Future Labour – Crop load optimisation September 2016

Prepared by Craig Hornblow and Jonathan Brookes

September 2016 AgFirst NZ

These notes are intended to support the power point presentation and field walk discussion carried out during the early spring / crop load round of grower meetings. The power point presentation also contains photos and figures that demonstrate the text.

Crop load optimisation is one of the key drivers in overall orchard success. Each variety block within an orchard needs to be treated as an individual and assessed on its own merits as variables can have different levels of effect between blocks.

Key factors that will influence the potential optimum crop load of a block need to be well understood:-

- Maximum yield potential of the block
- Fruit quality and size requirements
- Required vigour status of the block
- Within block variability
- Biennial bearing risk of the variety
- Biennial bearing status of the block

How can excellence in crop load management influence labour requirements?

- Minimised variability – Tree to tree and within tree
    - Improve efficiency by simplifying the labour requirements following – Create easier hand thinning and or easier harvest. Excellent distribution of fruit allows simpler rules when completing hand thinning.
    - Improve the pool of people available - More consistent trees need less thinking required and a less technical skill set amongst the workers. Easier to find the skill set required.
    - Improve fruit quality and size – Less variability is likely to mean more fruit that matches required fruit size and quality parameters.
- Maximise high quality production % – Reduce the fixed costs per harvest unit due to higher production of apples. More efficiency out of management staff, QC's tractor drives etc.

Make it cheaper, make it easier, improve the fruit quality.

What are the key seasonal timings for managing crop load?

There is no one specific time where crop load will be fully managed, it is a whole system approach involving understanding what has happened before now, your specific block targets, what is happening now, and what management decisions / changes need to be made due to the current observations.

Below is a list of the management processes that are carried out when creating a systemised approach to crop load management.

- Initial Crop load planning – Post harvest - Looking at historical data understanding what went right and what could be improved on. What is the likely vigour status and biennial bearing pattern of the block?
- Pruning – Pruning is systemised to create a set of rules that best suit the crop load plan. Data is collected after pruning has taken place and is turned into information indicated how suitable the final pruning job is likely to be to achieve the block crop load goal (bud numbers, branch numbers etc.)
- Chemical thinning – A plan needs to be created that best suits the variety, the block history, the bud/ flower load and the weather conditions.
- Hand thinning – Create a hand thinning plan for final fruit number per tree requirements, how much fruit to be thinned, how often, and when?

This document will focus on two key areas of crop load management that are appropriate at the time of the orchard visits

- Biennial Bearing
- Chemical Thinning

Biennial Bearing management -

Fruit set or biennial bearing?

In a number of situations growers are sure they have a problem with biennial bearing when the real problem is fruit set, there are good flower numbers and for a range of reasons fruit set has been poor. Cross pollination, pollen source, bud strength, hive numbers, vigour, bee activity, wet weather, frost, shade and netting can all have an impact on fruit set.

Poor fruit set due to any of the above factors can lead the tree into strong biennial swings if not managed correctly.

What we want is high flower numbers and strong fruit set conditions, then the crop load management decisions are easy. We can prune harder, chemical thin aggressively and we will have fruit numbers throughout the tree for good fruit distribution in hand thinning.
When fruit set is likely to be poor it is much harder to understand, manage and is unpredictable. We need to be more cautious in pruning, chemical and hand thinning, but what exactly 'more cautious' is can be hard to determine.

Always set out to achieve strong fruit set conditions and management strategies are easier and more predictable.

How does biennial bearing influence orchard labour requirements?

Biennial bearing can have a significant impact on orchard labour. 'On' years can give excess hand thinning cost, as well as producing later fruit harvest dates and having a negative impact on fruit quality (colour, maturity and fruit size). 'Off' years increase costs due to fixed costs being spread across lower yields as well as potential for fruit quality issues such as Bitter Pit and Lenticel Blotch. Overall Biennial bearing leads to lower efficiency with the ability to accurately predict and plan for labour requirements being significantly more difficult.

We can't change what we do not measure – How do we keep score? What do we need to do to improve?

Focus on ways to ensure blocks are not in a Biennial bearing cropping pattern;

- What has happened historically? – Production and size over time.
- What is the variety risk? Fuji vs Royal Gala
- Create a biennial bearing plan (on year and off year)
- What can we change to minimise the impact?
    - Pruning
    - Pollination
    - Chemical thinning
    - Hand thinning
    - Root ripping / cincturing
    - Return bloom – mid season Ethrel / ANA
    - Irrigation
    - Post harvest nutrition
- Execute appropriate improvement solutions based around the plan as well as up to date observations
- What are the trees telling us along the way?
    - Post harvest
        - What are your final yield / size / quality results? What will this mean for last year? What is the seasonal focus likely to be for next year? (on year / off year / keep the same result) What is the post-harvest nutritional status of your trees? When should you be pruning?
    - Post pruning
        - What are the fruiting buds telling you? How many? Level of bud quality? Do we need to think about late winter root ripping? Do you need to consider bud breaker products to condense flowering?
    - At flowering
        - What is the bloom looking like? Are you sure your flowers are getting well pollenated? What should you choose for your chemical thinning program (if any)? Do we need to think about early cincturing to minimise fruit drop? Do you need to look at Regalis™ for vigour control?
    - Post chemical thinning
        - What is the result from chemical thinning? Did you hit the correct weather windows for the products to work correctly? What does this mean for hand thinning? What is your hand thinning plan (how much and when)? Do you need to cincture to help with return bloom?
        - Do you need to focus on other tools to help manage biennial bearing – Mid season NAA or Ethephon (Ethrel™) applications? What is your irrigation and nutrition strategy for the season?
    - Post hand thinning
        - How accurately was the work carried out? What do your counts say? How much tree to tree variability exists? Do you need to go back again?

Visit the APAL Library
Solving Biennial Bearing
http://apal.org.au/wp-content/uploads/2013/07/fo-ow-13-nov-biennial-bearing-agfirst.pdf

Chemical Thinning -

How can Chemical Thinning influence orchard labour requirements?

Chemical thinning can have an extreme impact on orchard labour requirements. An excellent chemical thinning result can mean significantly lower hand thinning cost with fewer fruit to be removed. Simple instructions can be given that make the job and the supervision more efficient (eg. fruit thinned to 1's and spaced a hand width apart).

When fruit numbers are taken down very close to target early in the season the potential yield of the block will be increased, compared to areas where significant fruit growth has been partitioned into fruit that need to be hand thinned off and removed. Excellent chemical thinning can also give growers the option to make the hand thinning job in these blocks later, spreading the potential work window for hand thinning. Combine this with some blocks treated by hand thinning flowers very early in the season and this gives growers the potential to spread out the hand thinning labour demand peak, requiring fewer staff or possibly being able to choose staff of a higher skill base. Remember the upper quartile growers always spend more per hectare on hand thinning than the average, their goal is to maximize fruit numbers close to their target with good distribution throughout the whole tree canopy. No top grower sets out with an aim to have no hand thinning as this is likely to indicate they have over thinned.

Poor chemical thinning can also leave fruit in bunches where multiples might have to be left to get correct fruit numbers per tree. This is likely to cause issues at hand thinning (more difficult) and at harvest (poor colour and easier to damage or drop adjoining fruit). Poor chemical thinning can also mean different zones of the trees have different hand thinning requirements making the job more technically difficult- for example a tree being over thinned in the bottoms and under thinned in the tops is very typical.

What is the ultimate outcome of chemical thinning?

Provide a level of fruit removal within the block that:-

- Reduces biennial bearing through removing fruiting sites for the future.
- Produces an even crop load result between different trees in the blocks as well as throughout the tree canopy
- Gets fruit numbers down to the level where tree vigour is appropriate for the canopy
- Significantly reduces hand thinning requirements without excess fruit removal (over thinning)

Remember this is a small part of the overall crop load picture, we need to understand overall goals before we can optimize chemical thinning options. We need to understand what our needs are, what products are available, when and how then can be used and what weather conditions we have that might influence our product choice. Use historical observations / learnings

How do we achieve this?

Chemical thinning is a very concentrated time of the year for critical decisions so think it through carefully well ahead of time. Not many factors change dramatically from season to season so review past years and write your plan out carefully. Most of the decisions can be made prior to thinning application- calibrations and water volumes, chemical rate options and how the tanks are mixed. Document these now so in the heat of the battle the only thing to focus on is timing.

Sprayer calibration is the least managed part of chemical thinning but can have one of the biggest impacts. The top of the tree is where most of the money is spent in hand thinning due to over thinning the bottoms. How do we target the tops and minimise spray application in the bottoms? Prior to flowering try different sprayer and nozzles setups, different water volumes and sprayers, to achieve spraying only the target.

Go through your old spray records and write down spray rates and mixes, review these and commit them to standard practice diary. Every year excessive or poor results are seen because someone has the chemical or wetter rate wrong.

Your personal thinning plan

1. Clear Goal – described in detail by variety by block, fruit per tree, type of wood that needs targeting
2. Detailed plan - by block, which chemistry, when (targeted timing), calibrations. Sometimes the plan is no chemical thinners just strategies to increase fruit set.
3. Chemistry options: detail a table of chemical options and tank mixes
4. Calibrations: setup and test calibration options for each type of canopy. Not all sprayers perform the same so check each that will be used for chemical thinning.

Visit APAL Library:

http://apal.org.au/wp-content/uploads/2013/07/fo-ow-handout-09-sept-thin-to-optimise-bound.pdf

When are we going to do it?

The timing for chemical thinning is based around what part of the flower / fruitlet stage the product of choice is most effective at, what the weather conditions have been and will be over the application, and what is your intended target for the chemical application (secondary flowers on spurs, one year old wood, late flower in the tops of the trees, secondary fruitlets once king fruit has set…)

How do we measure the results?

- Fruit counts and fruit number per cluster pre hand thinning, compared to fruit number estimates.
- Make sure you record what your results have been both good and bad.

What will our next management plan be?

- Depending on the results you might change the hand thinning instructions for your thinners
- You might look to change the timing of hand thinning (leave the timing to a bit later to control vigour or hand thin early to ensure fruit load is off the tree ASAP.
- Chemical thinning results may change your biennial bearing management plans.
- You might increase or relax your focus on other management decisions such as biennial bearing, irrigation, nutrition, summer pruning etc.

Visit the APAL library

Flower variation
http://apal.org.au/future-orchards-webinar-variation-in-flowering/

Bud counting
http://apal.org.au/future-orchards-webinar-bud-counting-and-tca-measurement/

High Orchard Performance
http://apal.org.au/high-orchard-performance-depends-good-thinning/