

Travel Report: Visit to Australia and New Zealand

December 2023



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1. Objectives of the visits:

- The trip was part of Hortgro's two-year industry leadership development programme that culminated with an international study tour to gain international industry exposure. Six of the 19 participants of the programme, together with Prof Wiehann Steyn, programme Steering Committee member and tour leader, visited Australia and New Zealand.
- In addition, we attended the II International Symposium on Precision Management of Orchards and Vineyards in Tatura, Australia to stay abreast of the newest developments in the field of precision.
- Another objective was to build relationships with researchers, technical experts, and industry members in Australia and New Zealand.

2. Touring party members:

- Wiehann Steyn (Hortgro)
- Minette Karsten (Hortgro)
- Marno van der Westhuizen (Hortgro)
- Ross Heyns (Glen Fruin Farms)
- Gerrit van der Merwe (Fonteintjie)
- Jaco Bruwer (Vleihoek Agri)
- Wilhelm Loock (JJ Loock Ongelegen)

3. Visits in Victoria, Australia:

Pre-Symposium Tour

30 November – 3 December 2023 – Melbourne, West Gippsland and Yarra Valley

Host

- Kevin Sanders (colonel@yvapples.com.au), apple grower, Sanders apples, and retired director of Apple and Pear Australia Limited.

Programme of the pre-symposium tour

- We started off the tour on Thursday, 30 November with a visit to Monash University to view their latest research and developments in agricultural robotics, followed by a visit to grower group, Montague. From Friday to Sunday, 1 – 3 December we visited growers in the West Gippsland and Yarra Valley regions. The farms visited were Priest Bros Orchards (Paul Priest), Fankhauser Apples (Brad Fankhauser), Battunga Orchards (Mark Trzaskoma), Finger Farm (David and Nick Finger) and Sanders Apples (Kevin Sanders).

Observations

General

- Montague Farms found drape net to be more effective than fixed net in terms of hail protection in 2022. They also use growing degree days as the biggest tell for internal browning risk and refrain from using ethylene blockers like Harvista™ on cultivars like Envy™ that's sensitive to internal browning.
- Brad Fankhauser mentioned that they only start to irrigate in late November due to the high rainfall. All new irrigation that's being installed is pressure compensated drip.

Technology

- Professor Chao Chen and his team from Monash University have made significant progress with the development of the MARS (Monash Apple Retrieving System) robotic harvester with a 70% success rate with harvesting. They are currently doing orchard testing at Fankhauser Orchards and their development focus now is on wire detection and 3-D reconstruction of the trees. See link for an introduction to the MARS robotic harvester - <https://www.youtube.com/watch?v=gnFWmKMCCWQ>

- Priest Bros Orchards and Fankhauser Apples make extensively use of picking platforms.

Darwin Tecnofruit harvesting platform



- No bags or ladders.
- Auto steered and self-levelling.
- 4 – 6 people on a platform.
- They aim to grow 300 g fruit, so will be getting a new altered platform with a bigger belt system and less electronics.
- 12 – 15 minutes per 380 kg bin.
- Cost is $\pm$ R1.8 million.

Zucal harvesting platform



- They find a $\pm$ 50% increase in picking productivity.
- On average, 350 kg/person/hour on the platform versus 220 kg/person/hour with bags and ladders.
- Can work in 2.5 - 4m row width.
- 6 – 8 people on a platform.
- Takes 40 – 50 seconds to change a bin.
- Can work at night with LED bars ($\pm$ R60 000 per light). However, hourly wage differs when working from 21:30 – 04:30.
- Cost is $\pm$ R2.0 million.

- Finger Farm use the Hydralada mobile elevating platform for numerous practices on the farm like harvesting, pruning and thinning.



The Hydralada 300 (left) and the picking bags used on the platform (right).

- Priest Bros use reflective mulch and a leaf defoliator for colour development. Before using the defoliator 2 weeks before harvest, they trim the branches with a hedge trimmer to make it more rigid for the defoliation process.

- Fankhauser Apples use Hectre (<https://www.hectre.com/>) for bin traceability and to fruit size distribution in the picked bin.
- Battunga Orchards use the Conservis software (<https://conservis.ag/farm-management-software/permanent-crop-management-software/>) to track the progress of jobs, view spray diaries etc.
- Kevin Sanders introduced us to a very handy battery-operated staple gun that's used to fix trees to the trellis system.



The battery-operated staple gun.

- Australian growers use the Green Atlas cartographer for information like flower density estimation, fruit size distribution, leaf area mapping, fruit colour mapping etc. See more details on Green Atlas' offering at <https://greenatlas.com/>.
- With the vast amount of innovation taking place in the technology field, all the growers emphasized the importance of keeping the end goal and real value of the different products in sight when evaluating the available options.
- Mark Trzaskoma indicated that if you're going to make an investment in technology, you need to make an equal investment in people to run the technology.

Training Systems

- We viewed high-density, two-dimensional orchards that are trained to be more efficient and suitable for mechanisation – see examples of such training systems below. Given the financial pressure on fruit production and the resulting strong movement towards more efficient planting systems, it was interesting to note that many Australian orchards are still planted to the so-called traditional system. According to Kevin Sanders, these orchards will probably not make it.



The training system that works best for Battunga Orchards – 4800 trees/ha with a double wire system consisting of 8 wires a side.



2002 Rosy Glow with M.26 rootstock on a V-trellis with 3300 trees/ha. Kevin emphasized four factors that lead to this orchard's success:

- *The low amount of wood to fruit. In his words: "We're growing fruit and not wood."*
- *An appropriate support structure with enough poles.*
- *The importance of row spacing with this system to ensure that the trees fill their space.*
- *Well managed vigor – to be able to still see through three rows with a full canopy.*

Crop Protection

- Finger Farms attains promising results in managing apple scab inoculum by removing leaves with a leaf sweeper. They use Ethrel® to drop the leaves and then do two sweeps per season once all the leaves have fell. There's also a vacuum attachment available for the sweeper that will pick up fallen fruit and leaves.



*The leaf sweeper
on Finger Farm*

- We were introduced to the BioScout technology at the symposium. BioScout is an Australian company that has developed an instrument deployed in vineyards to automate the collection of air samples to detect, identify and count specific fungal spores. The results are combined with weather data to produce disease forecasts that can inform spray programmes. Although BioScout technology is not available for pome fruit currently, they are looking to expand to other fruit types.
- On a packhouse visit during the symposium, we noticed that the bins are washed before they get dipped in the flume system.
- When replacing a high-density orchard that performed well during its lifetime, with trees still in a healthy condition, replant conditions are avoided by simply grafting the trees.



An example of a successfully grafted established orchard on Finger Farm. See the link for an example of progress on such an orchard - https://www.linkedin.com/posts/fruihelp_apples-fruihelp-activity-7211285486592503809--GKE?utm_source=share&utm_medium=member_desktop

4. Visits in Hawke's Bay, New Zealand:

11 December – 15 December 2023

Host

- Dr Ken Breen (ken.breen@plantandfood.co.nz), Science team leader – temperate tree physiology, The New Zealand Institute for Plant and Food Research.

Programme of the post-symposium tour

- Monday, 11 December: The New Zealand Institute for Plant and Food Research
- Tuesday, 12 December: AgFirst and T&G/VentureFruit
- Wednesday, 13 December: Prevar and New Zealand Apples and Pears Inc.
- Thursday, 14 December: Bostock, Fruition Horticulture and John Morton Ltd.
- Friday, 15 December: The New Zealand Institute for Plant and Food Research – Te Puke research station.

Observations/Learnings



The New Zealand Institute for Plant and Food Research

Dr Ken Breen - ken.breen@plantandfood.co.nz
<https://www.plantandfood.com/en-nz/>

Breeding – Dr Ben Orcheski and Dr Vincent Bus

- The Plant and Food Research breeding programme receives significant funding. They aim to produce a new apple cultivar every three years.
- New cultivars must have double-gene resistance to apple scab. The breeding team is currently working on triple gene resistant scions.
- Gaps to be filled in apple breeding in the future include breeding for size, like Rockit™ apples, red flesh and increased vitamin C and E content.

- In terms of rootstocks, they're looking at dwarfing rootstocks with resistance to fire blight, European canker and woolly apple aphid.

Post Harvest Physiology – Dr Nicolette Niemann

- They are a team of 6 that works on apples, pears and cherries. Their aim is to push apples to a 2 million NZD product.
- They are evaluating CR Automation's rotary high-pressure washer for removing the clay mixture used for pathogen control. Although the washer successfully removes the clay mixture in the calyx and stem end, its commercial cost is over a million NZD. The washer also has a lot of moving parts, which increases the risk of malfunctioning. Given the high cost and risk, they've designed a targeted apple washer that specifically sprays the calyx and stem end with less pump issues and are currently evaluating it. They find that air blasting doesn't work in removing the clay mixture.

Training Systems – Dr Ken Breen

- We visited the Future Orchard Planting System (FOPS) trial site where Ken and team are evaluating how different row spacings affect light interception. The trial is currently in its 12th season and consist of Royal Gala, Fuji, Scifresh and Scilate trees, all on M.9, that's trained to a planar cordon system and planted at 1.5 m and 2 m row spacings. Although the FOPS is showing promising results, it is an expensive system, and the jury is still out whether it's viable in a commercial setup. Plant and Food will be looking at the economics next while most growers are doing their own small in-house trials.

Some details/comments on the FOPS system:

- Each tree consists of 10 uprights that's 30 cm apart.
- Pruning cost on the system is similar to the cost on high density spindle trees.
- They aim for 3.7 m high trees.
- The system can attain 80 – 100 kg/tree and depending on fruit size, can yield up to 180 ton/ha.
- They aim for 40 – 50 fruit per upright.
- The colour packout for Jazz in year 9 was 90+ percent.
- New plantings of the system range between 1.8 m – 2.2 m row width and 3 m – 3.6 m tree spacing.



The Future Orchard Planting System

One of the noteworthy observations was the ability to see through 3 – 4 rows.



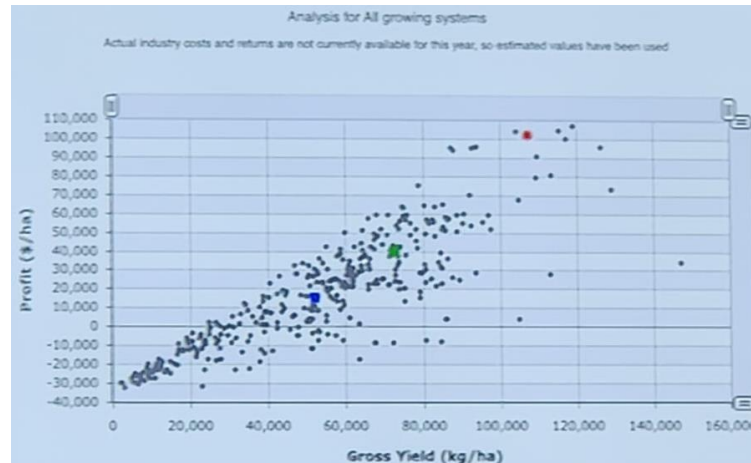
Multi leader training system trial with PremP009 pears.



AGFIRST New Zealand

Jack Wilson – Horticultural Consultant (jack.wilson@agfirst.co.nz)
<https://www.agfirst.co.nz/>

- AgFirst is New Zealand's leading agricultural, horticultural and ag-engineering consultancy group with seven horticultural consultants in the Hawke's Bay region. They offer consultancy services, economic and benchmarking analysis, environmental services, farm purchase and investment analysis and do applied research.
- Their applied research focus on grower trials like nanobubble irrigation, leaf defoliation, tree trimming and pollination. They also look at chemical rate trials and registration of products.
- In terms of precision agriculture, they look at blossom densities, vigor mapping, tree height mapping and fruit count and size mapping. Jack indicated that they use Aurea Imaging (<https://aureaimaging.com/>) to compile thinning maps by doing flower counts, which gives an idea of the thinning need. The only issue is that the map is based on a picture at a specific point in time which means that more than one picture is needed to incorporate possible delayed foliation. They also use OrchardNet® (<https://hortwatch.com/orchardnet/>), an AgFirst developed cloud-based orchard management tool that captures production, monitoring and financial metrics.
- It was interesting to note that they can't grow Honeycrisp because it gets too big and that they are working towards a 270g Scilate apple. Due to their high production costs and the relatively low price that they get for Royal Gala, they strive for a 170g apple in order not to compete with our smaller Galas.
- Labor is one of the biggest expenses, with an hourly rate of 30 NZD (R330/hour). The estimated cost for hand thinning per tree is 225 NZD (R2,477)



The profit/hectare and gross yield (kg/hectare) of 368 Envy™ blocks (674ha). It's interesting to note the variation and promising profit attained by the top performing blocks.



VentureFruit®

Chris Fitzgerald – Global Variety Technician (chris@venturefruit.com)
<https://venturefruit.com/>

- VentureFruit® is a T&G Global company that provides plant variety commercialisation and management services for fresh produce growers and marketers, on behalf of variety breeders and owners. T&G Global is a grower group that makes up ± a third of New Zealand's apple production, with 650 ha of their own farms and the rest consisting of alliance and 3rd party growers.
- T&G aims to reduce their carbon footprint by 40%.
- They are looking at G.11 and G.41 as alternative rootstocks to M.9.
- Shade nets are becoming more prominent to mitigate the hail risk and improve packout percentages.
- Their main crop protection challenges are European canker, fire blight and apple scab. T&G have dedicated canker teams that map the presence of the pathogen to identify hotspots and remove affected branches.
- In terms of Envy™, they find that over cropping results in a drop in dry matter content (DMC) which leads to poor eating quality and has subsequently developed DMC metrics for the cultivar.



Envy™ on M.9 trees that was planted in 2018 at 3 m x 1.4 m and formally trained to 8 wires. This is believed as the best practice training system for T&G.



T&G's new state of the art packhouse of ± R1.3 bn.

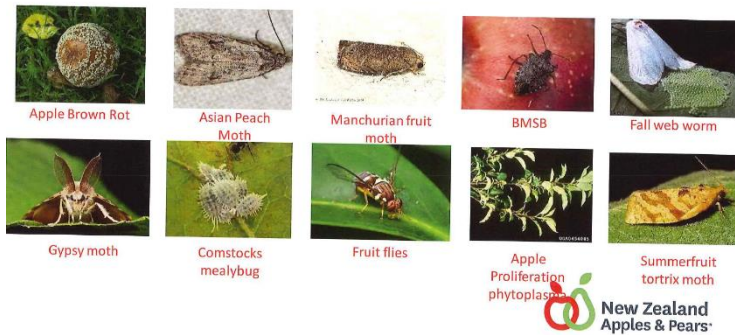


New Zealand Apples and Pears®

Karen Morrish – Chief Executive Officer (karen@applesandpears.nz)
<https://www.applesandpears.nz/>

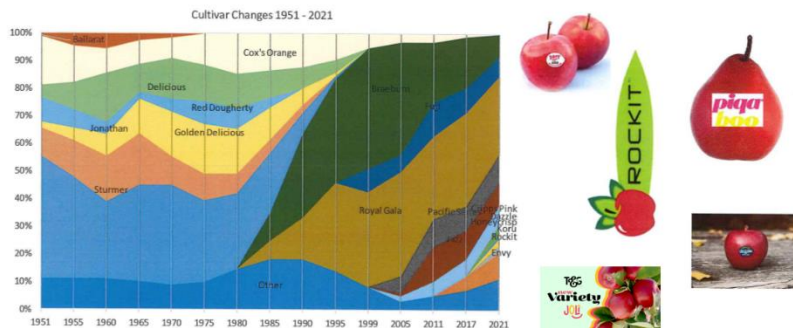
- According to the 2022 national production data, the New Zealand apple and pear industry consist of 10 820 hectares, 256 export growers and 46 export packhouses. 68 034 Tonnes of apples and pears were supplied to the domestic market and 340 403 tonnes were exported.
- New Zealand produces less than 0.5% of the world apple production and accounts for 4% of the global export market. Although one of the smallest producers internationally, they are frequently rated as the number 1 apple producer in the world based on productivity, innovation and profitability.
- It was interesting to note how aligned the New Zealand industry is in terms of their vision and goals and how aggregated it is, with two grower groups, Mr Apple and T&G, making up 60% of the industry.
- The seasonal challenges they face include labour shortages and climate change. Hawke's Bay lost ± 10% of its apple orchards to cyclone Gabrielle.
- The industry is transitioning to more productive/robot ready planting systems. The current distribution of their plantings is: 47% low density plantings (average 30-60 tonnes/ha), 37% high

density plantings (average 60 – 90 tonnes/ha) and 17% robot ready plantings (average >90 tonnes/ha).



The top 10 biosecurity risks to the New Zealand apple and pear industry. South Africa has similar biosecurity risks to New Zealand as 9 of their top 10 pests and diseases don't occur in South Africa and should be on our biosecurity radar.

Transition to new varieties



The change in distribution of apple cultivars in New Zealand from 1951 to 2021. The New Zealand apple industry is transitioning towards new, higher value cultivars, with volumes of the traditional varieties in decline. This could provide South Africa the potential opportunity to fill the gap in traditional commodity varieties.



Prevar™

Duncan Park – Quality Manager (duncan@prevar.co.nz)
<https://prevar.co.nz/>

- Prevar™ commercialise new apple and pear varieties for licensing in New Zealand and around the world. It's a private joint venture company owned by industry with shareholders, New Zealand Apples and Pears (51%), Plant & Food Research™ (29%) and APAL (20%).



Some of the varieties in Prevar's portfolio.

- They work in collaboration with Plant & Food Research to deliver new varieties, with a budget of $\pm$ 3 million NZD per annum provided to Plant & Food Research for breeding.
- Prevar's varieties currently makes up $\pm$ 33% of the New Zealand apple crop.
- It was interesting to hear that the T&G group plans to plant 250 000 Joli™ apple trees by 2025.
- Duncan indicated that for New Zealand growers to make money and survive, they need to earn at least 30 NZD per 18 kg carton.



Bostock

Tom Bostock – Grower (tomb@bostock.co.nz)
<https://www.bostock.nz/>

- Bostock is one of New Zealand's leading growers and the largest organic apple producer with $\pm$ 500 ha of organic orchards.
- They make up $\pm$ 90% of New Zealand's organic apple market.
- Dazzle™ and Fuji Suprema are their main cultivars, and they mostly use G.202 as rootstock.
- Some their biggest crop protection issues are the bronze beetle (*Eucolaspis brunnea*), apple scab, European canker and fire blight. It was interesting to hear that something that wasn't mentioned as an issue in commercial apple orchards, like bronze beetle, are the main issue for organic apple growers.
- They graze older orchards with sheep at the beginning of winter to mulch the leaves on the orchard floor and subsequently reduce the apple scab inoculum. Interestingly, they only use specific breeds as some breeds eat the bark of the trees.
- Bostock's main market is the counter season organics in the USA. They also get a good price premium in Asia, but the volumes are still small.
- As they use standard, non-organic nursery trees and treated posts, they must comply with a transitioning period of three years before the posts and trees can be classified as organic.



Fruition

Jack Hughes – Managing Director (jackhughes@fruition.net.nz)
<https://www.fruitionhort.com/>

- Fruition Hawke's Bay is an independent consultancy group that provides horticultural advice and technical services to pome fruit growers.
- It was interesting to hear that they feel nutrition must become a focus again in New Zealand, as it hasn't been a priority for some time due to the good quality soil.
- Jack indicated that their soil organic matter naturally ranges between 5-10%.
- A big lesson learned after the cyclone was how poor the drainage of some orchards is.
- Jack mentioned that the water table in some places can be as high as 1 meter below the soil surface.



John Morton Limited

John Morton – CEO (johnmortonltd.co.nz)
<http://www.johnmortonltd.co.nz/>

- John Morton Ltd. is a private company that specializes in the introduction, development and commercialisation of new fruit varieties.
- John also mentioned that they can't market smaller fruit competitively with South Africa due to their high input costs. Therefore, they are forced to produce larger fruit or have a unique product.
- John shared some interesting remarks on where he thinks the New Zealand apple industry is going:
 - They can only cut costs so far.
 - There will have to be a replant programme.
 - The number of apple hectares will shrink.
 - They see huge promise in interspecific pears.



The Kiwifruit Breeding Centre™ – Te Puke

Juanita Dunn – Business Manager – Kiwis (juanita.dunn@plantandfood.co.nz)
<https://www.kiwifruitbreeding.com/>

- The Kiwifruit Breeding Centre™ is a joint venture between The New Zealand Institute for Plant and Food Research and Zespri.
- The research centre consists of 100 hectares of kiwis, which is substantial given that the average kiwi farm in New Zealand is 3.5 hectares.
- Juanita mentioned how challenging it is to land a new cultivar, given that they've bred over a million seedlings, with only three cultivars on the market.
- The kiwifruit is the grower's responsibility until it touches the deck of the ship, after which Zespri takes ownership. Interestingly, Zespri sends a technician on each ship to monitor factors like temperature and humidity.
- It was interesting to note that their kiwi industry, that's also highly dependent on Dormex®, is also at risk of losing the chemical and are investing major money into finding an alternative.



The touring party members at the Kiwifruit Breeding Centre™.

5. Lessons Learned – Australia and New Zealand:

- Class 1 fruit is a priority for Australia and New Zealand as they won't be able to survive if they produce a high percentage of 3rd class fruit.
- We retain a significant cost advantage over Australia and New Zealand, keeping in mind that cost is relative. These countries have extremely high labour costs, in addition to limited access to labour, and this is the main reason for the drive behind mechanisation and automation.
- Planting systems are designed for suitability for mechanisation and automation to reduce costs, improve pack-out percentages and produce high-quality fruit. There is no consensus yet on what the new architecture should be. Most of the new systems, like the FOPS, comes with significantly higher establishment costs, require higher capital costs, require more labour inputs, as well as a combination. Thus, it remains to be seen which system provides the best return on these inputs. However, although a variety of training systems are still used, most involve narrower, more efficient tree canopies and narrower row widths with the shared advantage of improved fruit quality and labour efficiency.
- Packhouses are being automated to a large extent.
- The producers that appear to be better at managing the high-cost environment are still prepared to allocate significant resources to improve pack-outs of the desired size and grade fruit, for example, by hand thinning, and summer pruning.
- We have much to learn from Australia and New Zealand about labour efficiency, considering that labour is half of their on-farm expenses, like ours, but at a much higher hourly labour rate. It was clear that they don't shy away of spending man hours in the orchard, but if you look at how low their man hours per hectare are compared to ours, it seems that we are wasting man hours. This might be due to our tree architecture and harsher conditions, but there is definitely room for improvement.
- It was interesting to note the similarity in challenges faced by South Africa and New Zealand, including biosecurity.
- The high biosecurity standards – the levels of input and buy-in – in Australia and New Zealand are impressive. They investigate potential risks proactively and, in more depth, than we do. This proves what's possible when a country really invests in surveillance.
- In terms of crop protection, fire blight and European canker, which neither are present in South Africa, are their biggest challenges, and after seeing the devastation it can cause, it is something we should keep out of our country.

6. Appendix 1: Contacts

1. Sanders Apples

- Kevin Sanders (colonel@yvapples.com.au), apple grower and retired director of Apple and Pear Australia Limited.

2. The New Zealand Institute for Plant and Food Research

- Dr Ken Breen (ken.breen@plantandfood.co.nz), science team leader – temperate tree physiology.

3. AgFirst

- Jack Wilson (jack.wilson@agfirst.co.nz), Horticultural Consultant

4. VentureFruit

- Chris Fitzgerald (chris@venturefruit.com), Global Variety Technician

5. New Zealand Apples and Pears

- Karen Morrish (karen@applesandpears.nz), Chief Executive Officer

6. Prevar

- Duncan Park (duncan@prevar.co.nz), Quality Manager (duncan@prevar.co.nz)

7. Bostock

- Tom Bostock (tomb@bostock.co.nz), Grower

8. Fruition

- Jack Hughes (jackhughes@fruition.net.nz), Managing Director

9. John Morton Limited

- John Morton (johnmortonltd.co.nz), CEO

10. The Kiwifruit Breeding Centre

- Juanita Dunn (juanita.dunn@plantandfood.co.nz), Business Manager – Kiwis

7. Appendix 2: Itinerary

ITINERARY FOR TRIP TO AUSTRALIA AND NEW ZEALAND

<u>29 NOV:</u>	Arrive in Melbourne.
<u>30 NOV:</u>	Morning: Monash University Afternoon: Montague Farms.
<u>1 - 3 DEC:</u>	Pre-Symposium tour.
<u>4 - 8 DEC:</u>	II Precision Management of Orchards and Vineyards.
<u>11 DEC:</u>	New Zealand Plant and Food Research.
<u>12 DEC:</u>	Morning: AgFirst. Afternoon: VentureFruit.
<u>13 DEC:</u>	Morning: New Zealand Apples and Pears. Afternoon: Prevar.
<u>14 DEC:</u>	Morning: Bostock and Fruition Horticulture. Afternoon: John Morton.
<u>15 DEC:</u>	New Zealand Plant and Food Research – Te Puke.
<u>17 DEC:</u>	Return to Cape Town.