Focus Orchard & Trial Update - West and South Australia
April 2020

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Focus Orchard Update Filsell Orchard - Adelaide Hills

The Filsell family have been growing and packing a range of apples in the Adelaide Hills since the early 1900s. As the next generation take on a bigger role in the business, they also bring with them new ideas and a new passion for the industry. One such member of this generation is 25-year-old James Filsell who has been working closely with AgFirst Consultant Steve Spark as part of the Future Orchard project.

The Filsell’s Orchards suffered from “more than a week of 45 degrees plus” in December. Their Gala apples didn’t grow for a month because the trees “were just in shock and trying to survive.”

Subsequently, the size of their fruit is down this season. The hot temperatures also created some watercore problems in their Fuji crop. Thankfully for James, the new year brought significant rainfall which assisted fruit size. Overall, James is expecting harvest to be down somewhere between 15 and 20% on last season. However, because they haven’t suffered from hail, as in previous seasons, this harvest is shaping up to be better in terms of saleable product.

Picture 1. A FO meeting (L to R) Angus Crawford APAL, James and father Mark Filsell (Filsell Orchards), Paul James FLA and Rick Derrie (T&G USA).
Furthermore, apple prices are good in SA compared to other states, with James believing that Covid-19 has meant more people are eating apples. Filsell’s Orchards pack and sell their own fruit and sales have been up. James exclaimed that they are facing issues about not having enough fruit to sell because it is selling so quickly (*Not a bad problem to have*).

The next few years have a lot in store for James. He wants to erect a lot more netting and develop improved soil moisture monitoring so that he is better prepared to cope with extreme growing conditions. Furthermore, he is paying more attention to how much water is being applied so that he is making use of all the water and similarly is not under-watering his crops. This winter, Filsell’s Orchards are posting out a new orchard in a multileader V-trellis which is a part of James’s plan to remove the older varieties and replace them with more Jazz, Ambrosia and Envy. He explained that being a part of the Focus Orchard program has been very valuable to him, especially as a young grower who is wanting to get ahead of the game. He can contact the AgFirst consultants with any questions about the new varieties and values their wealth of knowledge. Overall, the orchard is progressing well, and James is learning a lot. They both have a bright future ahead of them.

**RK & J Fox and Son Orchards - Pemberton WA**

The Fox family have been growing a range of pome fruit in Pemberton, WA, since the 1920s. They are at the forefront of improving fruit quality in WA and have been maturity testing to determine harvest times for more than ten years. The Fox’s are big advocates for enhancing the consumer experience and utilising available tools to improve the overall quality and consistency of WA apples. Mat Fox believes that setting a minimum standard is a step in the right direction. Mat joined the Future Orchard program to explore ways which he could improve productivity and profitability by; replacing outdated varieties, using and trying new methods for pruning.

*Picture 2. Matt Fox completing maturity test.*
This season Mat has had no issues with labour, with backpackers turning up to the orchard regularly. However, Covid-19 has been a challenge for him and his staff.

Despite the challenges, Mat explained that he is trying to see it as an opportunity for the industry to become better and more consistent at personal hygiene as well as health and safety.

Fox’s Orchards have experienced some problems with the Cockatoos getting under the netting and damaging fruit this season, which may require some novel solutions. Overall, the tree vigour at Fox’s Orchards has been good and kept under control throughout the season. Managing tree vigour can be a challenge for WA apple growers, and Mat credits his success to the changes he has made while a part of the Future Orchard program. This season he was able to manage tree vigour by pruning the Fuji trees late at flowering time, while also pruning the regrowth after harvest. Overall, the Future Orchard program has been beneficial to Mat in terms of having access to more information.

Another challenge Mat has faced this season are the warmer than usual night-time temperatures. Subsequently, the fruit has not been maturing at the same rate it has been colouring, which meant that he picked his Gala crop ten days earlier than normal. Finally, because of high summer temperatures, Mat is considering the feasibility of overhead irrigation and has begun paying a lot more attention to his water use.

**Trial Update WA**

Covid-19 has offered a golden opportunity to plan for the next season and focus on how to improve fruit quality. The WA apple industry is committed to lifting the quality standard of its fruit. Not only have they implemented several initiatives (e.g. “The apple maturity testing guide”) but the WA Community Orchard Group (COG) along with Susie Murphy White (Front Line Adviser -FLA) have established several trials which build on the theme of improving fruit quality.

*Picture 3. RK & J Fox and Son’s Fuji looking good February 2020*
Predicting lenticel damage and pit problems in Kanzi and Fuji

It has been reported that some lines of Kanzi apples in WA experienced 7-50% lenticel damage during the 2019 season. Although lenticel breakdown symptoms are a post harvest problem, the damage can be mitigated by managing nutritional imbalances, crop load and excessive tree vigour in the orchard. Furthermore, moisture stress and excessive irrigation can also raise the incidence of lenticel damage. Typically lenticel damage expresses after a period of 40 days in coolstore. It is of immense value to the grower/packer to be able to predict which lines are likely to have a problem prior to the coolstore/marketing regime being decided. A trial in WA led by Susie Murphy White (FLA) has been set up to determine whether lenticel damage can be predicted before harvest starts to prevent problems later in the season.

Three orchards participated in this trial, two which had experienced lenticel damage in the 2018-2019 season and one which recorded no lenticel damage. 100 fruit were sampled from each orchard three weeks before harvest to test if lenticel damage could be predicted (forced). Three different methods for predicting lenticel damage were trialled. These were the hot water method, which saw apples submerged in hot water (49°C) for 30 minutes, the Ethephon method, which dipped each apple in an Ethephon solution for 2 seconds, and the passive method, which maintained the fruit at an ambient temp of 22°C for three weeks. All the samples were then stored at room temperature (22°C) for three weeks and the number of apples with lenticel damage recorded weekly. Fruit nutrient levels were also measured to determine the nutritional balance in the fruit.

Picture 4. Lenticel damage in Kanzi Apples April 2020.
Results to date show that all three methods had some degree of success at forcing earlier expression of lenticel damage in Kanzi apples. However, the percentage of apples expressing lenticel damage out of cool store is still required with this trial to understand the accuracy of each treatment. The treatments suggest that Orchard 1 is likely to have the highest pit/blotch levels out of store.

Table 1. Apple fruit nutrient uptake (ppm).

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Orchard 1</th>
<th>Orchard 2</th>
<th>Orchard 3</th>
<th>Optimum Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>58</td>
<td>59</td>
<td>76</td>
<td>40-100</td>
</tr>
<tr>
<td>Ca</td>
<td>80</td>
<td>97</td>
<td>85</td>
<td>70-125</td>
</tr>
<tr>
<td>Mg</td>
<td>41</td>
<td>49</td>
<td>56</td>
<td>40-75</td>
</tr>
<tr>
<td>K</td>
<td>1123</td>
<td>1115</td>
<td>1293</td>
<td>1000-1750</td>
</tr>
<tr>
<td>NH4</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>1-10</td>
</tr>
<tr>
<td>NO3</td>
<td>BDL</td>
<td>BDL</td>
<td>8.05</td>
<td>10-50</td>
</tr>
<tr>
<td>(K+Mg): Ca</td>
<td>15:1</td>
<td>12:1</td>
<td>16:1</td>
<td>10.5: 1 - 12.5: 1</td>
</tr>
</tbody>
</table>

BDL = below detectable limit

Lenticel damage is caused by several factors which accumulate over time, and this trial has shed light on how nutrient imbalances contribute. Unbalanced nutrition, specifically low fruit Ca levels, are associated with the occurrence of lenticel damage. Interestingly Orchard 1 which has the highest blotch expression, and has the lowest fruit calcium level. High K and Mg levels also promote lenticel damage because they directly compete with fruit Ca levels. This is because Ca is a cation and competes with K and Mg (also both cations) in the fruit. Thus, the incidence of lenticel damage can be predicted from the fruits (K+Mg): Ca ratio (Table 1). Orchards 1 and 3 had higher (K+Mg): Ca ratios, than Orchard 2 which may also explain the higher pit blotch levels in Orchard 1.

Lenticel damage risk mitigation comes down to good pre- and post-harvest horticultural practices. An intensive calcium spray programme over the growing season is critical to reducing instances of lenticel damage, and we recommend that growers work closely with their consultants, or spray reps, to design a soil and foliar nutrient programme that is appropriate to their blocks.

Maintaining nutritional balance, optimum crop load and balanced tree vigour can all assist in reducing the potential of lenticel problems later in storage.

Lastly, water availability can influence the occurrence of lenticel damage, not only can hot and dry conditions increase the rate of its occurrence, but excessive irrigation can do the same. Subsequently, due to the hot and dry 2019/2020 season, we expect that there will be more
instances of lenticel damage compared to the 2018/2019 season. Growers can help minimise calcium export from the fruit, therefore reducing the risk of lenticel damage, by implementing a good irrigation strategy and minimising water stress during periods of high temperatures.

**Snap (Branch Breaking) vs Click Pruning**

If you have been following the Focus Orchard and Trial Updates, you would have read about a “Click Pruning” method introduced by Dr Stefan Musacchi (Focus Orchard Trial Update September 2019 WA). You would also have learnt about SNAP canopies (simple, narrow, accessible and productive). However, this article uses ‘Snap’ to mean breaking of branches to reduce shoot regrowth. This trial, led by Susie Murphy White (FLA), came about because several growers have experienced good results using the Click method. It set out to determine the time and cost efficiencies of Click, and Snap pruning on 2015 planted Alvina Gala on V-trellis. The time taken for experienced pruners to prune two bays using each method were recorded, and bud and fruit counts provided some valuable information for growers to learn from.

*Picture 5. Snap (broken) pruned trees*
The results show that there was little difference in the time taken to prune using the two methods. On average, it was 0.05 min faster using the Snap method than the Click method. Furthermore, the trees pruned using the SNAP method (Picture 5) had a higher yield (Table 2). The average number of apples per SNAP tree was 220 and 168 per Click tree (Table 2).

**Table 2. Time taken for Click and Snap pruning.**

<table>
<thead>
<tr>
<th>Row/Bay</th>
<th>Pruning Method</th>
<th>Time taken 7/8/19</th>
<th>Bud count 5/9/19</th>
<th>Fruit count 7/2/20</th>
<th>Buds per fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2</td>
<td>Snap</td>
<td>1.00min/2 bays</td>
<td>396</td>
<td>220</td>
<td>1.8</td>
</tr>
<tr>
<td>R2</td>
<td>Click</td>
<td>1.05min/2 bays</td>
<td>344</td>
<td>168</td>
<td>2.0</td>
</tr>
</tbody>
</table>

The tree growth response was different between the treatments, and there was an obvious difference in their pre-harvest fruit counts, although this may be due to higher winter bud numbers rather than pruning technique. Surprisingly the pruning times for each treatment were similar. The more important decision on whether to change pruning systems would appear to be tree growth response and fruitfulness based on these early learnings.

**Water use, growth rate and taste**

Another trial led by Susie Murphy White (FLA) is trying to determine “How much water do the trees require” during the season and how close to harvest can the water be reduced?” Although this trial will not be complete until late May, its interim results are fascinating.

This trial examines the effect of the amount of water applied on fruit growth rates, maturity and taste. It has also established the range in water being applied across seven orchards in WA this season. Each orchard reported on how many hours they irrigated per week, and meteorological data was collected from the DPIRD weather stations. A water balance calculation then defined the irrigation deficiency.
Figure 2. Accumulated water deficit 2019 – 2020 season for the Gala blocks.

The participating orchards have a range of different watering systems (drip or under tree sprinkler), environments (net or no net), soil types and climatic conditions. Results show that the variability in these factors means that each grower irrigates differently (Figure 2). This season saw some hot days (>38°C) early in December, and it’s interesting to see how growers responded. Furthermore, getting these growers to think about how much water they use has been an interesting learning curve for most of them, reports Susie.

Alongside the water applied throughout the season (accumulated water deficit), fruit growth rate and maturity testing was recorded (Brix, Starch, Pressure and Dry Matter Content). For Gala, a taste test was also performed to see if the different watering systems affected fruit taste (Figure 3). Unfortunately, because of Covid-19, the possibility of taste testing Pink Lady remains up in the air.

Figure 3. The overall taste profile of the Gala apples in February 2020.

There is no apparent correlation between the taste profile of Gala and the different watering systems because the maturity of each fruit at the time of testing varied and its likely that fruit maturity influenced the results.
One interesting observation is that there was no apparent trend between the netted trees and the unnetted trees (Figure 3). Normally it could be expected that there would be some variation in dry matter and sugars caused by the different ET and light penetration experienced between netted and unnetted orchards. Once again, it is likely that other factors influenced these results; however, we lack the data to understand why.

Figure 4. OrchardNet Monthly Water Use 2020

(A) Netted Sprinkler
(B) No Net Sprinkler
(C) Net Drip
(D) No Net Drip
Overall, this trial showed that there is more work to be done in WA orchards around irrigation management and fruit quality. These preliminary results have provided an opportunity to redefine the trial and find some more conclusive answers in the future. Furthermore, as extreme weather events become more common, it is critical to use tools to monitor water use more effectively. Only by up tooling can growers become better equipped to make informed irrigation decisions and therefore have greater control over the quality, consistency and marketability of their fruit.

This trial highlighted some great work from Susie and her WA growers. This and the other trial reports will be available on the APAL website.

**Acknowledgements**

Special thanks must go to the Focus Orchard participants Mat Fox and James Filsell, also Susie Murphy White (FLA) in WA for these great trials, the growers who kindly allowed these trials and the local WA Community Group.

**Further reading:**

- [https://edepot.wur.nl/211705](https://edepot.wur.nl/211705)