Future Orchards®

Actionable extension for better orchard results

Setting the crop up for a successful harvest with the right hand-thinning

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Simplify and improve your seasonal decision making using good orchard data. ›

Covid-19 is not going away in a hurry and the resulting disruptions are testing businesses including orcharding. There are a number of challenges to the orchard businesses that come with Covid-19 and we need to manage what we can, and focus on areas where we have the most significant impact. Excellent growers around the world combat unwanted challenges by being very well informed, by capturing data and making decisions based on good data and sound logic.

In the winter issue we outlined how to use objective orcharding to set crop load targets as a base for guiding decisions on pruning through to chemical thinning. Now that the fruit have set, we turn our attention to objective hand thinning to ensure the crop is on track to meet targets moving into harvest.

This article will focus on how we can use good data when setting up a crop at hand thinning for harvest. Given the ongoing Covid-19 pressure on labour availability, there is added incentive to set up a quality crop tailored to reducing the labour demand. This starts with development of a plan using the targets that were set in the winter to help to make informed decision regarding your hand thinning strategy.

Metrics we should have

Being an objective orchardist often means going the extra mile. There are a number of KPIs that can be collected during the winter/spring months to help you make more informed decisions. Below is a list of those metrics and a description of why they will help you moving forward:

– **Block profitability** – Identifying a block's profit gives you the ability to prioritise your blocks to accurately allocate resources across the orchard business.

– **Historical production performance** – understand what has happened before so you have a clearer picture of what will happen in the future. This gives you the ability to manage factors such as class 1 yield, biennial bearing, fruit size and fruit colour.

– **Chemical thinning historical performance** – good chemical thinning is likely to be one of the solutions in combatting a season with little labour available. By good recording of previous chemical thinning performance, all that is needed is to adjust for the new season and fine tune the recipe.

– **Climate data** – every season is different, weather and climate drive the pest and disease and crop outcomes, it is so critical to our business we need to track it and understand it.

– **Winter bud numbers** – this is the first cut of your crop estimation. Too high or too low has implications and different management requirements.

Available tools

Note: There are a range of tools that can help you capture and analyse your data. OrchardNet has been used for the worked examples in this article. These decision-making calculations should however be adaptable to your own orchard management software or business management process.

The APAL Future Orchards project has available two orchard management decision-support tools that can be used by growers and have built up 15 years of reference data.

(i) **OrchardNet** – OrchardNet allows you to share data, see history, plan how to meet your goals for the coming season. Its benchmarking capabilities allows you to compare your results year by year, block by block or between companies. To go to the demo site, go to the OrchardNet login page http://www.hortwatch.com/orchardnet/ and type in **Username:** Augrower, **Password:** cobber.

(ii) **Orchard Business Analysis (OBA) program** – As part of Future Orchards™ program, the OBA is a modelling exercise that provides the industry's best economic indicator of productivity and financial performance of the orchard businesses.

In high value blocks, tweaking the crop load to improve fruit quality at harvest is likely to improve packouts, and overall block profitability.

- Canopy development/vigour outcomes – good fruit production needs a full, consistent, calm canopy. Understanding where your canopy is at will determine what you are trying to achieve in terms of growth and crop load. Vigour extension on a mature canopy; is it too vigorous or too weak. Once recorded, the various tools can be used to manipulate vigour to maximise crop outcome,

- Dam irrigation water availability – irrigation water supply is a large limiting factor. You need to understand what is available (ML/ha) and build a short term and medium-term plan around it.

- Labour requirements – being in touch with your labour suppliers allows you to be proactive and ahead of any major decision you will need to make during the season.

A data-based thinning plan

Consider the Demo Orchard farmed by Joe Bloggs. Joe is forecasting another labour shortage for the 2022 harvest. He has calculated the profitability of each block of trees (Fig 2). Although the 2021 orchard bottom line is a healthy $500,000, there are three varieties that for Joe are making losses, Fuji, Williams Bon Chretien (WBC) and Sundowner. After looking at his production records and block margins, Joe has taken the hard decision and removed the Sundowner and WBC and aggressively chemical-thinned the Fuji, accepting a lighter crop and minimal hand thinning.

We now turn our attention to Joe's Royal Gala crop. Royal Gala for Joe is a big block (9.2 ha planted at 4.5m x 1m). It has the potential, in a good season,

Figure 2. Demo Orchard block profit summary

to generate a profit of $15,000 per ha (last year achieved $12,357 per ha).

To achieve a good profit from this block, Joe has calculated, based on good historical data, that the target should be 60 tonnes per ha, 83 per cent class 1 and a 166 gram (g) average fruit size. To achieve that he plans to harvest 163 apples per tree (Fig 3). Previous fruit counts indicate to Joe that the pickout percentage on this block is close to 90 per cent. Pick out is the percentage of fruitlets left after thinning that make it into the bin at harvest. It will never be 100 per cent and can be as low as 80 per cent in some large trees prone to drop. Joe has set the pickout to 90 per cent meaning that he needs an average of 181 fruit per tree after hand thinning. So how does Joe best set out to achieve that objective?

Step 1: Pre-thinning counts.

Strategy one: Use 'monitor trees' to set thinning rules
Assessing monitor trees involves selecting a set of trees – typically four per ha – identifying the preferred fruiting sites and, with an experienced thinner, thinning to a crop load that looks and feels right. The look and feel of the crop load on the tree will depend on the variety and based on past experience and knowledge of the block. Then count the fruit on these monitor trees and adjust the fruit numbers to match targets. Analyse the adjustments you made and develop simple rules that are going to make for an accurate job when done across the whole block by the thinning team. In Joe's case above the monitor trees were thinned to singles spaced a fist apart and the average came in below target at 150 apples per tree which is too low. Adjusting the instruction to thin to singles with no spacing required achieved the desired target. ›

Blockname	2021 Area	2021 $/ha	2021 Total	2020 Area	2020 $/ha	2020 Total	2019 Area	2019 $/ha	2019 Total	3 Yr Avg (per ha)	6 Yr Avg (per ha)
AU Demo Orchard	40.0	12,913	-516,521	40.0	6,397	255,865	40.0	10,863	434,528	10,058	6,006
Fuji	3.2	-5,270	-16,863	3.2	-8,320	-26,625	3.2	-9,180	-29,377	-7,590	-7,997
Granny	5.2	21,354	111,042	5.2	13,917	72,371	5.2	22,076	114,793	19,116	14,018
Jazz	2.4	42,475	101,940	2.4	29,008	69,620	2.4	36,201	86,882	35,895	24,857
Packhams	3.6	10,955	39,439	3.6	4,595	16,542	3.6	8,453	30,429	8,001	-1,981
Pink Lady	6.8	26,516	180,307	6.8	15,615	106,182	6.8	24,073	163,694	22,068	19,341
Rosy Glow	4.4	19,320	85,009	4.4	10,770	47,388	4.4	19,422	85,458	16,504	16,227
Red Delicious	1.6	14,755	23,607	1.6	1,605	2,568	1.6	11,676	18,681	9,345	-721
R Gala	9.2	12,337	113,503	9.2	9,856	90,671	9.2	9,289	85,461	10,494	6,772
Sundowner	1.2	1,789	2,147	1.2	-7,693	-9,232	1.2	4,617	5,541	-429	-8,320
WBC	2.4	-51,504	-123,610	2.4	-47,342	-113,620	2.4	-52,931	-127,033	-50,592	-45,400
Company Totals	40.0	12,913	516,521	40.0	6,397	255,865	40.0	10,863	434,528	10,058	6,006

> ... identifying which fruit to carry plays an important role ...

No of fruit per cluster	Cluster no	Fruit No	Thin to singles
1	99	99	99
2	55	110	55
3	37	111	37
4	0	0	
5	0	0	
		320	191

Figure 4. A crop loading mafcot wheel used to set fruit number per BCA during hand thinning.

Table1. Cluster counts pre hand thinning

Figure 3. Demo Royal Gala thinning report season ending 2022

Strategy two: count fruit clusters and number of fruit before thinning

Another option, which some growers prefer, is to count the fruit on the monitor trees pre hand thinning, recording the cluster number and the number of fruit in each cluster. This is typically a two-person role. Joe tried this on one of his Gala blocks and came up with the numbers in Table 1 below. The average tree was carrying 320 fruit post chemical thinning, with 99 singles, 55 double and 37 triples. Simple maths says by thinning all 2s and 3s to singles will achieve the target number.

Step 2: Investigate helpful crop loading tools

Just as it often seems that there are an endless number of databases, we can use to become more objective, there are also many helpful tools you can use to easily quantify what you are measuring. With more intensive, formal canopies such as slender spindle, Future Orchard Production Systems (FOPS) or 2D these tools have made it very easy to quantify metrics such as fruit per tree or fruit per branch. One example is a mafcot wheel (Figure 4), which gives the appropriate fruit number per branch for the corresponding branch cross-sectional area (BCA) as measured at the base of the branch.

Step 3: How to decide which fruit to carry – not all fruit are the same

As well as fruit number, identifying which fruit to carry plays an important role in every season whether you are struggling with labour or not. Your pre-thinning counts will determine how many fruit you need to remove from each tree and what you need to leave. The astute manager knows that not all fruit are the same. Consideration of the intrinsic fruit attributes will aid Joe to select the best 181 fruit to leave. For example

− Fruit on terminal buds is the best

− Fruit on lateral bud of 1 year wood, the worst

− A large fruit at thinning is the largest fruit at harvest

− Fruit will colour in doubles on the outside of the tree but may not on the inside, it may colour in the tops but not the bottoms

Blockname	Ssn	Type	Gross Kg/ha	Class 1 Kg/ha	Class 1 P/O%	Fruit Weight (g)	Harvested Fruit/ Tree	TCA	Harvested Fruit/ TCA	Tree Pickout %	Target Fruit/Tree post-thin	Fruit Pre-Tree	Fruit Monitor thin	Fruit Post-thin
Royal Gala														
R Gala	2022	Est	60,000	49,800	83	166	163	–	–	90	181			
		Act	–	–	–	–	–	–	–	–	–	320	150	185
	2021	Act	58,000	46,400	80	161	162	–	–	91	180	–	–	178
	2020	Act	51,000	41,820	82	162	142	–	–	91	157	–	–	155
	2019	Act	56,000	43,680	78	160	158	–	–	90	175	–	–	175

Step 4: Developing simple rules

In many orchard activities that require a large team, regardless of their experience or skills, communicating and supervising simple rules is the most effective way to obtain an accurate outcome. Using your estimated production data and pre thinning fruit counts and your knowledge of the block you can develop simple rules that will effectively reduce the crop load to your target, leaving the fruit with the best quality and size potential on the tree. Developing simple rules at hand thinning removes the complexity for the team doing the work. It is up to the manager to ensure those rules will provide an even, high quality result.

The development of hand thinning rules needs to be focused on both production goals and a clear understanding of which fruit and sites are preferable. The more fruit in preferable sites with a good light environment, the easier it will be to harvest.

For example, hand thinning rules that are easily conveyed or demonstrated and, with good supervision, can be tweaked as required are:

- Space the fruit into singles a hand span apart (always leaving the largest fruit)
- Space into singles a fist space apart
- Thin all fruit down to singles (no spacing)
- Leave all fruit in doubles
- Leave doubles in these locations (e.g. tops, on bourse shoots, in good light)

Strategies to spread your labour demand

Arguably the most effective way to reduce your labour demand is to take a chainsaw to the base of your poorer/est trees. Removing the low margin blocks that were set to come out in the next 1–3 years will dramatically reduce your labour demand. However, you need to know the economic margin of each block and your overall labour situation to entertain such a drastic approach.

If the block has little long-term prospect, you might be doing yourself a favour in these challenging times. The less intense version of the chainsaw is to grow marginal blocks for juice. This way you eliminate hand thinning and can harvest as labour allows rather than to a strict maturity window.

Another way to reduce your labour demand is to extend your hand thinning and harvest periods and to take out the peaks at harvest using some of the strategies below (Table 2).

Labour planners

To manage the challenging labour situation many of us face this season, orchardists need to be sure to plan well in advance.

This starts by having a good idea of how many people you need and being regularly in touch with your labour supplier.

The range of metrics captured through the winter months can be used to calculate objective labour requirement numbers. OrchardNet contains a labour planning tool for the hand thinning period. >

SCAN TO VIEW

[1] Ross Wilson's Future Orchards spring walk presentation *Targeting Perfect Chemical Thinning in Spring 2021* is available on the APAL website or by scanning the QR code above.

Table 2. Strategies used to reduce labour demand over the entire season

Extending hand thinning period:

- Spur pruning (ASE) from dormancy through to flowering
- Hand flower or Darwin (string) thinning
- Aim to start hand thinning some blocks earlier than normal through the use of good primary chemical thinning[1] or Metamitron on your early blocks.
- Consider two pass hand thinning (first pass to 80–90 per cent and then a tidy up later when labour allows).
- Finish later on blocks where late thinning will have the lowest economic impact.
- Remove the crop from young blocks and grow the tree this year
- Aggressively chemical thin blocks where over-thinning is not such a large financial loss

Extending the harvest period:

- Understand your harvest peaks and troughs. Using labour planners as discussed below.
- Bring harvest forward:
  - o dormancy breakers
  - o flower thinning
  - o girdle
  - o early reflective mulch
  - o thin well and early, bringing the crop to 80–90 per cent of the target crop load.
- Push harvest later:
  - o Thin later
  - o leave full crop loads
  - o use growth regulator tools like Retain® or Harvista™.

Labour Thinning Calculator
View report description

Select Year
| ⦿2022 | ○2021 | ○2020 | ○2019 | ○2018 |

Production
⦿Estimated ○Actual

Thinned Kg's per hour
320

Thinning start and end dates
1/11/2021 (dd/mm/yyyy)
23/12/2021 (dd/mm/yyyy)

Show Report

Figure 5. The input section for the hand thinning labour calculator in OrchardNet
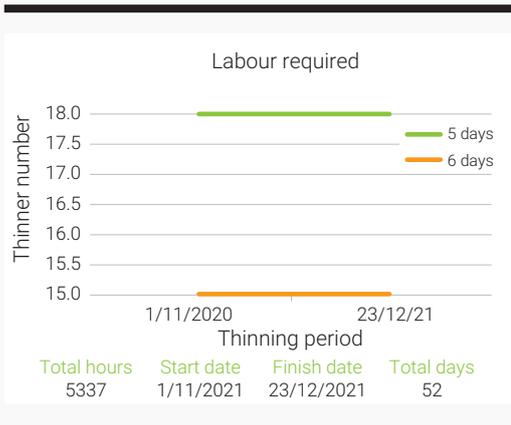
Figure 6. Example of the thinning labour planning tool.

Labour required

Total hours	Start date	Finish date	Total days
5337	1/11/2021	23/12/2021	52

Labour required

Total hours	Start date	Finish date	Total days
5337	15/10/2021	15/1/2022	92

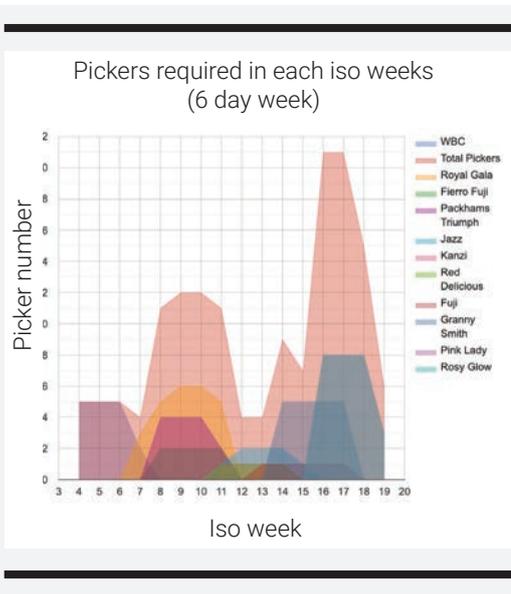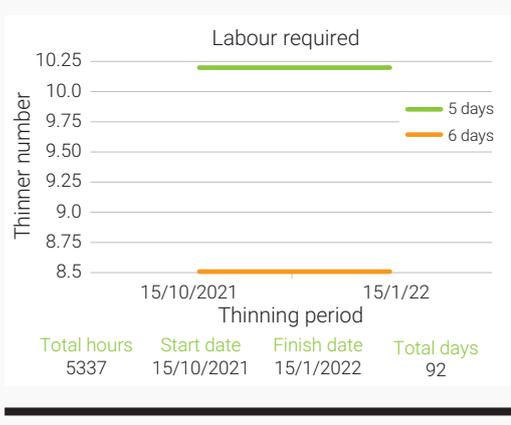**Pickers required in each iso weeks (6 day week)**

Figure 7. Harvest labour planner generated from OrchardNet

Further information:
The OBA report and OrchardNet are both available through the Future Orchards® program. The OBA Analysis Report is available exclusively to levy-paying growers. To request a copy please contact APAL by emailing reception@apal.org.au or phone 03 9329 3511. If you want to try OrchardNet contact adrian.stone@agfirst.co.nz for set-up assistance.

The hand thinning tool considers your estimated production data and calculates the number of thinners needed assuming a person can thin 320 kg of harvested fruit per hour (industry average). It will calculate, over a select period, how many thinners are required assuming a five-day or six-day working week. Metrics you need to calculate your thinner requirement include:

– the estimated production values per block or variety (a metric we calculated in the winter)

– the proposed start and finish date of your thinning period.

A very real scenario for the upcoming season is that there will be a shortage of labour during the thinning period. This tool allows you to alter the time period you spend thinning. By dragging the end date later or start date earlier to extend the thinning period you reduce the total number of people needed. The report on the right (Fig 6) shows the number of thinners needed over a conventional thinning period, 18 or 15 people working a five- or six-day working week, respectively. On the right it is clear that by extending the hand thinning period, you can reduce your labour demand significantly, by approximately eight people. Eight people that could be extremely hard to find in these testing times.

When the crop is set, frequent walking of the block when the fruit size starts to increase will allow quick identification of where a block is over or under thinned. In high value blocks, tweaking the crop load to improve fruit quality at harvest is likely to improve packouts, and overall block profitability.

As growers we know that when hand thinning is behind us, harvest is right around the corner. Throughout the discussion of being objective orchardists, one of the underlying messages is be prepared. Being prepared is putting you in a position to avoid challenges. Harvest planning is no small task and by keeping in constant contact with labour suppliers and keeping tabs on the progression of your crop, you are putting yourself one step ahead for the busiest time of the year. As well as the thinning labour planner, OrchardNet has a built-in harvest labour planner which highlights your labour demand by variety by ISO week.

Figure 7 highlights the harvest labour demand for the Australian model orchard by variety and ISO week. You can see two major labour humps during the mid and late season. This is a tool that allows you to go to your labour supplier with sound, quantitative information based on your production figures you set leading into harvest.

It is important now more than ever with the uncertainties we face to become more objective orchardists. To grow apples and pears in Australia successfully, plan well, simplify and improve your decision making by using your orchard data and available industry benchmarking tools. Success in orcharding is not about luck, it's about hard work and informed decision making. AFG