The ORCHARDIST®

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HORTICULTURE NEW ZEALAND

Future Feijoas

Pages 11 and 40

Congratulations from Grochem to the lucky winners of the

Hooga Movable Outdoor Fireplaces

Andrew Kininmonth

HODDYS ORCHARDS TASMAN

It was a big surprise, so a huge thank you to Grochem for running the competition and for their ongoing support over the years with their tested, proven and innovative products and great technical advice. Their "give back to the grower" community is awesome. We have had a strong relationship with Grochem for 20+ years.

The Hoddys Hooga will be well used. It will be available for all of the permanent staff to use for personal functions or at one of our newly named Hoddys Hooga Happy Hours.

Jerry Hamilan

RIVERLAND ORCHARD GISBORNE

The team at Riverland have been using Grochem products for many years.

NZ company, trusted and proven. Great products with exceptional support.

Shane Flynn

FRESH MAX ORCHARDS HASTINGS

The support that we receive from the Grochem team is second to none. What I see is a company that is an industry leader in its space and prepared to continue to grow and progress which is great for the horticultural industry.

The work that you guys do to support local and abroad communities is fantastic from the support of hospice services and the clean water & education for RSE.

Dave Loynes

SONIC SPRAYERS BAY OF PLENTY

Thanks to the team at Grochem for the chance of being able to win the Hooga fireplace. I have been involved with using Grochem products for several years now and have nothing but good things to say about them. The products we use always give us the results we are after.

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Contents

APRIL 2022

At last there are positives to celebrate

I suggested the government had asked us to swallow a RAT last month. I should have been more careful about what I said because, as I write this, beside me is my positive RAT test!

Barry O'Neil : HortNZ president

That said, some real positives have happened over the last little while. Recognised Seasonal Employer (RSE) scheme worker numbers increasing to 16,000 is good, even though we would have liked this number to be 25,000, but at least it's a start. And with Working Holiday Visas starting again in mid-March, we will hopefully begin to see a return of backpackers to the country, to address the 10,000 shortfall in seasonal workers. And good to see Managed Isolation and Quarantine (MIQ) being phased out, along with bringing forward the border opening dates for tourism to start to recover.

And very good to see the changes the government has made to critical workers being able to continue to work, and for isolation periods to be reduced to seven days. It's absolutely essential that we allow our healthy workers to work!

I really commend the industry for its collaborative approach to the labour shortage, and the willingness to work as the horticulture sector to support each other. It's a no brainer to me, and something we should continue to focus on in the future, rather than competing with each other internally.

Another area for collaboration is how we go about attracting backpackers here, and making the campaign so appealing that they come to this side of the ditch. There's a great opportunity to work together to make this happen.

Harvest is beginning for our two biggest sectors, apples and kiwifruit, which is always something to celebrate. After a year of hard work to get the crop to its best possible state, there's nothing like picking and seeing the truck leave the orchard taking the fruit to market. The fruit is looking fantastic this season and while we all have our fingers and toes crossed that we can get it all picked, packed and shipped, we are off to a great start.

I really appreciate the efforts being made by many people to look after each other and our 'wellbeing.' There are some really great initiatives. I encourage everyone to make time to have a cuppa and catch up with others, which is a great way to keep an eye on each other.

Country of Origin labelling has been a long time coming but it has arrived, with the regulations coming into effect and now, imported produce needs to be labelled as such. I congratulate all the people over the years that have been working hard for this outcome, even though there was some serious push-back from others in the primary sector, along with the government.

> **"After a year of hard work to get the crop to its best possible state, there's nothing like picking and seeing the truck leave the orchard taking the fruit to market**

With our compliance costs increasing as a result of labour, fuel, audits, the Emissions Trading Scheme (ETS) and so on,

it's important that our consumers are not duped into buying cheaper imported produce that doesn't have the same production standards and costs.

And very important that we get our consumers supporting fantastic New Zealand-grown produce. This will ensure sustainable production into the future, which is at risk if cheaper, lesser quality produce floods our markets.

The Commerce Commission's report into the supermarket duopoly is another welcome outcome. While the devil will always be in the detail, it does address some of the challenges fresh produce growers have been having. The supplier retail code of conduct is what Horticulture New Zealand called for and will be a real help, if it is similar to what already exists in Australia and the United Kingdom to protect growers. Also helpful will be the recommendation to establish both a grocery sector regulator and a dispute resolution scheme.

> **"I encourage everyone to make time to have a cuppa and catch up with others, which is a great way to keep an eye on each other**

The New Zealand-United Kingdom Free Trade Agreement (FTA) is another very welcome positive, having now been finalised and signed. The up to 8 percent tariff that applied to some horticulture products is being removed. Let's hope this outcome gives the European Union FTA negotiators a rev up to finalise what will be one of the last FTAs that New Zealand will probably enter into, as most other parts of the world are already covered with good trade agreements.

Wonderful also that the police got rid of that rabble in Wellington. They must need the patience of a saint to be in that job. While I am fully on board with peaceful protests, what I saw in Wellington was a small group of hooligans that to me, have no place in our society.

Lastly and another positive at least for me, my Covid-19 infection was mild, thanks to what I think is our impressive vaccination rates and great community health support system. It is always a bit of a worry not knowing how your body will react to the virus so in some ways it's a relief to have had it.

I hope if you get Covid-19, it's mild also, and that the peak happens quickly so we can get back to a sense of normality.

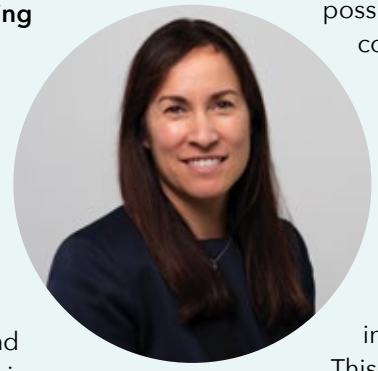
Kia kaha.

Working together for the greater good

If all of Horticulture New Zealand's members were a part of one massive business entity, our diversity would be a considerable strength.

Nadine Tunley : HortNZ chief executive

But as we are not one business entity, it is often a considerable weakness. HortNZ's role is to bring our industry together for the greater good. When we say this, it is because the unity of our collective voices has a greater impact and influence. This is particularly important when we are lobbying the Government for policy settings that will 'create an enduring environment where growers thrive'. That is HortNZ's purpose.



Early in the export fruit season, HortNZ brought together the relevant summerfruit, apple and kiwifruit product groups, along with New Zealand Winegrowers, Zespri and T&G Global to discuss and agree on a coordinated communications approach for the season. The group has focused on the kind of story it wanted to broadcast about the coming season. With that clear, the group has worked together to tell as positive a story as possible about the challenges and how the industry is responding, while making it clear that the situation is tough and unsustainable.

Early in the new year, it was apparent that we were facing some of the worst labour shortages known to our industry. It was also clear that the shortage would be compounded by Omicron – and that is exactly what has happened. There was also the necessity for this communications 'team' to distil and disseminate to growers, as quickly as possible, the significant volume of information coming out of the Government about Omicron. We did this to try and reduce the pressure and additional workload on growers to wade through such a lot of sometimes contradictory information.

Constant discussion

Throughout the year, we speak constantly with the Government about what our industry needs in terms of policy settings. This is so that growers can thrive, and New Zealand and the world can enjoy fresh, healthy and nutritious fruit and vegetables, particularly at a time when the world's health and wellbeing is under immense pressure.

The ORCHARDIST

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This is a relentless job. While as an industry we might live and breathe growing, central government officials in Wellington do not and neither do most regionally based local government officials. Overlay this situation with the fact that churn and change in central government are high, and you have quite a task.

> **Early in the new year, it was apparent that we were facing some of the worst labour shortages known to our industry**

That is why it is important the horticulture industry speaks with one coordinated voice in a considered and consistent way, so the message gets through. If we don't or if we can't, we create an environment where government officials become confused and decide what they *think* is best for our industry, based on what they have heard, which is often wide of the mark.

As an industry, we also need to remember this is a majority government that can make changes as it wants. We can't just toss our toys in this environment, otherwise, we will lose our seat at the table and risk not getting it back.

What we must do is speak with a united, coordinated and cohesive voice, that is backed up by robust analytics, solid data and policy that creates a compelling case. As HortNZ chief executive, that is my goal and I want to build on the success we've experienced with the export fruit groups and wine.

Increasing production costs

The increasing costs of production are affecting all of our members. This has been particularly topical for our vegetable sector of late, reducing already slim margins and putting vegetable growers under immense pressure. Over April, we will work with vegetable product groups and industry representatives, to put a coordinated advocacy plan in place, focused on the most significant issues. In doing so, we will provide the Government with a clear picture of what the New Zealand vegetable industry needs, in order to be sustainable and profitable. This will require collaboration and cooperation – but as outlined in this column – it has worked well for the export fruit groups.

YOUR LEVY AT WORK

INDUSTRY WIDE ISSUES FOR INDUSTRY GOOD

Natural resources and environment

Michelle Sands : HortNZ strategy and policy manager

Selwyn District Plan – hearing

Selwyn District Council notified the proposed Selwyn District Plan for public consultation in October 2020. Submissions on the proposed plan closed on 11 December 2020.

Key matters that are managed by the district plan include:

- Land zoning and subdivision – managing how land use change can occur and where urban growth is located.
- Reverse sensitivity issues for managing conflict between land uses, including things like noise, light, standards for sensitive activities.
- Provisions for buildings and structures, such as glasshouses, packhouses, worker accommodation and crop protection structures.
- Storage and management of hazardous substances.
- Protection of special features, landscapes and sites of significance.

Horticulture New Zealand and its expert planner presented evidence at the rural zone hearing in March.

Waikato District Plan – appeal

The decision version of the Waikato District Plan was notified on 17 January 2022, appeals closed 1 March 2022. Parties may join appeals as 'Section 274' parties by 22 March 2022. A total of 67 appeals were lodged.

HortNZ's appeal relates to:

- Opposing requirements for Seasonal Worker Accommodation being limited to a Record of Title with an area of at least 20 ha (otherwise non-complying).
- Opposing 12m setback requirement for artificial crop protection structures.
- An amendment to GRUZ-P5 to 'provide for' (i.e., through case-by-case assessment of appropriateness) rather than 'enable' non-rural activities.
- Seeking deletion of GRUZ-P16.
- Seeking to enable 'Ancillary Rural Earthworks' in flood management overlays.
- Seeking an amendment to the definition of 'farming' that restricts loading areas for helicopters and airstrips to only activities on the 'same site'.

Hawke's Bay Outstanding Water Bodies – mediation

Hawke's Bay Regional Council Plan Change 7: Outstanding Water Bodies proposes to change the Regional Resource Management Plan (RRMP) to include a list of the region's outstanding water bodies, together with a framework which prescribes a high level of protection for these water bodies in future plan making.

The water bodies identified in the proposed Plan Change 7 are the 'best of the best' within the region,

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featuring exceptional cultural, spiritual, recreation, natural character, landscape, geology or ecology values which are remarkable in Hawke's Bay.

The decision on the Plan Change was appealed, by parties wanting to add more water bodies and more criteria. HortNZ has joined the appeal as a 274 party and is participating in the mediation.

The focus of HortNZ's involvement in the mediation is to help make the plan provisions clear and easy to understand for future plan users. We want to ensure that the identification of outstanding water bodies and their significant values is related to the purpose of the National Policy Statement, and that only those water bodies that are truly outstanding are captured by the plan change.

Auckland Council – collaborative science project

HortNZ has committed to a joint modelling project with Auckland Council. Where possible, we seek to work with regulators to develop a mutual understanding of the science and economic information that will underpin future regulation.

The aim of the project is to improve the way vegetable growing is represented in the Auckland Council Freshwater Management Tool. The project aims to improve the representation of vegetable rotations, management practices and the economics of the vegetable growing.

> **"We want to ensure that the identification of outstanding water bodies and their significant values is related to the purpose of the National Policy Statement**

Two growers are on the Technical Advisory Group. The groups also include a representative from Plant & Food Research, Agribusiness Group and HortNZ. The project will draw on previous modelling and the work underway as part of the Sustainable Vegetable Systems research project.

A growers' reference group has been established. Workshops will be held to ensure that a range of growers have input into the way vegetable growing is represented in the Freshwater Management Tool. ●

Preventing injuries in the horticulture industry

Horticulture New Zealand has received funding from the ACC (Accident Compensation Corporation) for a project to look at how we can decrease injuries and deaths in the industry through tools that reflect what happens out in the orchard and vegetable garden.

Emily Lake : HortNZ data, systems and insights manager

The first step is to understand the real-life, on the ground picture around how and why injuries and deaths occur. Through this fuller picture, we can begin creating practical tools with industry, for the industry.

If you want more information or are keen to participate in our initial data collection, please contact me: emily.lake@hortnz.co.nz or 027 582 6655.
All data collected will be anonymised and used within strict privacy guidelines.

Speaking from experience

Catherine Lewis, a director at Lewis Farms, says she is interested in the project as she has noticed a higher rate of minor physical issues with people this year.

"We've had what seems like a greater number of people in our packhouse this year with sore backs and stiffness, due to both the age of our workforce and repetitive nature of the work. So, I am keen to look at ways to get on top of this issue so that our employees are fit, comfortable at work, and productive."

> **"Without understanding the harm first, it is difficult to know what interventions to develop**

Kate Trufitt, New Zealand Horticulture Health and Safety Council chair, says safety interventions can target the human, or the technological and organisational environment.

"But without understanding the harm first, it is difficult to know what interventions to develop. Safety is measured mainly by the absence of negatives, but this is changing. Safety professionals are now looking at harnessing people as the solution rather than the problem. So rather than use procedures, compliance and sanctions, we want to build the capacities of our people and in turn, industry.

"I really look forward to the outcomes of this project. That is, sustainable inventions to reduce harm in horticulture."

More about the project

The project will build capability and establish health and safety leadership through four key project steps: Understand > Intervene > Support > Lead.

An essential component of this research is engagement with the sector. It will ensure any harm reduction efforts are developed based on the sector's knowledge and successes, and reflect how business works within horticulture in New Zealand.

A systems thinking approach will be used, which simply put, will focus on company arrangements, work pressures, procedures and regulations, in addition to what individual workers are doing.

While HortNZ is leading this project, collaboration across the horticulture industry is key to ensuring success. The project is designed to begin with evidence and information sharing. Ultimately, activities will have the industry leading their own best practice initiatives with new tools and resources that are practical to implement and effective.

In terms of Step One – Understand, we need to understand the real-life, on the ground picture around how and why harm occurs. We need to understand how things are done in the sector, how people collect information about harm, and what people see as critical issues. By gaining this fuller picture, we can begin creating practical tools with industry, for the industry. ●

FOUR KEY PROJECT STEPS:

Step 1: **Understand** → Step 2: **Intervene** → Step 3: **Support** → Step 4: **Lead**

Participants empowered by leadership programme

Participants in a pilot course designed to support emerging leaders in the horticulture industry say it has boosted their confidence, as well as their skill base.

Kristine Walsh

Based in the Nelson region, the 23-strong pilot group for the Emerging Leaders Programme was a mix of supervisors, quality controllers, packhouse managers, foremen, research technicians and coolstore managers of varying ages and years of experience.

Of those, 22 completed the programme. Participants reported measurable improvement to their confidence, along with their ability to deal with conflict and "to have the hard conversations" that can arise in a workplace.

Emerge And Transform founder and coach, Sha Perera, initially developed the programme for the dairy sector and tweaked it for horticulture with the input of NZ Apples and Pears capability and development manager, Erin Simpson and GoHort's former team leader, Emma Boase. The trial for the three-month programme began in July 2021.

Sha says that, like others within the primary sector, the horticulture industry is facing big challenges due to labour shortages and it is vital that those working in leadership roles are empowered to work through the resulting changes.

"Emotions underpin all the decisions we make and are the number one driver of human behaviour," she says. "As such, the Emerging Leaders Programme centres on using emotional intelligence to help deal with challenges both in and out of work."

The programme is delivered using bite-sized, app-based learning modules and peer-to-peer workshops for learning and discussion which focus on creating "shifts" in mindset, relationships, perspective, focus, skillset and confidence.

"[It has helped me] to trust myself more and learn different ways of handling situations so I can make my team grow too," said one participant. Another said it had given them the "skills to stop managing and start leading".

> **"The programme addresses the gap that existed for upskilling emerging leaders at a grass roots level, who would flourish with further training**

Participants liked the way the course was delivered, too – with individual modules being knocked off in just five to ten minutes a day.

Canterbury GoHort career progression manager, Sarah Cobbold, says she and her colleagues across the regions are now reaching out to growers and orchardists to see who would get most benefit from the next delivery of the programme.

"The programme addresses the gap that existed for upskilling emerging leaders at a grass roots level, who would flourish with further training," says Sarah. "It creates a win-win for employers and employees and serves to retain staff and grow people in the industry."

YOUR INDUSTRY

ACROSS THE SECTOR — ACROSS THE COUNTRY

FEATURE ARTICLE

Gisborne feijoas

High hopes for a Kiwi classic

Though some regions are facing challenges from pests and disease, there are hopes that New Zealand's much-loved feijoas will become a big part of the food processing sector. By KRISTINE WALSH.

COVER STORY

A good growing season and strong domestic demand made for optimism in the feijoa sector as the 2022 harvest got underway.

Gisborne's Kaiaponi Farms has been producing feijoas for more than 20 years, both on its own orchards and for a couple of key growers.

Like last year, the 2022 harvest got off to an early start – late February as opposed to early March – which fruit procurement manager David Hansen says is due to some hot days coupled with episodes of well-timed rain making for a good growing season producing nice-sized fruit.

Across the 20 hectares of feijoas it oversees, Kaiaponi expects to see a 2022 harvest of around 400 tonnes, but David says that as different varieties produce fruit of different sizes, it's hard to get that estimate spot-on.

At that level, the company makes a solid contribution to the national crop... in 2019, the NZ Feijoa Growers Association's around 140 members produced about 1,200 tonnes of fruit from 240 hectares.

At that time, feijoas generated $4 million in domestic sales and $200,000 in exports. However, in recent years fall-out from the Covid-19 pandemic has impacted on exports, with most of the crop being sold on the domestic market despite an estimated 20 percent increase in volumes in 2020, numbers that were repeated in 2021.

David Hansen loves feijoas – he's even got a few trees planted on his lifestyle block, just out of Gisborne – but admits their distinctive tropical taste can be polarising, which could also explain why so many Kiwis are passionate about them.

Kaiaponi Farms' domestic sales lead Olivia Abernethy and fruit procurement manager David Hansen at the eight-hectare Hexton Block, which the company manages on behalf of owner Barton Witters

As a board member of the New Zealand Feijoa Growers Association (NZFGA), he says he is committed to helping educate the public palate to appreciate feijoas in their best condition.

> **"For many people, their strongest association is having a feijoa off the ground in grandma's garden, one that was over-ripe and totally not at its best**

"They are quite a distinct flavour but for many people, their strongest association is having a feijoa off the ground in grandma's garden, one that was over-ripe and totally not at its best," he says.

"That's why we want them to try feijoas at their optimal maturity that offers that premium flavour and texture."

To get that fruit off at the right time, the trees – each of which will eventually produce up to 25 kilograms a year – are understrung with nets and the fruit shaken into it.

"Getting the fruit off before they drop naturally means we can target certain levels of maturity," David says.

"So if you want less ripe fruit that will last longer in the market, you just shake the tree a bit harder then grade the fruit according to maturity."

The company's domestic sales lead Olivia Abernethy says that, even early in the season, both demand and values were strong, with fruit moving well through the market.

As volumes increased towards the peak at the end of March, she expected more demand from supermarkets – which like to know they are guaranteed good supplies – with consumers benefiting from the resulting lower price points.

Kaiaponi and its growers produce varieties including Kakariki, Anatoki, Kaiteri, White Goose and Den's Choice, a mix that gives them strong cross-pollination as well as early and late-fruiting trees, which helps smooth out the harvest.

Even so, the season is short – just two or three months – so the NZFGA is actively encouraging research around new cultivars and improved technologies that will produce more robust fruit, and help it get to market in great condition.

And like many others in the industry, David Hansen would like to see more processing opportunities so consumers can enjoy the distinctive taste of feijoas all year round.

As it stands, Kaiaponi sends up to 15 percent of its crop for processing.

Feijoa disease

The challenges of the Covid-19 pandemic have put paid to Kaiaponi Farms' feijoa exports in recent years, but fruit procurement manager David Hansen says the company's fruit has easily been absorbed into the domestic market.

However, he admits that ease could have come at the expense of growers in the north of the North Island who have in recent years tussled with the arrival of both the damaging guava moth, whose larvae burrows into the fruit; and the fungal disease anthracnose, which causes fruit to fall off trees while still small and has resulted in significant crop losses.

Plant and Food Research New Zealand is working to address both those issues with the decade-long guava moth research due for completion in November 2021, while studies into the aggressive anthracnose disease were expected to finish in July of this year.

However, Plant and Food Research scientists say the Covid-19 pandemic has impacted on both those projects.

In the new timeline, the guava moth study was due to be wrapped up by the end of March, and the anthracnose project was granted a year's extension to July 2023.

Feijoa health

While public education and increased processing are seen as potential boosts for the feijoa market, health benefits are also being touted as an advantage on the global stage.

As well as being very high in fibre and containing folic acid, potassium, magnesium and other minerals, feijoas are rich in vitamins including Vitamin C... eating just two provides 64 percent of the recommended daily intake.

In addition:

- Research concluded in 2017 by Victoria University of Wellington PhD researcher Mona Mokhtari showed that the known antibacterial properties of feijoa compounds were eclipsed some 50 times over by their effectiveness as an antifungal agent.
- A 2019 study from the University of Auckland's school of Food Science noted that, among other attributes, the cultivars examined displayed "significant antioxidant activity", which is highly sought-after as a health benefit.

Feijoa grower and processor Heather Smith would love to see more processing facilities available to smaller growers with multiple products like hers

"That market has certainly improved over last year or two with products for juices and smoothies, in particular, being a key part of it," David says.

"But if the industry is to grow it needs to build on the really good stuff we're already seeing happening in that area of packaged products in the food sector."

Processing facilities could help ramp up production

Over in Hawke's Bay, grower Heather Smith has gone a step further, producing her own range of processed products from freeze-dried feijoa wedges and powder to purée, jelly, frozen whole-peeled fruit and a hydrosol face and body spritz.

It's been a hit – the frozen fruit in particular is a regular sell-out – but Heather has struggled to find processing facilities that can help her cater for the market.

> "Falling in love with feijoas at her first taste she did some research, decided they were the next superfood, and set to work planting a mix of nearly 2,000 trees

It all started more than 20 years ago when American biologist Heather and her then husband moved to New Zealand and bought a farm at Tukituki, in Central Hawke's Bay.

> "Coming from America, where consumers are always looking for exciting new flavours, I was interested in processing right from the start

Falling in love with feijoas at her first taste she did some research, decided they were the next superfood, and set to work planting a mix of nearly 2,000 trees with varieties ranging from her favourite, Mammoth, to White and Yellow Goose, Apollo and an experimental block of cuttings.

Today, those trees produce up to 50 tonnes of fruit a year with about 80 percent of that sold fresh to producers of everything from juice and wine to beer and kombucha.

The rest, however, she holds onto to create her ever-growing range of processed goods.

"Coming from America, where consumers are always looking for exciting new flavours, I was interested in processing right from the start," Heather says.

"So about seven years ago I started experimenting to discover the best ways to use this amazing fruit, and that's how Heather's Feijoas was born."

With a few offshore outlets already secured Heather has achieved her aim of creating delicious, transportable ways to get feijoas to the market, but says getting those products made has been an uphill battle.

"I am dependent on other processing companies and because I make a range of products, that means I have to use a range of facilities that can't always accommodate me in a timely manner," she says.

Those barriers are the only thing standing in the way of Heather's Feijoas ramping up production to cater for both domestic and offshore consumers, Heather adds.

"My absolute dream would be to see someone with the will, and the means, set up a factory in Hawke's Bay that could provide all sorts of processing methods for modest runs such as ours, and could also deal with other product lines like berries.

"We know the demand is there, we just don't have the capital to do it. So if an investor with vision could see that need and address it there could be major benefits across the industry."

Heather Smith says her freeze-dried feijoas are a hit, especially with kids who love the flavour bomb they get from each bite

Biosecurity New Zealand continues to closely monitor container and other cargo arriving in New Zealand

A 3D scanner being trialled at Auckland Airport by Biosecurity New Zealand

Smart tech won't replace humans and dogs

Electronic 'noses', 3D X-ray technology and the use of machine-learning algorithms will play a part in keeping our borders safe, but will not replace dogs and humans completely says Biosecurity New Zealand's northern regional commissioner Michael Inglis.

Elaine Fisher

"We are investing in technology and the results are positive, but it is not the answer to everything, and we don't want to put all our fruit into one basket," he told the Tauranga Moana Biosecurity Capital online partner's forum in February.

"Biosecurity is not about just one aspect. While we are looking to future technology, human intervention is still required, and Biosecurity New Zealand has talented, extremely experienced, professional people from all walks of life on its team."

In May last year Australia and New Zealand began collaboration on a project to develop and trial world-leading auto-detection algorithms for 3D X-ray technology to enhance biosecurity screening and speed up travel. Michael said the new technology is significantly more efficient than 2D X-ray.

3D X-ray technology can automatically detect fruit, vegetables, meat, seafood and plant material and has been twice as effective in an airport environment and more than three times more effective in mail centres when compared to other detection technologies.

"Eventually we may be able to detect a biosecurity threat in a suitcase in Australia even before it is loaded onto a plane."

The Covid-19 pandemic had led to a dramatic decrease in passengers arriving in New Zealand on aircraft and cruise ships. Biosecurity New Zealand had redeployed many people to other areas of its operation due to the drop in passenger traffic. With the borders reopening, a recruitment process was underway to increase staff numbers, he said.

All luggage brought in by passengers would continue to be X-rayed and detector dog screening would return to international airports. Planning is underway for biosecurity measures around cruise ships once they begin operating again.

New scanning technology will also be installed in the NZ Post $100 million-plus mail centre due to open in 2023 at Wiri in Auckland. This will include 3D X-ray and Rapiscan Systems real time tomography (RTT). The centre is being built in response to the dramatic increase in online sales largely due to Covid-19 lockdown restrictions.

Biosecurity New Zealand continues to closely monitor container and other cargo arriving in New Zealand. Michael said the 'maturity' within the maritime industry has improved significantly with vessel captains often reporting suspected risks to authorities. However, there are still issues with incorrect or even fraudulent paperwork associated with incoming containers.

Biosecurity New Zealand's northern regional commissioner Michael Inglis

During the forum's question time, Barry O'Neil, Horticulture New Zealand president and chairman of directors asked if Biosecurity New Zealand was still using intelligence gathering to assess the risk from offshore.

Michael said Biosecurity New Zealand still has a clear focus on gathering biosecurity intelligence in terms of pests and disease risks from offshore. "We are working with partners to look at risks, including from the brown marmorated stink bug (BMSB) and the changes which are happening globally and in our hemisphere."

Since Stu Hutchings was appointed chief biosecurity officer for the Ministry for Primary Industries last year there had been a serious reassessment of the value of intelligence gathering and risk assessments and the work of the directorate.

The directorate had increased what it was doing to improve outcomes but because of the nature of its undertakings Michael said the results were not "always as visible as they could be."

FEATURE ARTICLE

Tamarillo ripen at Robyn Wickenden and Aaron Davies' orchard at Maungatapere, Northland

TPP putting tamarillo growers under stress

Hot, dry summers and mild winters are putting extra pressure on the country's tamarillo growers as Tomato Potato Psyllid (TPP) populations thrive. HELENA O'NEILL talks with Robyn Wickenden about how her Northland orchard is coping.

Robyn Wickenden and Aaron Davies bought a one-hectare tamarillo orchard just out of Maungatapere, Northland in late 2016. From there operating Mya Enterprises Ltd has been a steep learning curve in growing, picking, grading and selling tamarillos. Just two years later Robyn became secretary for the NZ Tamarillo Growers Association (NZTGA), and in March 2020 was made its chairperson.

And if battling a pandemic wasn't hard enough, the Tomato Potato Psyllid (TPP) has been prolific leading to widespread *Liberibacter* infections on tamarillo orchards, particularly in Northland.

"Last year and the year before, we had two really dry, hot summers and mild winters. The psyllid absolutely blitzed everybody. This is one of the reasons we've gone down to such small grower numbers, people have decided to give up growing."

Aaron and Robyn were one of just two tamarillo growers who exported the fruit last year.

"This year we won't be exporting, we just won't have the fruit."

TPP was first detected around Pukekohe in tomatoes and potatoes in 2008, and the insect spread very rapidly to all growing areas during 2009 and 2010. TPP lives and reproduces on all plants

Robyn and Aaron attempt to cover their tamarillo orchard with psyllid netting

from the *Solanaceae* family, including tomatoes, potatoes, capsicums, eggplant and such weeds as nightshade and tobacco weed.

"When the psyllid liberibacter infection came into New Zealand around 2008, it devastated our industry and we're not big enough to keep fighting and doing the research and all the rest of it that needs to be done."

Tomato crops have mostly shifted indoors as their way of combating it, while potato growers have found that putting their crops under netting made a big difference, Robyn says.

"I talked to Stephen Wratten who has since passed away, he was the one who was spearheading that research at Lincoln University. He said 'why don't you put your trees under psyllid netting?' Our first thought was that it was not practical at all."

The idea of trying to cover 3.5m high trees while keeping tractor access to the orchard was a daunting one.

"After the losses we've had over the past two years, we think this is the only solution. So, we built a structure to 4m high and we've had to glue netting together to make one big sheet that we could lift up over the orchard so that there was no point of entry for the psyllid."

The orchard had 2,200 trees of the Laird's Large variety, but the couple had to remove about 200 trees in order to install supporting poles for the protective sheet.

The netting manufacturer was not able to stitch the netting together so the couple tested various means of attaching netting to itself to make that one sheet. They found the answer in a modified silicone glue, spending the better part of a week gluing sections of netting together.

"Trying to find contracting firms or someone to help us with the logistics has been impossible."

On 29 January the couple made their first attempt to hoist the net in place over the orchard.

"At 10 o'clock a 60kmh gust of wind came through and we then spent the next four hours battling holding the net in place. It was just like having the wind under a sail... by 2 o'clock we gave up and pulled it all back down again."

Since then, Robyn and her husband have been holding out for two calm days in order to get the netting in place over the orchard.

"We've had the windiest summer on record. It's been a mission."

Finding a way to control TPP is crucial for the survival of Robyn and Aaron's orchard.

"The psyllid is absolutely devastating. It comes in and feeds off the tree, if there's nothing to kill it then it just keeps on feeding and breeding. There's not a lot around in the organic line that can keep it under control so we

have to spray insecticides. The psyllid will still come in and bite the tree but the systemic spray stops them getting too far hopefully."

With a withholding period before the picking season, the trees are left unprotected for a while, leaving them open to infestation.

"Because it's been so warm the psyllid has kept on breeding. We don't see them breeding on our orchard but there are host plants around – the native poroporo is one of the host plants up here in Northland, and then there are the boxthorn hedges in Taranaki which is their main host plant."

In 2014 there were 60 active commercial tamarillo growers in the country, by last year this had dropped to about 25.

"I had another couple tell me that they were giving up this year, as they've got neighbours who grow organic and are putting pressure on them not to spray. The organic neighbours are growing things within the host family – they might have tamarillos or tomatoes or potatoes and they're basically hosting the psyllids for the commercial grower next door.

"Some of those older growers, it's been their passion for quite a while. They've just said they're too old to be planting this number of trees all the time. It is hard labour pulling out an infected tree, then digging a hole and putting a tree in it."

Meanwhile, other growers will be keeping an eye on Robyn and Aaron's orchard to see if covering thousands of trees is the answer to protecting their tamarillo crops.

Tamarillo history

Tamarillos were first introduced into New Zealand from Asia in the late 1800s. Originally only yellow and purple-fruited strains were produced. The red tamarillo was developed in the 1920s by an Auckland nurseryman from seed from South America. Other red strains appeared soon afterwards and continued reselection of these by growers has led to the large, high-quality varieties being grown commercially today.

The commercial production of tamarillos began on a small scale in the 1930s. During World War II demand for tamarillos grew, as the supply of other fruits high in vitamin C was restricted. Robyn says a government initiative at the time saw tamarillo trees in the backyards of most Kiwis.

Although tamarillos are from South America, the name is not Spanish, but a New Zealand invention. The fruit was originally known as the tree tomato, but to avoid confusion with the common tomato, and increase appeal to export customers, the former New Zealand Tree Tomato Promotions Council decided to rename it. Council member W. Thompson came up with 'tamarillo', claiming it sounded both Māori and Spanish. The new name was officially adopted on 1 February 1967.

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Erica and Bill Lynch could not have harvested their crop without RSE workers

Tasman faces challenge to get stellar apple crop harvested

Tasman has a stellar apple crop of well coloured, good-sized fruit to harvest this season and the challenge will be getting it off the trees and onto ships.

Anne Hardie

Redwood Valley orchardists, Bill and Erica Lynch, say the region had a challenging start to the season with continually wet weather and they were spraying every five days to keep disease at bay. Then the weather cleared and they have had great growing conditions through to harvest, that produced good-sized fruit and plenty of it.

"We've got the size and colour and normally you don't get that together," Erica says.

By early autumn the region was getting a big temperature gap between night and day with no wind, providing perfect conditions for harvest.

The Lynches have a small family orchard of just 40ha and heading into their harvest they were scrambling for workers to pick the fruit. In the past they have usually had about 15 overseas backpackers with Working Holiday Visas, plus a handful of Kiwis. Most years they can borrow occasional staff from other orchards as different apple varieties allow, but this year everyone is short of pickers. Advertising through all the usual channels including Backpacker Board, PickNZ and roadside signage attracted only the equivalent 2.5 Kiwi workers. That was despite lifting bin rates considerably for pickers so that a reasonable Kiwi picker can now earn about $40 per hour (on average) and the Lynches also offer low-cost accommodation nearby.

At the same time, they were desperately trying to secure Recognised Seasonal Employer (RSE) scheme workers after being turned down the previous two years, and they say that is one of the challenges for small orchards.

This year they were again declined but Immigration New Zealand told them they could share RSE workers

with growers in Marlborough. That left them a bit stunned as Marlborough is two hours away and RSE workers would be busy with grapes at the same time as the apple harvest in Tasman.

As the harvest loomed, they were tense and desperate, wondering how they were going to pick their crop. At the last minute they were finally allocated ten RSE workers from Vanuatu who arrived in time for the beginning of harvest. On the hiked bin rates, the RSE workers can earn $250 a day for an eight-hour day.

They are still short of the usual 20 pickers they need for the middle of the harvest, and Bill says they will have to change their harvest plans so they can strategically pick varieties to counter staff shortages. That may mean leaving second picks on the trees.

Jino Taravaki from Vanuatu is part of the harvest team this year

"There's a big crop coming mid-season and it depends whether we can afford to go back to a second pick with varieties like Jazz, Envy and Fuji. We may pick more on that first pick."

He says harvest will be a challenge across the region because of staffing shortages and it is causing "a lot of simmering anxiety."

The threat of Covid-19 in orchards and packhouses accentuates staffing shortages and he says the crop then faces shipping issues similar to last year. Between Covid-19 and shipping delays, he worries about the region's storage capabilities for the crop if packhouses have staffing issues and can't get the fruit onto ships quickly enough.

To add to this year's woes, there is the uncertainty about the Class 2 fruit heading to Russia which in mid-March was looking unlikely. Bill says Russia does not take big volumes, but the market has provided reasonable returns for fruit that is otherwise juiced or of no value at all.

It all comes at a time when growers' costs are escalating faster than ever including fuel, chemicals, labour and packing. Now they have the perfect crop on the trees and they just need to get them picked, packed and shipped.

Supie has big plans, including taking the company nationwide

Fruit and vegetables being packed at Supie's warehouse – Nick, Sarah Balle and Cahan

Super growth for Supie

Online supermarket, Supie, has gone from strength to strength in the nine months since it was launched, and has even bigger plans for the future.

Glenys Christian

Sarah Balle, who founded the company, grew up on a Pukekohe vegetable growing property and saw for herself the amount of wastage caused by the long supply chain between supplier and end customer. Not only does the produce of many fruit and vegetable growers not meet supermarket standards, even if it did, they achieve small margins.

Sarah is also very aware of the carbon emissions from dumping food in landfill when a growing number of New Zealand children are living in food poverty. It's estimated that seven million kilograms of fruit and vegetables is wasted every year in this country at a cost of $1 billion.

So Supie was launched in June last year with 1,000 members in the Auckland area, offering a 48-hour delivery window from its south Auckland warehouse in Wiri. There were just ten staff handling the 2,000 products on its virtual shelves and just over 100 suppliers. Supie welcomes smaller brands and artisans not producing on a large scale, which means that its customers are able to enjoy products they might not be able to find in their local supermarket. As well as deals, discounts and free product samples, Supie also offers cashbacks which regular customers can use or donate. Now it's grown to have 16,000 members, who enjoy same-day delivery which is free if their order is over $70. There are 25 team members involved, with personal shoppers handling over 5,000 products which come from more than 300 producers.

Sarah, who trained as an accountant, says Supie's produce department offers some of the freshest fruit and vegetables to be found in Auckland.

"Our produce bundles make up a significant portion of our sales," she says.

"Our customers often showcase the produce they receive on social media and to our 7,000 Instagram followers. We love being able to educate consumers on produce and introduce them to fruit and vegetables that they wouldn't typically buy in a traditional supermarket. For example,

our 'seven surprises' produce bundle and $20 'seasonal bundle' has included twist melons and last week, kohlrabi."

Supie customers often say they can't believe how long the produce they receive has lasted and its quality, she says. Many say their deliveries make it easy to eat healthily, they have appreciated seamless deliveries over lockdown periods, and are impressed with the lack of plastic packaging. Some say vegetables such as cauliflower and spring onions are as fresh as if they'd picked them from their own gardens. Also stocked are a growing range of other grocery items such as milk, cereal, spreads, pet food, toilet paper and beer and wines.

Sarah says Supie has big plans, including taking the company nationwide.

"This requires significant investment, so we will continue to focus on the Auckland market until we raise the funding to expand," she says.

Asked about the Commerce Commission investigation into the supermarket sector she says it was a once-in-a-decade opportunity to make a meaningful change to set up a fair food future and a better outcome for every New Zealander.

"We believe the recommendations don't deliver on creating the fair food future that we want to see for decades to come," she says.

"We don't believe that the price of food at the checkout will go down for consumers, and believe that the supermarket duopoly will continue for the foreseeable future."

> **"Supie is the force for change, and a better tomorrow will only be achieved if Kiwis support the mission for better and fairer access to food in Aotearoa**

But the sector still needs to improve and positively contribute to everyday consumers.

"Supie is the force for change, and a better tomorrow will only be achieved if Kiwis support the mission for better and fairer access to food in Aotearoa," she says.

"We have unwavering commitment and will continue fighting for New Zealanders, food producers, and future generations."

FEATURE ARTICLE

At Tim (pictured) and Pirra Tietjen's 3.2-hectare orchard, just down the road from their home at Hexton, the plantings have cycled over the years from Green to today's SunGold. Under the new rating proposal, rates for the property have almost doubled

Kiwifruit rates battle heads to the High Court

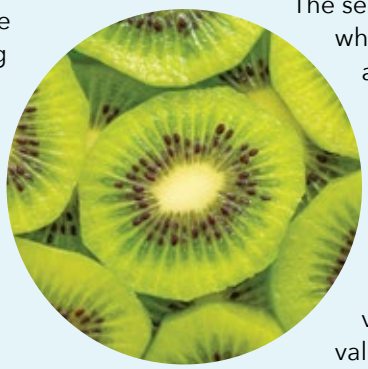
It's all eyes on the High Court as a Gisborne grower challenges a proposal to impose higher local body rates based on the value of kiwifruit licences. By KRISTINE WALSH.

Kiwifruit growers around New Zealand are watching with keen interest as a proposal to charge rates on SunGold licence values grinds its way through the court system.

Testing of the proposal has fallen to Gisborne District Council (GDC) as it is the first to bring in new values under the rating cycle.

And while growers have pushed back against its implementation, GDC has the backing of the Valuer-General to explore its legality – or otherwise – to ensure any wrinkles are ironed out before values are updated by other councils around the country.

As it stands, GDC has responded to a court decision in favour of a grower who objected to the rate increase by lodging an appeal in the High Court, which is likely to be heard in the next few months.



And it has been a long road to get to this point.

How did it start?

The seeds were planted back in August 2020 when rating valuation providers (like councils) and the Valuer-General, Neill Sullivan, met to discuss the definition of Value of Improvements, which reflect the value buildings and improvements add to bare land.

According to Toitū Te Whenua Land Information New Zealand (LINZ), "the valuers reached a view that the rating valuation had to include the licence to grow Gold (G3) kiwifruit vines and the planted vines."

"The Valuer-General accepted this view as reasonable based on the Rating Valuations Act 1998 definition of

Value of Improvements, which requires the assessment of the value of all work done on or for the benefit of the land.

"The change will mean an increase in the Capital Value and Value of Improvements for rating value assessments of Gold kiwifruit properties."

By December of that year the first local body due to update its valuation-based rates, GDC, had decided that, to be in keeping with the law, it would follow that recommendation by taking SunGold licences into account in its land valuations and, consequently, the rates it charged the owners of that land.

At that time, the issue had been quietly percolating away, but then word started to get around and reaction from Gisborne's around 50 kiwifruit growers was swift.

What happened next?

As the New Year progressed, GDC found the numbers of attendees at its 2021 Long-Term Plan meetings bolstered by kiwifruit growers irate at the proposed increase in rates.

There was a bit of push-me-pull-you … Mayor Rehette Stoltz reminded growers that city dwellers were already subsidising rural ratepayers, while growers pointed out that they did not use any more council services than growers of other products.

In support of growers, New Zealand Kiwifruit Growers Inc (NZKGI) in April 2021 submitted a report to the hearing for GDC's Draft Long-Term Plan, saying it did not support "excessive" rate increases for kiwifruit orchards, instead favouring "a fair and reasonable approach with consideration given to the return that growers provide back into the community".

At the same hearing a number of growers made their opposition heard, and former Horticulture New Zealand chief executive Mike Chapman put in a submission stating that growers in other regions were concerned about "the domino effect" of such a change to rating policies.

But in the end the new policy stood, and from July 2021 Gisborne kiwifruit growers were charged their new rates bills based on 2020 valuations that included the value of SunGold licences.

With the Zespri-issued licences now selling for around $500,000 a hectare, that made a big difference to valuations – and therefore to rates bills – so NZKGI decided to flex its legal muscle.

Using Gisborne grower Tim Tietjen as its case study and frontman – his Bushmere Trust is named as the applicant – NZKGI lodged an objection to his property valuation increase (from $1.65 million to $4.1 million) with the

Land Valuation Tribunal and in August 2021 took a judicial review proceeding to the High Court.

After a hearing on 23 August, it was ruled that the review proceedings would be delayed until the decision came through from the tribunal, which met over three days in November.

Among the NZKGI arguments at the tribunal hearing were:

- Kiwifruit licences are not attached to the land so cannot be viewed as an improvement for rating purposes.
- The new policy is inherently unfair in that SunGold kiwifruit growers will pay much more than their cropping neighbours.

Among the GDC arguments were:

- The SunGold (and other) licences that growers might buy from Zespri are "inherent and fundamental" to the capital value of the land and the addition of a licence "unlocks the value and potential of any given property."
- A licence is "work done on or for the benefit of the land by the expenditure of capital," and "attaches and is complementary to other improvements as defined under the Ratings Valuations Act."

In the end, the tribunal sided with NZKGI by ruling that Gold licences were neither an improvement nor benefit to the land, so could not be assessed as part of the rating valuation, and Bushmere Trust's valuation was scaled back to $2.8 million.

However, GDC didn't agree and in February announced that, with support and financial backing from the Valuer-General, it would appeal the Land Valuation Tribunal decision via a High Court hearing.

According to GDC, the Valuer-General believed the Land Valuation Tribunal's decision was "inconsistent with past case law decisions and the Rating Valuations Act 1998 requirement to value established vines as improvements" and removal of the licence value "creates an inequitable outcome for ratepayers, unfairly reducing the valuation and rates burden for some property owners and increasing the rates burden for others."

The Valuer-General considered it to be in the national public interest for the matter to be heard, GDC added, and as such "there is an obligation on Council to appeal."

As a relatively small grower who owns just under 0.05 percent of the total hectares of kiwifruit grown in New Zealand, Tim Tietjen's rate increase represents a tiny portion of what growers around the country could be paying should the High Court appeal not go his way.

On the one hand, paying the proposed rate increase could mean a sector of growers are unfairly penalised based on the product they grow.

On the other, those growers may not be paying their fair share.

That is what the High Court appeal will decide.

What happens now?

At the time *The Orchardist* magazine went to press the High Court had yet to set a date for an appeal, but the parties involved believed it could be heard some time after May.

If Bushmere Trust and its backers lose the appeal, it will continue paying the higher rates already imposed by GDC.

If it wins, however, Gisborne growers could be in for a bit of a windfall.

GDC chief financial officer Pauline Foreman says if GDC loses the High Court appeal, the current valuations will be revisited and rates revised based on new values.

"If Bushmere Trust and its backers lose the appeal, it will continue paying the higher rates already imposed by GDC. If it wins, however, Gisborne growers could be in for a bit of a windfall

"This would mean that SunGold properties would be valued at the same level as Green kiwifruit properties and the 2021–2022 rates would then be recalculated," she says. "And if a property value was lower than the 2021 Rateable Valuation that was originally applied, they would be refunded any rates differences, back-dated to 1 July 2021, when rates invoices were first applied."

Meanwhile, the outcome of the High Court appeal will be of special interest in the Bay of Plenty where, according to NZKGI, around 80 percent of the country's kiwifruit is grown.

And growers of other high-value fruits should also keep an eye on the process as licence holders for fruit such as Envy apples could also come under the Valuer-General's eye.

However, Pauline Foreman would not be drawn on that possibility as "decisions about the future valuations of properties are made by registered valuation service providers under the supervision of the Valuer-General, and in accordance with the law."

Gisborne growers have already had a small win with GDC backing off its proposal to progressively remove a near 20-year-old policy offering rate remissions for permanent cropland – which costs GDC up to $650,000 a year – instead modifying it to incorporate a cap.

Now, as the High Court appeal approaches, kiwifruit growers are going for the big one. ●

Avocado orchards need taller shelter

Elaine Fisher

The shelter on many Bay of Plenty avocado orchards is not tall enough nor properly maintained to provide adequate protection from high winds, says Hugh Moore of Morris Moore Farms, Katikati who has been orcharding in the district since the 1970s.

In his opinion, that's why ex-cyclone Dovi caused so much damage to avocado orchards when it hit the region on February 13 this year.

"Driving around, you can see the tops of the avocado trees above the shelter which is not good. We have 60 foot (18.28m) high shelter around our blocks at Kauri Point and we got off lightly from the wind. We didn't lose any trees and had little to no fruit on the ground in our sheltered blocks."

Other orchards were not so fortunate with trees ripped out, limbs broken off and hundreds of fruit waiting to be picked, stripped from trees.

On Morris Moore Farms blocks which were more exposed to the wind (which reached gusts of more than 100kph, and blew from the north), some fruit was lost but the big problem for Hugh and other affected growers, will be wind rub damage to fruit which stayed on the trees.

"It's tragic really because next season looked like it would be the New Zealand avocado industry's year as Australia won't have such a large crop, Asia is hungry for it and many of the shipping issues caused by Covid should be over.

"However, the scars left by wind rub will continue to grow as the fruit grows and any damaged fruit will only be good for oil."

To adequately protect avocado trees, Hugh says shelter should be taller than the trees and the ideal tree species is cryptomeria, not the often-favoured casuarina.

"Cryptomeria doesn't get wide at its apex and doesn't need topping. Many shelter trees are planted too closely together. The spacing should be 2.5m to 3m, not 1.25 to 1.5m and the bottom branches of the cryptomeria should be removed to allow the wind to blow through and not create a suction effect when it hits a solid barrier."

"The scars left by wind rub will continue to grow as the fruit grows and any damaged fruit will only be good for oil"

Taller shelter needed

Hugh says the science behind effective shelter, which protects trees and stops wind spiralling into orchard blocks, has been around for decades but is often not understood by newcomers to the industry, nor many consultants.

"Too many avocado orchards have the same height shelter as kiwifruit blocks and kiwifruit structures are around two metres high. In orchards avocado trees grow to 30 feet (9.14m) so kiwifruit shelter is no good. Avocados are jungle trees and left unpruned can reach 12 metres (40ft) high. Internal shelter has also been removed from many avocado orchards, leaving trees exposed to wind damage."

Ex-cyclone Dovi brought high winds, Hugh says, equal to those of Cyclone Giselle, (also called the Wahine storm) of April 9, 1968, which caused wide-spread damage throughout the country. That day the inter-island ferry the Wahine ran aground in Wellington Harbour with the loss of 51 lives.

"Those storms were extreme, but we get very high winds every decade or so, often in May. One in October, just before harvest about 20 years ago hit Kauri Point badly. A neighbour who had removed 70 to 80 foot (24.3 m) shelter trees had avocado trees blown right out of the ground.

"We picked up 36 bins of fruit off the ground and that was only about one third of what was there. Another neighbour who had poplar trees as shelter, the same height as his avocado trees, lost 32 bins of fruit."

The lesson to be learned from all those wind events is, says Hugh, that well-spaced, maintained and tall cryptomeria shelter can't be beaten for effective protection.

FEATURE ARTICLE

Knowing your total annual emissions is one of the Zero Carbon Bill's seven milestones

J R's Orchards from the air

Stepping on the scales

Jamiee Burns, the operations director of J R's Orchards, likens working out their annual agricultural greenhouse gas emissions number to stepping on the scales.

Glenys Christian

"I was a bit apprehensive," she says.

"But the template was very easy to use, and I think growers are very lucky because HortNZ had done a lot of work behind the scenes."

The calculation is all part of readying growers for coming changes to the way in which agricultural greenhouse gas emissions are to be priced under a new system being designed through He Waka Eke Noa, a partnership between industry, iwi/Māori and government, within which Horticulture New Zealand represents horticulture.

Agricultural greenhouse gas emissions are methane and nitrous oxide from animals, and nitrous oxide from synthetic nitrogen fertiliser. By the end of 2022, all farms over 80ha need to know their total annual emissions number. This is one of seven milestones in the Climate Change Response (Zero Carbon) Amendment Bill 2019 that He Waka Eke Noa is working towards between now and 2025. The final milestone is that by 1 January 2025, a farm-level system for accounting and reporting agricultural greenhouse gas emissions is in use.

The He Waka Eke Noa partnership is designing a system to price agricultural emissions from 2025, and a practical framework to support farmers and growers to measure, manage and reduce agricultural emissions. Included in this is an approach to recognise on-farm sequestration from a range of woody vegetation including orchard trees and bush blocks, and potential mitigations that can reduce agricultural emissions on farm or orchard.

Recommendations from He Waka Eke Noa will be reported to ministers by 31 May after broad primary sector engagement to present and hear feedback on the two emissions pricing design options, the farm-level levy or the processor-level hybrid levy.

Jamiee was involved in one of two HortNZ Zoom meetings held in February before working out exactly how the coming changes would affect the family-owned orchard

which was bought in 2003. While the apple and pear orchards were planted when the property was purchased, at that time there was no infrastructure so they enlarged the original packhouse which now has Compac grading along with Inspectra technology which can detect internal defects in fruit. Around 260,000 cartons of apples and pears are produced under the ECCO and Capital brands from the largest orchard in the Wairarapa and the only pipfruit exporter in the Wellington region.

Jamiee says annual soil testing has been carried out for a number of years along with leaf testing to see whether any reduction in fertiliser applied can be achieved. She finds it very useful that fertiliser companies now detail on their invoices exactly what the ratio of nitrogen is in their products.

"You can keep an eye on what goes on and you're not guessing anymore," she says.

The orchard has also been buying sustainable, natural fertilisers where possible. It's used a commercial seaweed-based product for the last five years which she says has helped with keeping their trees healthy as well as with leaf quality.

> **By the end of 2022, all farms over 80ha need to know their total annual emissions number**

There's also been a move to foliar feeding over that time rather than applying conventional fertilisers, so nutrients are taken directly into the trees rather than passing via the soil.

For most growers who only have agricultural emissions from synthetic nitrogen fertiliser under He Waka Eke Noa, the practices they use to manage nitrogen for emissions are the same used to manage impacts to water quality. This means that growers can count these practices in their emissions management plan, as well as their Freshwater Farm Plan.

The greenhouse gas emissions accounting and reporting system for agricultural emissions is still in process of refinement, but it is already assisting growers large and small find where they are on the scale and do their part towards reducing climate change. ●

FEATURE ARTICLE

Yieldia general manager Hamish Fenton (left), packhouse manager Umu Renata, and kiwiberry grower and chairman of NZ Kiwiberry Growers Inc Geoff Oliver check kiwiberries on the grading machine at Yieldia at Paengaroa

Good season for kiwiberries despite challenges

With the New Zealand kiwiberry season coming to a close, HELENA O'NEILL speaks with Paengaroa orchardist Geoff Oliver about the bite-sized fruit.

Near the affectionately dubbed 'Kiwifruit Capital of the World' of Te Puke, Geoff Oliver grows 6ha of kiwiberry across three orchards. He also grows green, gold and red kiwifruit, along with avocados, managing 85ha of orchards in total.

Kiwiberries are small (usually between 5g and 20g) with smooth hairless edible skins, and shapes varying from round to elongated. Like grapes they are a single mouthful, but unlike grapes they are considered a superfood due to the high density of vitamins, minerals, pigments and phenols.

Geoff says they really are packed full of essential nutrients and a great booster for your immune system. He's been growing kiwiberry on his Paengaroa orchards since they were first trialed about 14 years ago. Geoff is also the chairman of the New Zealand Kiwiberry Grower Association.

Kiwiberry (or baby kiwi as they are known in some countries) is the name used in New Zealand for *Actinidia arguta*.

The fruit grows wild in parts of China and is also found in north-eastern Siberia, Korea and Japan. Globally there is thought to be less than 200ha planted for commercial production.

Harvested between early February and mid-March, the New Zealand kiwiberry is recognised globally for its high quality and nutritional value. It has higher levels of vitamin C (gram for gram) than kiwifruit and oranges. The New Zealand commercial industry grows three main varieties: K2D4, Marju Red and Takaka Green which all provide slightly different flavours. They have been developed through private and Hort Research breeding programmes to develop varieties best suited to the New Zealand growing conditions.

The main producing countries who supply the international market are New Zealand, the United States, Canada and Chile.

"New Zealanders are probably the highest consumers of

Geoff Oliver inspecting kiwiberries in the orchard

kiwiberries per head of population. The returns aren't as good as export so it's not viable to grow just for the domestic market.

"There's still a lot of potential, particularly around food service and in restaurants, which are both under a lot of pressure at the moment. One of our big markets is Australia, so we can airfreight it over there very quickly."

Due to the limited shelf-life, the fruit for export can only be transported by airfreight.

"It's a fruit that doesn't have a hugely long shelf-life so it doesn't travel that well. The Asian markets are the best for us. As for the United States, we compete with Chile who produce cheaper kiwiberries but lower quality. They also fruit earlier so they control that market."

It's also a nervous and exciting wait for growers as efforts are underway to re-enter the Chinese market.

"Right at the moment we are very close to getting back into China. We had access there up until 2016 when Chinese authorities reviewed the kiwifruit category and we were dropped off."

Returning to the Chinese market will help increase prices and make it more viable for kiwiberry growers, Geoff says.

"Last year and this year the freight rates have gone up and the range of services is a lot more limited, with less planes flying. Overall, it's been a net extra cost for growers. Hopefully in the future we can get back to something more reasonable."

Numbers of kiwiberry growers have dropped over the past few years while returns have been lower, Geoff says. There are only around 25 commercial kiwiberry growers in the country.

"If you get really good production and good yields, you will do well. It's the same with every crop."

Kiwiberries are grown in the same areas as kiwifruit, with the same structures and the same layout (every second row is male). Kiwiberry does have a very high winter pruning cost, he says.

Like their larger counterparts, kiwiberries are susceptible to thrips and scale, although the scale is only on the leaf, not the fruit, when the fruit is harvested.

"Overall, this season's New Zealand production will be down slightly. The extra rain in January meant thicker canopies causing some softer fruit and a little more fruit drop, but prices have remained good at around $28 to $30 a tray."

Picking the smaller fruit is a lot more labour intensive, meaning it is more expensive to pick.

"It costs around $1.50 a kilo to pick initially, rising to $3 a kilo for the second pick. It's not like green or gold where you can pay by the bin or container, it is best to pay by the hour and get the quality pick for the job. When you're picking a green or a gold fruit, one fruit is about four or five kiwiberries."

Like the kiwiberry harvest, the national red kiwifruit harvest has wrapped up, but Geoff is already picking gold kiwifruit across his orchards starting late last month [March], a little earlier than previous years.

Finding enough staff to pick and pack fruit remains a big concern for Geoff and other growers.

"It will get pretty competitive between different sites with such a limited labour force. It's going to be a massive challenge for the industry from now until the beginning of June, to get everything picked and packed.

"We have a small packhouse here where we pack a range of crops, and we're 40 percent down on staff today due to Covid-19."

The packhouse arm of operations is rebranding from Kiwi Produce to Yieldia. It was established in 1986 as a specialist kiwifruit packhouse, pre-packer and distributor. It is operational 12 months of the year and handles a large range of New Zealand produce including avocados, kiwifruit, feijoas, kiwiberry, citrus, passionfruit and other sub-tropical fruits.

Yieldia packs over 2 million tray equivalents of locally grown fruit a year and employs 60 staff at the peak of the season. The site also incorporates six fully-monitored coolstores. Newer products include Kiwilicious Dried Kiwifruit and Kiwilicious IQF (Individually Quick Frozen) Kiwifruit.

Barry's orchard vehicle is an aging VW Golf he 'converted' to fit under the vines when it failed yet another warrant

Windstorm's impact will be far reaching

The full impacts of ex-cyclone Dovi which hit Bay of Plenty kiwifruit orchards on February 13 might not be known until the 2023 harvest, says kiwifruit grower and president of HortNZ, Barry O'Neil.

Elaine Fisher

The high winds brought down trees and shelter across some orchard blocks, blew down string poles, stripped fruit and leaves from vines and damaged replacement canes, leaving growers with massive clean-up and repair work just weeks before the harvest began.

Barry says some growers will have less export fruit and possibly higher reject rates due to wind damaged fruit, but the big concern is also for how the vines will fare through to the next harvest.

"On my orchard the leaves have gone from leader canes I want to lay down for next season and some have been terminated by the wind. They have produced new shoots but not the fruiting wood I want."

He's also concerned about an increased risk of infection by the vine disease Psa-V, especially in younger vines where bark has been damaged by wind rub, and those which have been stressed by the storm.

"I will tie down what I can and take the risk of Psa. There are treatments we can use to help protect the vines, including copper and Aureo Gold, but at this time of the season you have to be careful because of the risk of fruit staining."

Sunburn is another factor. "The wind has taken leaves off the canopy, especially in the outside rows, allowing the sun to penetrate and burning the skin on exposed fruit. These fruit are exploders. They are soft and will explode on the grader, so I will be employing staff to go through and remove the damaged fruit before harvest.

"It is fortunate that the fruit is less sensitive this time of year to rubbing damage. If we had had these winds in December, it

A young block of gold kiwifruit on Barry's orchard was worst hit by the windstorm

Sunburn to fruit, caused after leaves were blown off the sheltering canopy, is of concern this harvest

could have meant the loss of 30 to 40 percent of the crop. The fruit is hardier now so there should be less rejects."

Barry's six-hectare orchard on the shores of the upper Tauranga harbour, is just north of Katikati. It is made up of 1.5 canopy hectares of conventional gold fruit grafted in 2010 and 2.5 canopy hectares of organic gold planted two years ago.

Ex-cyclone Dovi's winds came from the northwest on 13 February, a direction his orchard is not well sheltered from. "This was just really horrible gusty wind. I was monitoring a neighbour's weather station which recorded wind gusts of 100km but they got so strong the gauge stopped working so I don't know what speed gusts actually got up to.

"The wind came over the shelter and down like a curl, damaging the outside rows – most of them were trashed, leaves gone or damaged and a lot of fruit on the ground."

Damage was even worse among the younger organic vines, which are on flat, frost-prone land making them even more susceptible to Psa this winter.

"For some reason my fruit is smaller this season, but I did have a big crop of 17,000 trays a hectare last season, which could be a factor.

"I think it will be down to 15,000 to 16,000 this year."

Barry normally harvests his fruit early but believes, because he continued to irrigate longer than normal to help vines recover from the storm, fruit will be slower to reach harvest required dry matter.

The storm is yet another blow to the industry which is thousands of people short for the harvest and facing increasing costs all round. "Production and packaging costs have increased by around $1 a tray, and the industry moving to pack increasingly into bulk trays to reduce labour needs, means lower value and overall a lower return for growers.

"This will be a year to pay the bills. It will not be a profitable outcome."

Barry acknowledges that Bay of Plenty avocado growers were overall harder hit, losing not only this season's fruit, but that for the next harvest too, as well as experiencing significant damage and even loss of trees. And that's on top of a difficult marketing season for avocados.

"Growing is never straight forward and we often get these curve balls thrown at us, but we are also a very resilient industry and as such we can hopefully bounce back next season." ●

Asha Chhagan, Plant & Food Research entomologist, is researching the guava moth

Asha's career – insects won out over birds

Asha Chhagan was so intrigued by biology that when it came to deciding what to specialise in for her master's degree, she couldn't decide between birds or insects.

Elaine Fisher

"I was at a fork in the road and could have gone either way. What took me to entomology was when I visited HortResearch (now Plant & Food Research) to meet with a potential supervisor and entomologist Philippa Stevens. She was so passionate about her work that it steered me to entomology," says Asha who is now a Plant & Food Research entomologist, based at Mount Albert in Auckland and a member of Women in Horticulture.

Asha is researching the sustainable management, biology and distribution of guava moth which has been in New Zealand for more than 20 years and thrives in the warm Northland climate.

Although very much "a city kid," Asha says growing food is in her genes. "My parents owned a fruit shop in central Auckland and from a young age I was exposed to lots of exotic fruit and vegetables."

Among her happy childhood memories is visiting the Turners & Growers auction rooms near the waterfront with her dad early in the morning to pick up fruit and vegetables for the store.

"My extended family were market gardeners at Pukekohe, growing potatoes, onions and greens and my relatives in India were market gardeners too, so I guess horticulture is in my blood."

Asha credits her understanding of the horticultural industry through all stages from growing, to retail to the consumer to her childhood experiences and family traditions. It's that background which also motivates her to carry out research to make positive differences for growers.

Her first introduction to that kind of research was working part-time at HortResearch while studying for her master's

Asha strongly recommends science as a career for women

project. "Once I graduated, I was lucky enough to be offered a job as a technician which led to opportunities to move through the ranks to researcher and most recently, scientist."

Despite its name, the guava moth (*Coscinoptycha improbana*) doesn't affect only guava fruit. "It has a large host range including feijoa, macadamia, citrus, loquat and plums so is a problem not just for commercial growers but the home gardener too.

"I've been working on this project for three years and the moth is one of the most challenging of pests when it comes to understanding its life cycle and biology. It doesn't appear to have a diapause stage (a period of suspended development) but develops throughout the year, using different hosts."

The female lays its eggs on the surface of fruit and within 24 hours of hatching, the larvae burrow inside and start eating. Once mature, they crawl out, drop to the ground on silken threads, and make a cocoon out of soil and debris. Adult moths emerge, find each other using pheromones, and mate. The whole cycle takes around eight weeks in summer.

As the moth is only a pest in New Zealand, the research of Asha and her team is world-leading. Guava moth is native to Australia, quite a different biological and climatic environment. Currently in New Zealand the insect is found in Northland, Auckland, the Coromandel and north Waikato but with climate change Asha believes it will move further south.

Management options include pheromone traps for males, mating disruption, insecticides and good orchard hygiene practices including removing fallen fruit and debris from around trees.

While male pheromone traps are an effective tool for monitoring the pest, the ideal solution would be to disrupt mating or create effective traps to capture females. "If we could find attractants for females it would be a big deal because we could shut down the lifecycle and stop eggs being laid and subsequent larval damage in fruit.

"Work to collect volatile smells from feijoa and test these attractants in the lab produced some positive results. Unfortunately when we took the experimental attractants into the field we did not catch as many females as we hoped."

Funding for the research is coming to an end but Asha hopes more can be found. "Now we have got this far, we don't want to let the research end."

Asha is a strong advocate for young women considering science as a career. "What I especially love is that my work is really diverse and no day is the same. Science offers so many amazing opportunities for women. I really recommend it, in whatever field, as a career choice." ●

To keep up-to-date with Women in Horticulture, its news and activities, and join the membership database, email **info@women-in-hort.nz**. Everyone is welcome.

Positive images of people enjoying their work in kiwifruit orchards are part of the NZKGI labour attraction strategy

2022 harvest not time to be a passive grower

The 2022 harvest is shaping up to be the most challenging the industry has faced in the Covid-19 era – and it's no time to be a passive grower, says Colin Bond, chief executive of New Zealand Kiwifruit Growers Inc (NZKGI).

Elaine Fisher

"We have a history of picking every fruit and want to do that again this year, but it will be a challenge. The first step for growers is to be aware of the challenges and carry out forward planning. This is not the year to be a passive grower.

"This is the year to help on orchard and actively find others to come and help. We have almost 3,000 growers, if they find two people each, we should have the numbers."

Predictions are for a shortfall of around 6,500 workers, largely because backpackers, who have traditionally accounted for around 25 percent of the labour force, aren't in the country. Absenteeism due to Covid-19 could make the number higher.

"In 2020, as an essential industry we were able to employ people who had lost their jobs in other sectors, but that workforce has now moved on. The 2022 harvest is likely to be the most challenging; one more hill to climb before the borders fully open. Hopefully by 2023 things will be back to normal."

Zespri is forecasting yet another record crop, 190 million trays, compared to 177 million trays last season. The harvest began in late February with the first of an estimated 240,000 trays of Zespri RubyRed fruit harvested in Te Puke; a modest forerunner to the height of the harvest when 2 million trays of Zespri SunGold fruit will be picked each day. "That's the mountain we have to climb."

The kiwifruit industry is a great New Zealand growth story and Colin says the problems it faces are a product of its own success.

Long-term confidence remains strong, with the significant new plantings of the last five years now coming into production, and continuing demand for licences to grow Zespri's varieties.

"Zespri has performed well during Covid-19, exporting record volumes of fruit to the world and demonstrating the strength of the single desk."

One of those strengths is the ability of Zespri to manage the supply chain, including securing vessels to take fruit to market, something smaller exporters have struggled with.

NZKGI's labour attraction programme was up and running early in the year, including the distribution of *The little green and gold book: a guide to finding seasonal work in the New Zealand kiwifruit industry*; as well as a Facebook page (which has around 10,000 followers) and this year the use of Instagram too to promote jobs.

"We also have on-going relationships with the Ministry of Social Development and the Ministry for Primary Industries and other government departments to help get the message out there that work is available."

A five-point plan to reduce the peak demand for workers includes making sure growers don't hold on to fruit when packhouses have capacity to pack, and going from single layer to bulk trays to speed up packing.

Recognised Seasonal Employer (RSE) scheme workers from Vanuatu, Tonga and Samoa make up about 10 percent of the workforce, but says Colin, they represent a highly-skilled and very productive part of the manpower. These seasonal workers are also in demand elsewhere and some who have been coming to New Zealand for five or more years have now gone to Australia.

Employers are offering flexible working hours, sometimes help with transport and bonuses or other incentives for staff who work full weeks.

Absenteeism was more noticeable last harvest. "With increased pay rates, ($22.75 an hour in the packhouse) some people earned in a few days what they had in a week and took days off. Employers are offering incentives to get them to work every day, or saying, if you only want to work three days, tell us so we can arrange our shifts. Pickers on a piece rate earn $27 an hour and there are stronger rates for more highly skilled staff."

Measures used in the last two Covid-impacted harvests are in force again including worker 'bubbles,' using PPE (personal protective equipment), observing social distancing and strict hygiene standards. "The government has not mandated vaccines but we strongly encourage staff to be vaccinated and are doing everything we can to keep staff safe."

Colin took up his role with NZKGI in 2021, one year into the Covid-19 pandemic. "In a perverse sort of way it was a great time to start as I came into this industry to make a difference and NZKGI adds most value during a crisis, including bringing people together and engaging with government."

Promoting employment in the kiwifruit industry as 'Kiwi As' is among NZKGI's labour attraction strategies for the 2022 season

FEATURE ARTICLE

Feijoa ripen on the tree at Pounamu Orchards near Morrinsville

Plenty of challenges facing feijoa industry

As the feijoa season ramps up, HELENA O'NEILL chats with Feijoa Growers Association president Roger Matthews about his experiences as an orchardist and the difficulties faced by feijoa growers.

COVER STORY

Becoming an orchardist was somewhat of a baptism of fire for Roger Matthews.

He operates Pounamu Orchards, a feijoa, chestnut, fig, and macadamia orchard on a 20ha block near Morrinsville. He has 1.5ha in feijoas, 1ha of chestnuts, a relatively small block of figs and 0.5ha of macadamias. When he took over the land in May 2017, it was a series of bare maize fields. His first fruit trees were planted just two months later.

"I try to keep it at a size that I can handle the orchard myself. Picking has not been a huge problem. My feijoas are grown in the espalier form, on wires, which means they've got to be pruned every year. I have 34 rows and I can prune a row a day, meaning 34 days of pruning. That definitely keeps me busy."

Roger's first few commercial feijoa seasons haven't been easy, with lockdowns and other Covid-19 restrictions affecting both compliance and the market.

"The first year of Covid-19 was my first commercial year and I was in a position where I was unable to sell anything because I couldn't finalise my NZGAP (Good Agricultural Practice) audit because we couldn't have anyone onto the property. I couldn't sell to supermarkets, and no-one else was selling and buying, so I put a tonne and a half of feijoas into my neighbour's pigs.

Roger grows nine different varieties of feijoa across his 1,100 trees, with Anatoki and Kakariki the early fruiters, along with an experimental variety dubbed "Number 1." Opal Star and Wiki Tu are his latest fruiters.

"Generally, it's a bit of a race between the final ripening and the first frost. Once you start getting frosts the fruit tends to deteriorate. Last year I got a front on 1 May. My season will go longer if I don't get those early frosts.

"Certainly, by mid-May I will be done. Every year I start getting frosts earlier and later."

This feijoa season is looking like a mixed bag, due to heavy rain in November and a lack of rain in the warmer months.

"We've had a dry January, and March is disastrous. That's certainly going to slow them down and possibly lead to a smaller fruit size. But unlike some areas my pollination period was good – I know some places growers had quite a lot of rain in the pollination period in November. You can have pollen washed out of the flowers if you get heavy rain in November, also some growers have problems with fungus and mould on their flowers which is going to severely hurt their crop. This year is a bit on the dry side."

When ex-Tropical Cyclone Dovi hit parts of the country in February, it did not leave Roger's orchard unscathed.

"We had that big storm through and I lost about four chestnut trees and four or five fig trees as well. They just got blown over. Some people got rain with the strong winds, but we didn't get a drop. If the trees had got wet, we may have had more tree damage."

Aside from the weather, the guava moth and the fungus anthracnose are proving to be serious threats to the feijoa industry, particularly for northern growers.

The guava moth thrives in the warm Northland climate and has many hosts such as feijoa, citrus and macadamia. Since arriving in the region 20 years ago, the moth has caused big problems for growers and home orchardists.

"We've been doing quite a lot of research on guava moth with Plant & Food Research, unfortunately we've not been successful in identifying a control measure and effectively you've got to try and live with them. At this stage, they've not been conclusively found south of the Bombay Hills."

> **"Roger grows nine different varieties of feijoa across his 1,100 trees**

Spraying is ineffective in dealing with guava moths, and orchard hygiene is the biggest way to control the pest.

"Making sure you have no windfall fruit on the ground to ensure you break that life-cycle."

Small pockets in the Coromandel have guava moth, but it does not yet appear to have spread south of Franklin, Roger says.

On behalf of the Feijoa Growers Association, there is a series of traps across the northern part of Waikato, including Pounamu Orchards.

"I don't have guava moth at all, and the same goes for anthracnose. This form is very aggressive and it's even been found affecting flowers. It's systemic within the tree, so once you've got it in a tree then it's largely done."

The fungal disease first started appearing in 2019 and has devastated orchards in the wider Kerikeri area. Anthracnose is usually a post-harvest spot, but this strain attacks the fruit before it is ready.

"At the moment it's only in Kerikeri. Basically, all the feijoa orchards around the Kerikeri area are gone – they've all ripped their trees out. The crop production from Northland has dropped dramatically due to this. The planting of feijoas in Northland has dropped quite a lot."

As for his other crops, it is early days for his 50 fig trees and a slow start selling his fruit.

"It's a little bit of a struggle the figs at the moment. Hamilton is a small market and it's quite easy to flood the market with figs. A lot of restaurants are operating at volume and supermarkets aren't buying as they would. It's a bit of a shame seeing as they have a short shelf-life. The prices are good but I would prefer that they sold."

While his macadamia trees are too small to be producing yet, he has sold some chestnuts online.

> **"Basically, all the feijoa orchards around the Kerikeri area are gone – they've all ripped their trees out**

"I'm going to try putting them through the market this year and see how that goes. There are a few people out there growing chestnuts but I'm probably one of the few who have NZGAP audit on my orchard. If you haven't got that then the supermarkets won't touch you."

He's also looking into the possibility of gluten-free chestnut beer, to help develop more markets for his crops.

"I've had a go myself, to make some as a trial so I can take some along to breweries. There's a growing number of brewpubs or boutique breweries around the country. There's a growing number of people who are or who think they are gluten-intolerant. One guy I spoke to said he's gluten-intolerant and he's sick of drinking ciders because they're too sweet and he wants something bitter. So, I think there is a market there."

Roger first started brewing beer at home during one of the lockdowns, first using homebrew kits before experimenting with his own concoctions.

"In the meantime, I'm having a bit of fun and teaching myself a bit of chemistry as I make my own beer. They're a very starchy nut. You can make beer out of chestnuts because they are weird in that they have almost zero oil content. You couldn't use any other sort of nut because the oil means you wouldn't be able to get a head on your beer." ●

Packaged Roxy ready for overseas markets

After 20 years of breeding, Roxy heads to Vietnam

Bill and Erica Lynch love the "intrigue and suspense" of being plant breeders and after more than 20 years developing a range of new apple varieties, they are selling fruit from the first of their brood, the Roxy apple, to Asia.

Anne Hardie

The couple operate a small family orchard at Redwood Valley in Tasman where their son, Dan, now oversees the day-to-day management of 40ha of apples. Their foray into plant breeding began more than two decades ago when they recognised the only way a small family orchard could survive without the economies of scale of larger enterprises, was by being innovative. To them, that meant creating unique varieties of apples that could produce the higher returns they needed to counter the ever-increasing cost of production.

They have planted new varieties produced by the industry over the years, but often an apple looked good but lacked flavour or was too hard to grow successfully. Apart from being disappointing, continually replacing apples was a cost that a small family orchard could not sustain.

They wanted varieties that not only looked good, but had the flavour of heritage apples, were easy to grow and were not just a fly-by-nighter in the market.

Roxy is the first of their apples being exported to buyers, though the variety has been trialled in China, Vietnam, Taiwan and Hong Kong during the past four years without a brand. This year it has a name and about 12,000 cartons are heading to Vietnam.

Bill says they have customers who want to buy Roxy and growers who want to grow it, but first it has to prove it can achieve a good return before more growers will plant it and produce the quantity for interested customers. It is a Catch-22.

"The market wants lots to trial, but you don't have lots until it proves itself."

Bill Lynch with the Roxy apple that has been more than 20 years in the making

The Lynches would have struggled to harvest their crop this year without a last-minute crew of RSE workers

"We had Chinese buyers come out here five years ago who wanted Roxy – they wanted 100 containers and we just laughed. We had eight to ten bins in the coolstore."

So far, there's only about 25,000 Roxy trees planted and most of them are on their Redwood Valley orchard, though a few growers around the country have taken a punt with the variety after viewing the apples at open days on the orchard, and planted small numbers that can be ramped up if it turns out to be a market success.

Two New Zealand nurseries have also liked the variety enough to propagate trees, while overseas the variety is being trialled at the IFO (Institute for Economic Research) station in France. IFO's next step is to trial Roxy on orchards throughout Europe.

To be a success, Bill says any variety needs to be fetching close to $40 per carton or more as the cost of production is now around $30 per carton. Early price indications for Roxy are higher than $60 per carton, but this has yet to be achieved.

Roxy's origins go back to a single tree of the heritage Gala variety on a former orchard they owned at nearby Mapua. Its complex flavours appealed to them and they took wood from that tree for grafting some 1,000 possibilities. From those, they chose three to work on over the years in a very simple orchard environment.

"We're just using the science of nature. The birds and the bees do all our pollination and we have a couple of buckets to sit on with a grafting knife and a pair of secateurs."

"Not very corporate," Erica adds.

The resulting Roxy is a "pretty pink" apple with the flavour of a heritage Gala apple. It has a short growing season that begins late – it is the last variety to break dormancy on their own orchard – and harvests seven to ten days earlier than Royal Gala. It takes more than looks and taste to be a success though; it has to be easy. Dan has given it the thumbs up in the orchard and calls it a "dream apple to grow."

Its genetic material goes back 60 years or more and Bill says apple varieties back then were very straightforward with really complex flavours, and they wanted to capture all those attributes with a modern apple.

Roxy is one of seven apple varieties they have bred through their breeding programme that operates as Fashion Foods Ltd. Plenty of other potential varieties didn't make it this far and Bill acknowledges it has been financially challenging as a small private plant breeder to persevere over the years.

Once they got close to marketing their first variety, they set up a business structure to protect their brands in the market. To do that, they set up the Lost Orchard Company which then has exclusive global rights to Fashion Foods' intellectual property, plant material and brands. The name Lost Orchard refers to the little family orchard getting lost among the bigger players in the industry, plus lost genetics and lost flavours that are actually now being retained and recharacterised in new apple varieties.

Lost Orchard has now given a new exporter, Snazzy Fruit Company, the rights to export up to 500,000 cartons of Roxy a year. Bill says Snazzy Fruit Company director, Josh Parlane, heard about Roxy in Asia and that was the impetus for establishing the company and investing in Lost Orchard shares. To grow or export Roxy, growers and exporters have to buy one share per carton and also pay a 4% annual trademark royalty of the freight on board (FOB) value.

Meanwhile, other varieties are stepping up to the blocks behind Roxy. Goldie, an apple that is a mellow shade of gold that deepens through storage, is piggybacking on the Roxy order to Asia to be trialled with customers, along with a couple of other varieties.

"Feedback will determine where we go from here. If the market can't see a point of difference, there's no point continuing with a variety. We've cut a lot of firewood over the years!"

They still have varieties such as Jazz, Envy, Granny Smith, Red Braeburn and Royal Gala in the orchard, but are gradually replanting with their own varieties in the hope they will have some that will be successes fetching premium prices.

Bill acknowledges it is a gamble and describes it as "white knuckle stuff." But if the gamble pays off, it will be well worth it. ●

Istvan Hajdu – research scientist at PlantTech – gathering 'ground truth data' as part of the project to determine if sun-induced fluorescence is an indicator of plant stress

Is fluorescence an answer to diagnosing plant stress?

Kiwifruit vines on some Bay of Plenty orchards are under intense scrutiny from above and below as scientists gather information to discover how fluorescence emitted by their leaves can be used as an indication of plant stress.

Elaine Fisher

The international research is led by Tauranga's PlantTech Research Institute and funded by a $1 million grant from the Ministry for Business, Innovation & Employment (MBIE) Endeavour Fund, New Zealand's largest contestable research fund.

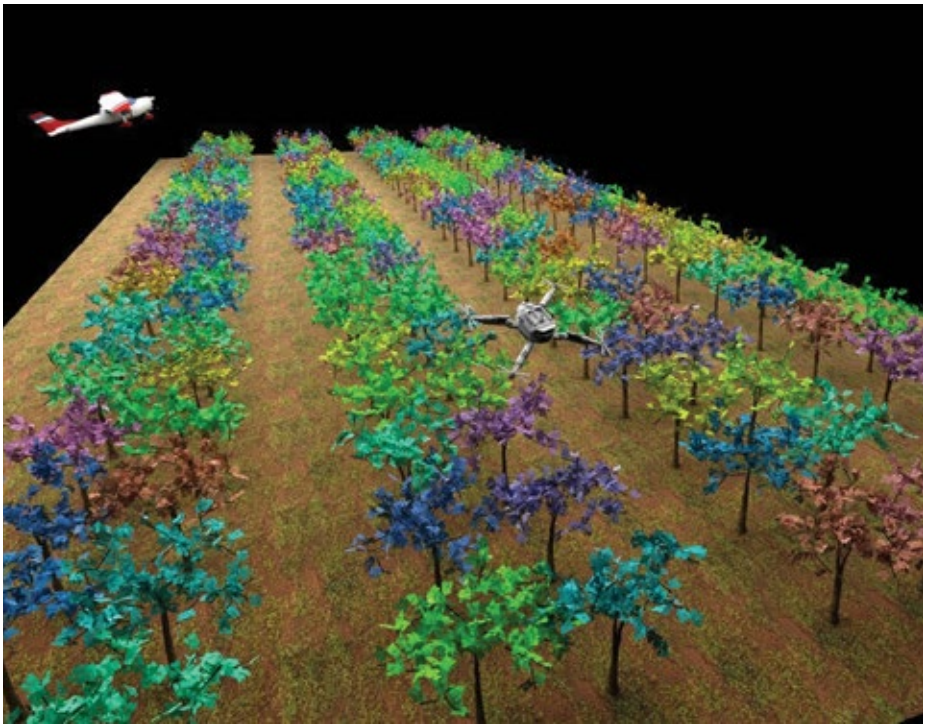
The project has assembled a team of experts from PlantTech, Plant & Food Research, Massey University, Melbourne University in Australia and Durham University in the United Kingdom with international expertise in remote sensing, numerical physical simulations, machine learning and computer vision.

Principal research scientist leading the project, Dr Alvaro Orsi, says data is being collected from kiwifruit orchards at Matapihi and Katikati.

"PlantTech will pass back the knowledge from this project to the growers from whose blocks data is collected. This is core to the project's aims, which is not to stop with scientific research but to translate what is learned into actionable insights which growers can apply to create sustainable management practices."

To gather the information required, data collection platforms mounted on drones, fixed wing aircraft and ground-based vehicles are measuring sun-induced fluorescence (SIF) which is an indicator of photosynthetic activity and plant stress, such as lack of water, hot temperatures and nutrient deficiency. Pests and disease also impact photosynthetic efficiency and can be probed by studying SIF.

"We are collecting data from several locations to create a virtual 3D representation of an orchard. We aim to develop models to show how sunlight



Data collection platforms over a virtual kiwifruit canopy coloured to denote areas that may be affected by different sources of stress. The image is just the illustration of the concept, and there is no connection to a real orchard, but shows a visualisation of one of the outcomes of the project

interacts with the kiwifruit canopy. By the end of this year, we should have a good understanding of what happens in the orchard and how the direct application of that knowledge can benefit growers and industry."

One of the data collection platforms is LiDAR (Light Detection and Ranging) laser scanning technology fitted to a drone. "It is the same tech in the latest generation of smart phones, iPhone and iPad, but with much more resolution and accuracy."

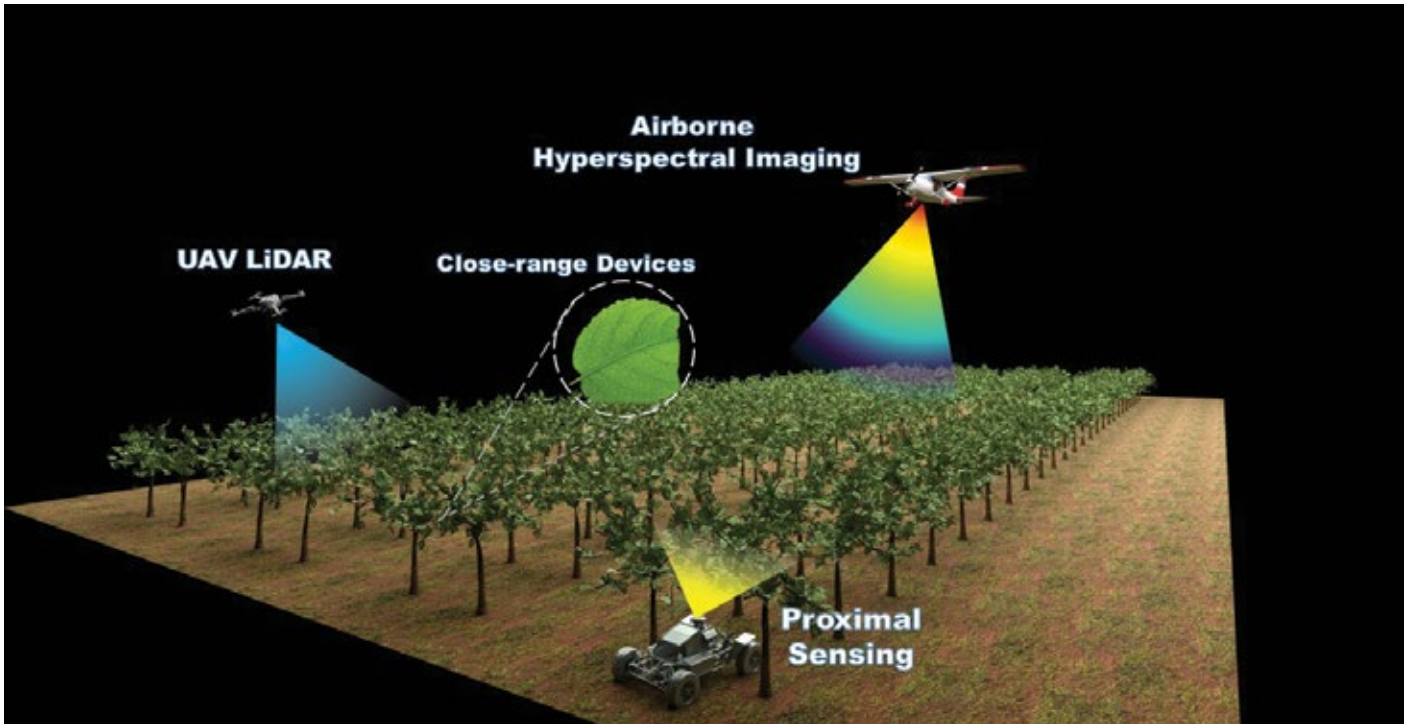
Alvaro explains that the LiDAR uses 'point cloud' technology to collect billions of individual measurement points, in this case the surface of kiwifruit leaves. "A point cloud is like throwing sand into the canopy and recording where each sand grain falls. The big challenge is to analyse this point cloud data and convert it to a 3D representation of the orchard.

"The aim is to capture a realistic and robust representation of the distribution of the inclination of leaves in the canopy. Not all leaves are perfectly horizontal, and the distribution of inclination is ultimately a key factor in determining photosynthesis in the orchard. This is important as photosynthesis drives plant growth and fruit quality."

Another instrument being employed is a hyperspectral imaging camera fitted to a light aircraft which flies over orchards. "A normal smartphone camera captures light in red, green, and blue channels (RGB), but using hyperspectral imaging we are capturing over 360 different wave bands within the optical and near infra-red range.

"This gives us detailed information about the way the canopy is reflecting sunlight. During photosynthesis, the leaves are absorbing radiation from the sun. At some point, light receptors become saturated and need to get rid of excess radiation which is released in the form of heat or thermal radiation. Chlorophyll also releases a tiny amount of excess radiation in the form of fluorescence emission.

"Hyperspectral imaging captures a lot of detail about the different properties of light reflected by the leaves, which is especially important as the main challenge of our project is to measure sun-induced fluorescence.



Remote sensors are recording data in kiwifruit orchards from above and below as part of an international project led by PlantTech

"Fluorescence is the process that excites the chlorophyll molecules within the leaves to emit radiation and for the purposes of our research, is a proxy for photosynthesis efficiency.

"We want to measure and interpret fluorescence to provide an indication of what the plant is doing. If photosynthesis is below optimal, that will be a signature for stress, and we will be able to use that signature to tell which regions in an orchard are suffering more stress than others."

Alvaro says the next step is to understand why parts of an orchard are showing stress. To help interpret the extensive data being collected, the research is also gathering 'ground truth data' which includes the field collection of leaf properties using proximal sensors and laboratory analysis of nutrient contents of leaves.

"Once we are able to say this part of an orchard is experiencing stress it may be possible to determine if that is because of water or nutrient deficiency, or even due to the presence of pests or disease."

With that information, growers can decide which areas in their orchard should receive irrigation. The information will also lead to improved nutrient management in the form of localised fertiliser applications.

"Traditional management techniques are uniform throughout an orchard, which is ineffective because areas with optimal nutrient and water levels may become saturated while those which require it may not receive sufficient water or fertiliser.

"The goal of this research is to provide a more intelligent, informed way to manage and conserve water and fertiliser resources, which is the way the industry is heading.

"Such a strategy will result in further optimisation of irrigation and fertilisation management, and crop yield and quality overall by promoting a pathway to enable photosynthetically efficient crops.

"These impacts will help mitigate the global challenges of increasing world demand for sustainable food production, as climate change makes traditional orchard management practices progressively more obsolete.

"Improved horticultural practices will make horticultural businesses more financially sustainable. In the first instance these benefits will flow to the kiwifruit industry, as Aotearoa New Zealand's largest horticultural exporter, and kiwifruit growers in particular.

"In time, the benefits will transfer into other horticultural exports, such as the avocado, apple and pear export sectors," says Alvaro.

PlantTech chief executive Mark Begbie says, "Maintaining food supply and production efficiency in the face of climate change will become increasingly challenging. Through this work, we will develop techniques that help us to manage limited resources more efficiently and derive understandings that can give us deeper insights into crop health. By doing this project using remote sensing data we create a scalable solution with the potential to have global impact across the primary industry." ●

SUMMERFRUIT UPDATE

Summerfruit season summary

Kate Hellstrom : Summerfruit NZ chief executive

Despite the challenges of a severe labour shortage and the looming threat of Omicron, the summerfruit season was, in general, a fairly good one for the majority of growers and exporters.

Overall, the summerfruit crop was lighter than was forecast pre-season. The yield was patchy in some orchards and good in others, so it has been an up and down season for the sector. All the growing regions had too much rain at various times of the season. Hawke's Bay had excess rain early in the season, so struggled to achieve good quality fruit in December, and while January was hot and dry, the returning wet, humid weather in February led to rot and fungal diseases in much of the remaining crop. Marlborough had a particularly tough season with flooding in July and further heavy rainfall in September and October which affected pollination, resulting in the lowest fruit yield in decades and a shortage of cherries in the district. Central Otago also had some wet weather at times but luckily avoided a repeat of last year's extreme rainfall event.

Export volumes of all summerfruit, except nectarines, were the highest of the past three years. The export cherry crop was 3,200 tonnes, compared to a 2,500-tonne crop last year. The cherry export season had an average start before Christmas, was fairly strong in early to mid-January, and dropped off faster than other years at the tail end of the season. The challenges of airfreight capacity continued to hamper the export sector, despite the ongoing support of the Government's International Air Freight Capacity scheme. Many growers, when faced with freight rates making it challenging to get into overseas markets, saw the domestic market as a better option this season.

The domestic season went quite well, with strong sales volumes and buoyant pricing. While in some cases fruit quality has not been quite as good as it could be, growers have continued to respond well to the consistent message from retailers and wholesalers about the need to supply good quality fruit. In general, growers have been relatively happy with their returns this year, particularly those who have rejuvenated their fruit varieties and pulled out non-performing crops.

The severe labour shortage defined the season as it did in 2020–21. Growers have been under a lot of pressure and stress levels have been high due to the challenges of finding and retaining staff. Almost all growers struggled to attract enough pickers and packhouse staff; while some required an additional handful of workers, others were down over a hundred staff or have had a shortfall of up to fifty percent of their workforce in some cases. Even those with just enough staff, who ultimately were able to harvest their full crop, remained on edge for the entire season.

The looming threat of Omicron also defined the season; orchards and packhouses had to adjust to the Red 'traffic light' restrictions and continued to operate while ensuring that their workforce stayed safe, by closely following all protocols such as workforce bubbles, mask-wearing, gathering restrictions and the use of vaccine passes.

> **"Looking ahead, the 2022–23 season appears more promising as New Zealand's borders slowly reopen**

Looking ahead, the 2022–23 season appears more promising as New Zealand's borders slowly reopen. Working holiday visas will start to be issued later this year, and we look forward to welcoming new travellers to our regions who will hopefully help with the harvest next season. Summerfruit NZ also welcomes the news that the Government has increased the cap on workers from the Pacific under the Recognised Seasonal Employer (RSE) scheme to 16,000 workers. This cap increase will support the summerfruit sector, and wider horticulture industry, in the longer term and will help relieve some of the stress that growers have been under.

While these changes are too late to help with this season's summerfruit harvest, I hope that next year will prove to be more productive and less stressful on growers and exporters. ●

TECHNICAL

THE LATEST INNOVATIONS AND IMPROVEMENTS

Flattening the curve – horticulture style

If a new plant pest enters the country, everyone one wants to get rid of it as fast as possible but sometimes eradication is not possible. What can growers do to help flatten an invasion curve?

Eve Pleydell : HortNZ risk policy advisor

Key points

- **Eradication of an invasive pest or disease is not always feasible.**
- **Alternative options include trying to contain or manage the pest.**
- **At all stages of the invasion curve growers can minimise the risk to and impacts on their business by using good on-farm biosecurity practices.**

In New Zealand we are fortunate to be free from many pests and diseases that occur in other countries. To protect this status and support our primary industries we impose some of the strictest biosecurity border controls in the world. However, as the international movements of people, goods, and mail increases, our country is coming under greater invasion pressure from unwanted pests and diseases and it is not possible for border controls alone to provide 100 percent protection.

When an invasive plant pest is detected in New Zealand for the first time, the Ministry for Primary Industries (MPI) works with the affected sector to control the local situation, assess the national situation, and decide on the best control strategy. While eradication of the pest is often the most desirable outcome, the chances of eradication being successful decreases as the length of time the pest has been here and the geographical distance it has spread over increase.

Eradication is also more difficult if the pest is biologically programmed to be a successful invader. For example, pests capable of spreading across long distances fast, or that reproduce rapidly, or that are hard to detect early are likely to be more challenging to eradicate. Think of the difference between the original strain of Covid-19 that as a country we successfully eliminated using lockdowns and the Omicron strain that spreads far too quickly for elimination to be

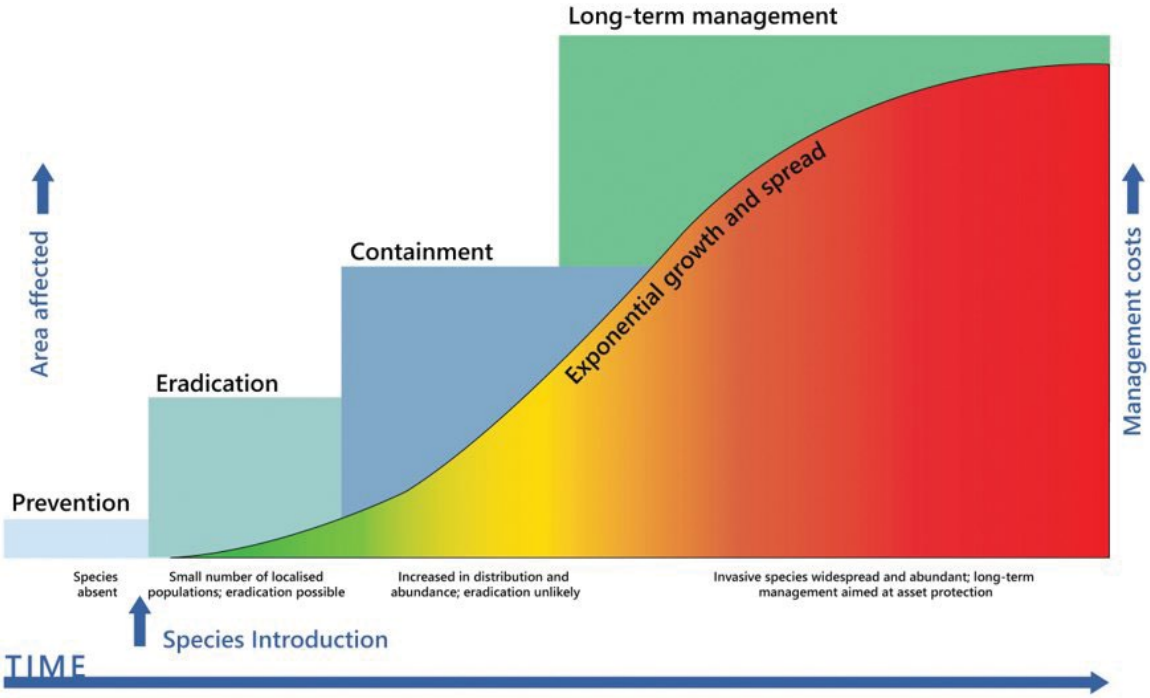


Figure 1 An invasion curve showing how control options change as the size of an invading pest population increases over time and across larger areas of a country. In reality, knowing when eradication is no longer feasible or when long-term management is the only real option left is not straight forward. Image sourced from Invasive Species Council, Australia. Invasion-Curve – Invasive Species Council

feasible. Sometimes a strategy other than eradication is forced upon us by the characteristics of the situation.

The pest control options available at different stages of an invasion can be illustrated using an invasion curve. If the size of an invading pest population is already too large for national eradication to be successful, it may still be possible to contain the infestation in a particular part of the country using localised control measures. However, if the pest has well and truly established itself then we all have to learn to live with it and develop the best long-term management strategy to minimise its negative impacts.

In recent years, the United Kingdom and Australia both made quite rapid decisions not to pursue eradication of a significant invasive plant pest. (See the case studies below.) Instead, they focussed on industry, science and government working together to flatten the invasion curve by developing long-term management strategies that effectively minimise pest-related damage and impacts.

Growers play key roles at every stage of an invasion curve. While some actions may be mandated on growers by MPI as part of a biosecurity response, enhancing general biosecurity practices on farms is also important for pest and disease control. It can be the actions of growers that stop a pest in its tracks and achieve eradication, as demonstrated recently by the pea growers of Wairarapa. But when a pest or disease does become locally or nationally established it is also the growers who are the main players in preventing huge population explosions that then become very challenging to control. The actions we take here within New Zealand are critical parts of the overall biosecurity system. Border protection alone cannot keep our businesses and communities safe from harm from unwanted pests and diseases, but there is a lot growers can do to mitigate the risks posed by these invaders to their own farm and the country.

Case study A: Spotted wing drosophila (SWD) in the United Kingdom

Spotted wing drosophila is a small fly that likes to lay its eggs in underripe, thin-skinned fruit before harvest. The fly larvae then destroy the fruit pulp as they feed, producing sunken blemishes in quality fruit. Suitable hosts include berries, stonefruit and grapes. The species originated in Asia, although it was detected in Hawaii in 1980. In 2008, it started to spread through North America and Europe reaching south east England in 2012 (CAB International, 2021).

This fly can spread locally by flying and also moves rapidly over larger distances through the movement of infested fruit. The fly's high reproductive rate and ability to produce up to 13 generations per year make it a formidable pest to eradicate.

Because of the fly's biology, official European Union control measures had been unable to stop SWD from spreading across the continent and the fly was deregulated at the EU level in 2012.Soon after its detection in England, a government-industry-scientist working group was established.

The group was chaired by a fruit grower and enabled information to be shared effectively about the spread and impact of the pest and how to best control it (Agriculture & Horticulture Development Board, 2017). Information gaps were identified and research initiated to provide some answers.

A code of practice for fruit growers and packhouses was produced, using lessons from neighbouring countries and incorporating the results from UK-focussed research as they become available. Active monitoring of SWD populations by growers plays a key role in early detection of the fly in an orchard, which enables early control and targeted spraying of SWD effective pesticides. As the adult flies feed on waste fruit, the careful disposal of damaged fruit to remove that food source is another critical control point to avoid population explosions of SWD. Stringent orchard hygiene practices also help to prevent movements of the fly between orchards.

When SWD first arrives on a farm the impacts can be severe with some growers reporting significant crop losses. However, using an integrated pest management (IPM) approach has resulted in satisfactory levels of commercial control being achieved in future years. Being ready to adopt new practices early can help growers minimise losses in the first few years of living with a new pest.

Case study B: Fall armyworm (FAW) in Australia

Fall armyworm is actually a moth whose caterpillars feed in large numbers on over 350 species of plants, including some vegetables and fruits, although it prefers maize, sorghum, grasses and cereals. This species is native to the Americas but from 2016 it started steadily moving across the globe before being detected in the Torres Strait in January 2020. Detections soon followed in Queensland (February) and the Northern Territory (March). The most likely entry route to Australia was wind-assisted flight. Genetic typing of the moth is underway to increase understanding of when, from where and how often this pest has entered Australia (Plant Health Australia, 2020).

Fall armyworm is a formidable pest. Under favourable conditions this moth can fly hundreds of kilometres over several nights. This moth can also reproduce quickly, with a single female capable of producing up to 1,500 eggs during her life, and a lifecycle that can be completed within 23-27 days.

The biological characteristics of the moth coupled with widespread detections across large geographical areas of Australia led the Consultative Committee on Emergency Plant Diseases to conclude that it was not possible to eradicate this pest from Australia. The decision to opt for long-term management was announced on 24 February 2020 (Government of Western Australia, 2021).

What does living with FAW look like for Australian horticulture?

- The government surveillance system continues to monitor the distribution of the moth using pheromone traps and public reports. Regular updates are issued to let growers know if it has entered a new area.
- Sectors such as the grains industry have produced continuity plans for their growers who are encouraged to regularly check their crops for signs of infestation to allow early detection on a farm. In Australia, it has been suggested that targeted spraying should be used only once the scale of the infestation has reached threshold levels. Indiscriminate use of pesticides is not recommended as this moth has developed pesticide resistance in some countries, and spraying may also affect natural predators of the moth (Cesar Australia, 2020).
- On-farm biosecurity practices help to protect crops such as instigating a 'clean-on, clean-off' policy for the farm and controlling weeds to remove potential host plants.
- To support the growers, a body of research is underway to help optimise control efforts in the Australian setting. This research includes identifying the most effective insecticide programmes, investigating possible biological control mechanisms, and improving predictions of seasonal migrations in order to best forewarn growers that the moth could arrive in their area.

The FAW infestations are expected to be severe for the first few years after its arrival but, as has been seen with other pests that have arrived in Australia, the annual impacts are expected to decrease with time (Queensland Government, 2020). This decrease will likely occur as the most effective control tools are identified and the affected industries become more skilled at controlling it. Natural predators of the caterpillars are also expected to increase in number.

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Flooded Motueka River, 17 July 2021

Global warming risks and opportunities

It is predicted that climate change will result in a significant warming of the environment, but more importantly the development of extreme weather conditions.

Mike Nichols

This will mean that rainfall patterns in particular which can influence crops, will be seriously affected. This will apply worldwide and we are already seeing some of these weather phenomena, for example the extremely high temperatures this northern hemisphere summer in North America. And the drought and frosts recently in Brazil which will affect world coffee production (and therefore prices) for several years.

New Zealand is not immune to these extreme weather happenings, but with modern technology it should be possible to overcome, and even make use of them to improve our production systems.

Kiwifruit is currently the major horticultural export earner, and they are (as far as we are aware) very sensitive to environment. At one time it was considered that the crop could only be produced in a limited area near Te Puke, though this theory has now been completely debunked. Nevertheless, adequate winter chill is an important component of productivity and with the pending departure of Hi-cane, this could pose major problems for kiwifruit producers in the top half of the North Island, unless a satisfactory alternative is developed.

Many of the other tree fruits also require significant winter chill to perform, particularly apricots, nectarines and peaches, and even apple buds will fail to break evenly in the spring if they are inadequately chilled.

Some 30 years ago a group of senior New Zealand agricultural scientists predicted that a major effect of

global warming for New Zealand would be that the West Coast of both islands would have higher rainfalls, while the East Coast would receive lower rainfalls.

This is going to pose a major problem for the horticultural industry in Hawke's Bay, Marlborough and Canterbury, where high productivity is very dependent on adequate irrigation capacity in the summer.

For example, the decision not to build the Ruataniwha Water Storage Scheme must have serious implications for the long-term viability and any expansion of the horticultural industry in Hawke's Bay.

> **The pecking order for fresh water is (and must always be) people, industry and finally agriculture**

The pecking order for fresh water is (and must always be) people, industry and finally agriculture. The population (and therefore demand for fresh water) is only likely to increase in the future, and this will make less water available for agriculture, and put serious constraints on any increases in both expansion and intensification.

Some 30 years ago or more, I consulted with a Food & Agriculture Organization (FAO) team in Quetta, Pakistan on a pipfruit project. In our final report we emphasised that Quetta had an expanding human population, that the rainfall was an inconsistent 250 mm/year, and that any future fruit tree plantings should be linked to the estimated water available for irrigation. Little notice was taken of the report and the result was a significant planting of apples, with the capital rich growers boring the deeper irrigation wells, while the capital poor growers watched their half-grown apple trees die due to water shortage. The precise opposite of the advice in our report. Yes, there is water under the Hawke's Bay plains, but taking too much of it will allow saline water to move into the aquifer from the sea.

Recent visits to Hawke's Bay have shown a huge change in the horticultural crops being grown. High density apples are replacing wine grapes, with the danger that irrigation water will in the future be a limited resource. In a dry year wine grapes will still produce – in fact the wine quality may even be enhanced in a drought – but for apples the lack of water could be traumatic in terms of both yield and quality.

Perhaps the solution is to change the manner in which we grow fruit trees. There is already a move to grow rain sensitive fruit (such as cherries) under high plastic-clad greenhouses and this may be a possible approach for apples, which after all are now grown at high density and barely three metres tall. The greenhouses will also provide a means of trapping rain for storage for later irrigation, and the potential for growing fruit trees hydroponically is water efficient, and clearly the next step up in technology for the fruit industry.

The model is quite clear – 60 years ago virtually no greenhouse tomatoes were grown hydroponically, but now in all developed countries it is the exception to find them grown in greenhouses in the soil. More and more berryfruit are being grown in greenhouses hydroponically, and it is only a question of when (not if) the tree fruits will follow suit. Hydroponics offers not only water conservation but also the efficient use of nutrients (fertiliser) by using a recirculating system. It also offers potential yield increases, as the plants receive not only the optimum water they require to produce high yields, but also (critically) the optimum level of nutrition.

It must be noted that soil is NOT necessarily an ideal medium in which to grow plants, particularly high value crops. Many New Zealand soils are deficient in one or more of the critical minerals required to obtain optimum crop productivity, and hydroponics offers the opportunity to provide the crop with the optimum nutritional levels according to our current knowledge, without any concern for the underlying soil type. The poorest quality land (puggy clay or coarse sand) will have no influence on productivity with a hydroponic system.

> **Why pay thousands of dollars per hectare for land when with hydroponics any rubbishy old land can be just as productive?**

The potential of protected cultivation need not be restricted only to current horticultural production areas, as the West Coasts of both islands (particularly near the sea) have excellent sunshine levels, and using greenhouses as rain shelters, and hydroponics could well be a cheap and efficient way into intensive horticulture. Why pay thousands of dollars per hectare for land when with hydroponics any rubbishy old land can be just as productive?

Of course there will be exceptions, particularly for extensive field crops such as process vegetables, and some broad acre crops like potatoes and onions, however the move by LeaderBrand to grow fresh cut lettuce in a large greenhouse is perhaps a sign of the future. ●

A tile drain exit point

Nitrogen cycling in permanent fruit crops: Part 1

Being a key element for plant growth, nitrogen is very important to all food systems. It is important in all ecosystems too.

Leander Archer : AgFirst Horticultural and environmental consultant

It's when it gets out of balance that it becomes an issue. In the environment, this could be too much nitrogen finding its way into river systems, often paired with other factors such as high levels of sunlight and warmth that together create a poor environment for aquatic organisms. In an orcharding environment, too much nitrogen causes too much vegetative growth (vigour) which diverts photosynthate and other key nutrients from the fruit, causing all manner of quality issues.

We know our river systems are not coping with the highly altered environments humans have created around them. From rural agriculture, through intensive cropping and orcharding, to the highly intensive cityscape and finally to the coastal environment, there are so many pressures occurring all at once on these systems.

But there has been great focus on these issues of late (and about time!) I've met no-one who doesn't want swimmable rivers. And I've not met a grower who wants to see the fertiliser they paid for to nourish their plants being lost into a waterway to go and grow some highly underserving algae!

Our challenge is to upskill in measurement of nitrogen cycling through our growing systems in order to attain the highest precision and uptake efficiency, and to be able to show proof of this.

Figure 1 Nitrogen deficiency in apple trees

Figure 2 Nitrogen excess in apple trees, with deep green colouration and excessive vigour

Starting with a scenario to get you thinking – imagine you've always applied a total of 100kg of nitrogen per year, spread out over the four months from August to November. It's worked a treat! Your plants are continually testing at the right leaf N percentage and your fruit quality is great. Now imagine that in reality, your crop only removes 80kg of N/ha/year, it only took up 50kg of the 100kg you applied, and the rest (30kg) was already being mineralised from soil organic matter. You were losing 50kg N/ha/year to waterways and nitrous oxide gas.

My question is: "*How would you know?*"

Why is nitrogen important for the tree?

Nitrogen is a key macronutrient essential to plant growth. It is a key component of amino acids, proteins, chlorophylls and more. A deficiency results in chlorosis, which is the yellowing of the leaf due to loss (or reduced development) of chlorophyll. Nitrogen readily moved through the phloem from older to younger leaves, therefore deficiency shows up strongest in older leaves.

On the orchard scale, nitrogen is required for adequate vegetative and root growth, fruit development, yield and quality. Excess nitrogen is detrimental, pushing growth into shoots rather than fruits and often creating less ideal fruit quality characteristics (e.g. shading, more pruning for you to do, reduced storability).

Chlorophyll is the pigment that absorbs light energy in the red and blue wavelengths and reflects the green, hence creates the green colouration in plant vegetation. This absorption of light energy and conversion into chemical energy (photosynthesis) is the main way energy enters our biosphere from the sun, and is the reason life can exist as it does on the earth. So nitrogen, being a key part of this hard-working molecule, is pretty important.

This apple tree shown in Figure 1 has lowered photosynthetic capacity, due to lack of chlorophyll pigment, to a level at which the tree has aborted its crop completely. It was likely that it did not have enough nitrogen last season and did not create many floral buds, then when that deficiency continued in spring, the flower (if any flowers were produced) would not have set fruit. This photo is taken in February, a month before harvest.

Contrast this to another apple block, where we have excess nitrogen (Figure 2).

Note that deficiency symptoms as in Figure 1 can appear due to waterlogging too. Roots starved of oxygen die and cannot take up available nitrogen. The waterlogged soil also loses nitrate to nitrous oxide gas and nitrogen gas via anaerobic conditions, triggering denitrification.

Conversely, in Figure 2, excess nitrogen, deep green coloured leaves and vigorous growth can occur in some soils without any application of nitrogen by the grower. This means that organic matter is continually releasing more than adequate amounts of nitrogen from soil reserves and biological fixation from legumes, such as clover, present in the sward.

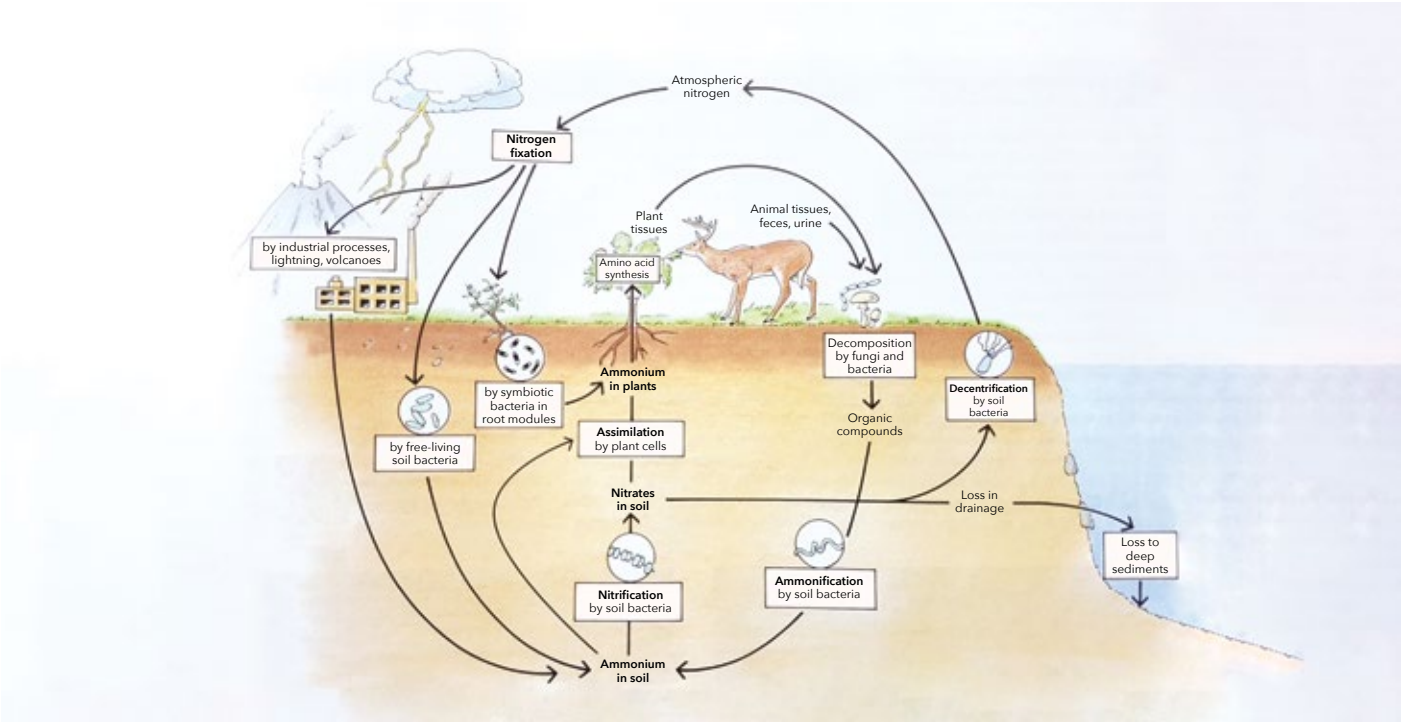


Figure 3 The Nitrogen Cycle (Evert & Eichhorn, 2013)

How does nitrogen cycle in soils?

Nitrogen mineralisation – Organic material (e.g. plant matter and animal excrement) is a food source for soil dwelling bacteria and fungi, which decompose this matter and release excess nitrogen in the form of ammonium ions (NH_4^+).

Nitrification – In the presence of oxygen, moisture and warmth, other bacteria convert ammonium to nitrite (NO_2^-) and then nitrate (NO_3^-) very quickly. Hence nitrate is the most common form of nitrogen freely available in soils for plant uptake.

Denitrification – Without oxygen, this process instead takes ammonium to nitrous oxide gas (N_2O) and with full anaerobic conditions, completely denitrifies this to nitrogen (N_2) gas, which makes up about 78 percent of the earth's atmosphere. Nitrous oxide however, is a powerful greenhouse gas, so fertilising poorly drained soils with nitrogen increases greenhouse gas emissions, more so than through fertilising well drained soils. Well drained soils still have anaerobic conditions present within centres of soil colloids (clumps that provide soil structure) but some gaseous loss occurs from all common soil types.

Leaching loss – When oxygen is available and nitrification occurs, this leaves free anions nitrite and nitrate. The key to understanding why nitrite and nitrate leach is that they are anions (negatively charged particles). Soil, particularly clay particles and organic matter, tends to have a negative charge. Hence soil particles hold cations (positively charged ions) like Potassium, Magnesium and Calcium (K^+, Mg_2^+ and Ca_2^+). However, imagine pushing the two negative sides of a magnet together. This is what occurs with anions and negatively charged organic matter and clay particles in soil. Nitrate readily dissolves in water, and as soon as water moves with gravity through the soil, these unbound nitrate anions travel freely out with it.

Plant uptake – When plants are actively growing they take up nitrogen in dissolved forms from healthy feeder roots. Mostly this is in the form of nitrate (NO_3^-) ions. Plants and their roots need to maintain a neutral charge internally, so they accompany uptake of negative and positively charged nutrient ions together, or else expel H^+ ions (acidifying soil) or OH^- ions (reducing soil acidity) to balance charge. (H^+ is hydrogen and OH^- is hydroxide.) For example, to take up two nitrate anions, (NO_3^-), the root can balance this with uptake of two K^+ ions, or one Ca_2^+ ion, or can release two OH^- ions. This is why applying nitrate-based fertilisers is common in orchards, as it applies nitrogen already in a negatively charged NO_3^- form, avoiding soil acidification.

With so many loss pathways, there must also be pathways to gain nitrogen.

Nitrogen fixation – This is the main process by which nitrogen is added back into the cycle. Fixation is mainly carried out by soil bacteria, either living symbiotically in plant root nodules, or free living in the soil. Through fixation, N_2 gas, prevalent in the atmosphere, is reduced to NH_4^+ and made available for the uptake or loss process already discussed. As with the industrial process to do this, it is an energy expensive process for the bacteria involved as well. The most effective method for bacteria is to form root nodules on legumes- the bacteria invade the roots, and use carbon containing molecules from the plant for energy to fix nitrogen. In return, the bacteria provide the legume with nitrogen to grow, 'out of thin air'! A grazed 50 percent clover/ryegrass sward can add 100kgN/ha/year. A green manure crop of alfalfa ploughed back into the soil can add 300–350kgN/ha.

Fixation in a permanent orchard without grazing generally is in the range of 0 to 100kg N/ha/year depending on legume cover. Don't underestimate nitrogen fixation in your orchard, and remember to account for it in your nutrient balance.

The industrial alternative to fixation, the "Haber-Bosch process" fixes atmospheric nitrogen into nitrogen fertiliser, but unfortunately uses a large amount of fossil fuels in the process, both as reagents but also to create the extremely high temperature and pressure required. I was amazed to learn in writing this, that the additional amount of nitrogen fixed by this process each year amounts to a quarter to a half again of the planet's biological fixation! It's no small wonder we are seeing generally higher amounts of nitrogen within the nitrogen cycle, hence also more falling out of the cycle in various ways.

When do trees uptake nitrogen?

In deciduous crops, the growth flush in spring is mainly driven by reserves in the plant from previous growing seasons. Once most of the stored nitrogen has been mobilised, and the tree has access to photosynthates from new leaf, root uptake begins. The tree requires active photosynthesis for nitrogen root uptake, and so similarly as leaf fall approaches, nitrogen uptake drops off.

Practice and thinking differs in different fruit sectors comparing spring and autumn applications. This is generally based on key research that has been done historically in those crop types here and overseas.

A generalisation is that if you are needing nitrogen specifically into buds to strengthen the flowering and fruit set the coming spring, but you do not want any more nitrogen to invigorate shoot growth and entering this season's fruit, then post-harvest is the time that makes sense.

If you are looking at supplying longer term nitrogen requirements, and more vegetative growth this season is desirable, then spring applications work.

Apply nitrogen so that it is available to the root zone when your plants are actively photosynthesising. Then within this, consider what plant responses you want to achieve or avoid to determine timing. Most fruit sectors have timing advice specific to their crop.

Practically, there is also less risk applying in spring, as there is a longer optimal window of time than during post-harvest. Once leaves are actively photosynthesising, roots are actively growing and seeking nutrients, and there can be a period of about three months to spread applications over. This is as opposed to post-harvest, where for example in apples, the ideal post-harvest timing for early varieties is still during harvest for others. For late varieties, post-harvest timing can get quite close to leaf fall, when uptake slows down and stops for winter.

How much do you need each year?

Much of the nitrogen is recycled through the plant across multiple years, so the main loss or gain pathways to consider are:

Losses	Gains
Crop exported off the property	Biological fixation
Prunings burned or removed from property	Decomposition of soil organic matter
Leaching loss	Human inputs – fertiliser and composts
Loss to gaseous forms	

Our challenge is to match input volumes and timing closely to uptake for the crop, to keep efficiency of use high, keep the crop at the correct nitrogen level, and minimise losses to leaching and gaseous forms.

Young trees require enough nitrogen also to grow their canopy volume. Mature crops that do not need to grow as much new foliage or wood each year tend to require less nitrogen than, for example, kiwifruit where new canes are grown each year to replace most of the canopy area annually. However, this difference is not necessarily a loss – the prunings and leaf fall in kiwifruit will cycle into organic matter, decompose and become available to the roots again at times when there is warmth and moisture. And this coincides perfectly with when the vines will be actively growing and taking it up. However, the fact that it cycles through the nitrate form allows the chance that it will be lost with a drainage event at the wrong time, so the risk of loss is greater.

Most fruit crops are capable of luxury uptake of nitrogen. In many cases the elevated levels do not result in higher production (as they were not limiting), but usually result in lower fruit quality attributes that manifest through harvest, packing and storage. ●

Carbon farming intricacies

Keith Woodford, honorary Professor of Agri-Food Systems at Lincoln University, has recently written a number of articles comparing the economic returns of planting pine trees on farmland for carbon farming to various livestock farming enterprises.

Robin Boom

The projected figures show that carbon farming is far more lucrative than the current high returns from sheep and beef and that it is also more lucrative to plant a lot of recently converted dairy farms even at a $9/kg Milk Solids payout, into pine trees, and only intensive dairy farms and horticulture will be able to compete economically with carbon farming. In two short years the New Zealand Emissions Trading Scheme carbon unit price has more than tripled from $25 to $80 with projections it will shortly exceed $100 per unit.

Recent publicity about Huiarua Station on the East Coast, an iconic 5,000ha property inland of Tolaga Bay, being sold to go into trees for carbon farming has got politicians looking for solutions to the wholesale afforestation of pastoral land. Huiarua Station had been put up for tender in December last year and although there were good offers by livestock farmers, the deep pockets of overseas investors who understand the artificially created opportunity of carbon farming were the deepest.

Planting land into *Pinus radiata*, leaving them to absorb CO_2 out of the atmosphere for 30 years is easy money with few ongoing expenses. Huiarua Station has huge tracts of cropable and easy rolling country, and for this land to be lost forever, when there will be no net benefit for the local community, seems a tragic loss. When it comes to global climate change, there will be no gain worldwide, as the meat and wool not grown on Huiarua Station will be grown instead in some other country, where the carbon footprint is likely to be considerably higher.

New Zealand is known to produce food which has a very low carbon footprint compared to most countries. We were a signatory to the 2015 Paris Agreement of the United Nations Framework Convention on Climate Change and have a duty to fulfil the demands in the Agreement. One of the guiding principles in this agreement is "*Recognising the fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change*."

Article 2 (b) states the goal of "*Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner* ***that does not threaten food production***." As a food producing nation which feeds the equivalent of 40 million people through our food exports it is imperative that any policy implemented on climate change does not affect our food producing ability. Unfortunately these clauses in the Paris Accord seem to be ignored by many of our current crop of politicians.

Almost half of our greenhouse gas emissions come from agriculture, largely from enteric methane produced in the rumen of sheep, cattle, goats and deer, but also from nitrous oxide from animal urine and fertiliser nitrogen. Arable and vegetable crop production also produces greenhouse gases from CO_2 lost through soil inversion, fallowing and plant desiccation, as well as nitrous oxide from artificial nitrogenous fertilisers. Soil carbon loss can in part be mitigated through the use of composts, manures and biochar, but there will still be CO_2 lost into the atmosphere during the cultivation process from microbial decomposition of organic matter, a process which humans have been contributing to for thousands of years since the dawn of agriculture.

Soil carbon loss can in part be mitigated through the use of composts, manures and biochar, but there will still be CO_2 lost into the atmosphere during the cultivation process

Go-to tree

Pinus radiata is the go-to tree for carbon farming as it sequesters carbon rapidly due to its rapid growth, grows in a wide variety of conditions, gets close to maximum

sequestration in 30 years, meaning the carbon farmer will get maximum payment over thirty years, whereas native forests, a preference for many Kiwis, can take up to 300 years to reach their carbon potential, and in the short term the economic returns are a pittance compared to pines. Pine trees are a monoculture and do not encourage biological diversity in terms of bird, insect, flora and microbial communities. How upland afforestation will affect intensive horticulture downstream with things such as water quality, rainfall events, pollinators, bird and insect life; whether these will be better or worse than under pastoral agriculture is unknown.

Carbon trading and gaming with New Zealand Units (NZUs) in the Emissions Trading Scheme (ETS) through recent and upcoming auctions has been on an upward spiralling trajectory which looks to continue, and as it does, so too the local and international opportunists will convert farmed landscapes into trees. This has become an economic bonanza for retiring hill country farmers, but it is at the chagrin of their neighbours and rural communities as a whole, who see this loss of productive land to carbon sequestration as destructive to local infrastructure and job opportunities for future generations.

As an agronomist, I would like to see afforestation being limited to certain land classes based on Land Use Capability (LUC) categories. If afforestation was limited to LUCs of Class 6 soils and above, with more productive land categories remaining in agriculture or horticulture, when a property like Huiarua Station is sold, only the poorer producing areas should be allowed to be planted into trees, with the better country kept for food production of some sort.

Article 4/19 of the Paris Agreement states "*All Parties shall strive to formulate and communicate long-term low greenhouse gas emission strategies, mindful of Article 2 (above) taking into account their common but differentiated responsibilities and capabilities, in light of different national circumstances*." Our national circumstances are that we are blessed with a temperate maritime climate which is ideal for food production. We have limited Class 1 and 2 soils suitable for intensive horticulture, but we have significant class 4, 5 and 6 soils on steeper land which cannot be ploughed, but which is highly suitable for pastoral livestock production to produce meat and natural fibres.

Article 7 of the Paris Agreement states that signatory countries will engage in adaptation planning processes which may include "*The assessment of climate change impacts and vulnerability, with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems" and "Building the resilience of socioeconomic and ecological systems including through economic diversification and sustainable management of natural resources*" (clauses 9c & 9e).

In New Zealand there are many small rural towns and vulnerable communities which will be severely impacted if there is a wholesale conversion of good productive pastoral farmland into trees. Apart from the initial labour required for planting trees, if the trees are planted as a carbon sink, there will be no income earning potential for these communities whatsoever. If the trees are planted for commercial forestry production, there will be little labour required until harvest, and no income generated off the land until some 25 to 30 years later, which again would be devastating for local communities in the meantime.

I would like to see afforestation being limited to certain land classes

The very economic survival of most rural towns is dependent on providing support services for local farming families. Converting good productive farmland into trees will be the death knell for many of these communities, and is certainly not "*building the resilience of socioeconomic systems*" nor "*taking into account vulnerable people, places and ecosystems*" which Article 7 of the Paris Accord prescribes. Furthermore, when large national or international companies buy up good pastoral farms to plant into trees, they have no interest in the local communities. They do not live there, and often any tree work is contracted out to mobile forestry gangs from other regions. The money gained from timber sales never comes into the local communities as it goes to those foreign investors or Queen Street investors who have only purchased the land to 'carbon farm', and game this artificially created, politically driven, Emissions Trading Scheme (ETS).

Ironies

One of the ironies of the politics behind the ETS and carbon farming is that it is Left leaning politics which is promoting a cause that in reality is making a select few much wealthier and the vast majority poorer. It is a reverse Robin Hood scenario where money is taken from everyone via increased fuel taxes, energy, food, transport etc and given to the extremely wealthy who own these new forests, many of whom are overseas interests using our land to offset their own carbon emissions. It may look good for the New Zealand carbon balance in the short term to be sequestering carbon for the next 30 years through extensive pine afforestation, but as the Draft Report from the Climate Change Commission released last year stated, "*Forests have a role to play but we can't plant our way out of Climate Change*."

Being amongst the most carbon efficient food producers in the world there is no net gain to the world climate, as the food will be produced elsewhere with a higher carbon footprint. Unfortunately once land is planted into pines, in pines it is likely to remain. ●

New Zealand founded company marks 50 years in 2022

A spray equipment company founded in New Zealand which is now exporting products to the world is celebrating its 50th year of operation in 2022.

Croplands Equipment, founded by Miles Deck in 1972, developed the now market-leading Cropliner airblast sprayer in response to New Zealand's horticulture boom and has since grown to become one of the most popular sprayer brands on the market, servicing the horticulture, viticulture, arable, compact and home garden sectors in New Zealand, Australia and beyond.

Croplands general manager Sean Mulvaney said Miles' initial motivation for producing the Cropliner sprayer 50 years ago was to create a machine specifically designed for New Zealand conditions, believing imported sprayers at the time were inadequate.

"Croplands has a long history of delivering practical solutions for farmers stemming right back to the development of the Cropliner in 1972," he said.

"We pride ourselves on being resourceful and adaptable in meeting the needs of our customers – something Miles instilled in the company from day one.

"Croplands has been owned by Nufarm since 1988, but we continue to be guided by the strong family values that marked our beginning 50 years ago."

Sean said Croplands' Quantum Mist sprayers were another example of cutting-edge technology being developed to meet the needs of customers.

"Our equipment is designed to help crops and farmers thrive," he said.

"With its axial driven hydraulic fans, the Quantum Mist creates a turbulence among the leaves of vines or trees that produces unrivalled coverage and has been a game-changer in vineyard spraying."

"The Cropliner also remains one of our most popular products, demonstrating just how innovative Miles' original idea was."

Sean said the collaboration with Nufarm and long-standing relationship with PGG Wrightson and Fruitfed Supplies has meant customers receive the best support possible from machinery purchase right through to application in the field.

"Together, we have a major focus on chemical stewardship.

"That means our customers don't just get the sprayer, they also get the best advice in nozzle selection and best practice spray application as well."

Croplands will be celebrating its 50th year by expanding its Australian operation in Adelaide, and with a number of new product releases, with more detail to be revealed later in the year.

"We will continue to partner with farmers across New Zealand and the world to bring them the equipment they need to be profitable and productive," Sean said.

"Key to that will be our strong relationships with our dealer network."

More information: Kate McLachlan, Croplands Equipment marketing manager, **0427 419 178, kate.mclachlan@croplands.com.au**

NoMate – Mating disruption lures from Grochem

New pheromone technology to protect your apple and pear crop from codling moth.

Introducing NoMate Gold, a high strength pheromone dispenser for mating disruption of codling moth to prevent orchard infestation.

The NoMate Gold spirals have a much higher pheromone loading than the standard CM spiral and release at a higher daily rate for a longer time, as shown in the graph below. Therefore the same high level of prevention is attained even though there are only half the number of spirals (500 per hectare).

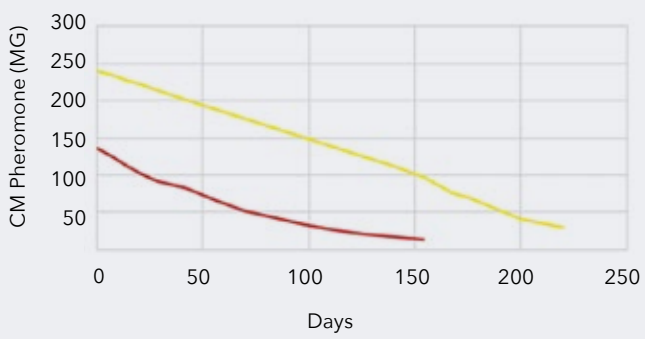
NoMate CM and Gold have been designed and manufactured in the United States by Scentry Biologicals, leaders in pheromone technology since 1978. Grochem introduced the CM spiral into New Zealand in the early 2000s followed by NoMate 3 Species (for control of light brown apple moth green and brown headed leafroller) and Quattro, the spiral combining NoMate CM and 3 Species.

NoMate utilises a unique pheromone impregnated plastic spiral, which release pheromone at a consistent rate and are not affected by dust and weather. They are also quick and easy to apply.

The constant release of a pheromone cloud disrupts mating by causing confusion amongst the male moths making it unlikely they will find a female moth to mate.

Application is easy, economical, and won't damage the trees. (CM spiral.)

NoMate CM Spiral (red) vs NoMate Gold CM (yellow)



NoMate Spirals are easy to apply

For best results

- Pheromone lures must be hung in the top 10% of the tree to give an umbrella like protection.
- Lures must be dispensed on the orchard before the biofix date administered by New Zealand Apples & Pears.

Check with your technical advisor or Grochem representative before use for more information

NoMate SPIRAL

picknz.co.nz™

FREE JOB BOARD

LIST YOUR SEASONAL ROLES NOW!

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- 80,000 - 100,000 hits a month
- Designed for growers
- National advertising campaigns

The newly developed PickNZ Job Board is a free site for employers to list seasonal roles like picking, packing, or thinning work.

Plan for the season by listing jobs in advance and collect "Expressions of Interest".

PickNZ is the go-to site for listing seasonal roles, and is backed by HortNZ, NZAPI, NZKGI, Summerfruit NZ and government to help fill seasonal vacancies.

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