these will assist tree growth but their impact can be greatly reduced if the water management is not optimum all the time.

I know water resources in many Australian pipfruit growing districts can be limited and often expensive and no one likes to waste it. But so too are trees that don't grow or produce fruit quickly enough. An investment to develop a new block of intensive apples or pears can cost upwards of \$50,000/ha. It's not cheap and therefore applying more water than you have in the past to young trees to enable a quicker return on this investment can be very worthwhile.



Figure 1 & 2—before and after flowers and shoots removed to encourage apical dominance



Figure 2 –



Figure 3 - Weeds will greatly restrict tree growth.



Figure 4 – Trees in background with increased shoot growth by removing fruit early. Photo Orchard Services

## References

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