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VOL 76 | NO 10 | DECEMBER 2021

HORTICULTURE NEW ZEALAND

SUPERB SQUASH

PAGES 40 & 42

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Value is being added to New Zealand buttercup squash through the 'Three Good Men' partnership and development of a novel new squash milk, 'Kabocha Milk'.
See pages 40 and 42.
Photo; Three Good Men

PRODUCT GROUPS

THE YEAR THAT WAS: PLENTY OF POSITIVES DESPITE TURBULENT TIMES

Words by Barry O'Neil : HortNZ president

The year 2021 was the United Nations International Year of Fruits and Vegetables.

The total global fruit and vegetable market is expected to be worth USD $373.5 billion by 2022, at a compound annual growth rate of 7.1% from 2017 to now.

Demand for New Zealand fresh fruit and vegetables is fantastic. We grow amazing produce that everyone wants more of, needs more of, and that ticks all the right boxes. It was a shining light in what otherwise was a very dark year; and with it, carried relief in knowing that demand for our produce will only increase as the world turns to an even healthier diet and to food that has been produced more sustainably.

It may seem like a paradox that there could be any positives in a year like 2021, but believe it or not there have been some. I would like my final article of the year to highlight some of these, along with some wishes for 2022.

In one of the most challenging years on record, the incredible effort from team Hort ensured most crops were still planted, harvested, packed and shipped – an amazing result from all who work in the sector. While you may be feeling like you have been to hell and back to make it happen, to me, it reinforces the calibre and commitment of all who work in this industry.

Congratulations to Melissa van den Heuvel who took home the 2021 Young Grower of the Year finals in Wellington. Fantastic effort Melissa, well done.

I wonder what Apata put in their water considering three of their staff have been national winners now! Recognition is also due for all the other contestants who stepped forward in what was an extremely high standard of both regional and national competition this year.

> "Being the only primary sector allowed to bring our full quota of 14,400 seasonal workers into New Zealand without having to go through Managed Isolation and Quarantine (MIQ) was another huge achievement for the sector

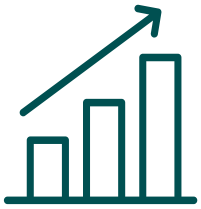
Our conference at Mystery Creek in August was a great event and we were lucky to get 700 people together for an amazing line-up of speakers in a year so disrupted by Covid-19. Mike Chapman was awarded the Bledisloe Cup at conference too in recognition of the incredible work he has done in horticulture, especially during his five-year tenure as Hort NZ's chief executive.

Another amazing achievement over the last nine years has been the great work and contribution of outgoing Apple and Pears chief executive, Alan Pollard, who has worked tirelessly to drive the expansion of the apple and pears industry in NZ, along with overseas markets access. I wish Alan all the very best for the next stage of his career.

Nadine Tunley replaced Mike as our new chief executive in June. Nadine immediately hit the ground running (maybe sprinting is more correct!) and we are already seeing the results of her leadership. The wider HortNZ team also did a fantastic job during the year with tackling labour and environment issues, as well as driving for Covid protocol certainty, all the while keeping everyone fully informed along the way.

It wasn't only HortNZ attracting talented new leadership this year. Kate Hellstrom was appointed as Summerfruit NZ chief executive, Colin Bond took the role of NZ Kiwifruit Growers Inc. chief executive, and Terry Meikle was recently announced as the NZ Apple and Pears chief executive. All great appointments and it's fantastic that such experienced and intelligent people are wanting to work in the horticulture sector.

Being the only primary sector allowed to bring our full quota of 14,400 seasonal workers into New Zealand without having to go through Managed Isolation and Quarantine (MIQ) was another huge achievement for the sector. I recognise all in the industry, product groups and HortNZ, who worked so hard to make this possible.



THE TOTAL GLOBAL FRUIT AND VEGETABLE MARKET IS EXPECTED TO BE WORTH USD

$373.5 BILLION

BY 2022, AT A COMPOUND ANNUAL GROWTH RATE OF

7.1%

FROM 2017 TO NOW

And while we all realise there will still be major shortages of seasonal staff for 2022, without our Recognised Seasonal Employer (RSE) scheme workers we would be in really dire straits.

Finally, my wish list for 2022 – which, by the way, is the United Nations International Year of Glass… transparency maybe?

New Zealand must get back in business. No more MIQ, borders or associated policy settings, enabling RSEs, backpackers and skilled migrants to enter the country without unnecessary costs and restrictions so we can fill work shortages in horticulture and the wider food and fibre sectors.

Shipping, fingers crossed, is showing signs that it will return to more predictable schedules with more reefers available and at more affordable rates. It needs to return to some sense of normalcy, and I especially hope our South Island growers and exporters who were more disadvantaged than others, get supported.

Last but no means least, **NO** new government primary sector reforms to be proposed please Jacinda and Damien, as our cup already overflows with what we have on the table now.

Thanks to all growers and members for working with and supporting HortNZ over the year. I hope you get some well-deserved time off the job to be with family and friends, relaxing and hopefully getting to enjoy the benefits of living in Aotearoa New Zealand.

Ngā mihi o te Kirihimete me te Tau Hou.

NZGROWER

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Your Levy AT WORK

MPA Associate Member (NZ)

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UNITY AND POSITIVITY IN 2022

Words by Nadine Tunley : HortNZ chief executive

I have now been back in the horticulture industry for six months after being away for four years, albeit still in the food and fibre sector as part of the honey industry.

The horticulture industry is a lot more diverse than say the dairy or meat industries. We grow more than 100 different varieties of fruit and vegetable, up and down New Zealand, for domestic and/or export. Plus, growers are represented by more than 40 groups, including product groups and district associations, all of which are very clear that they advocate for growers' interests.

I often hear it said that working with Government is more difficult than it should be because so many different Government agencies are involved in one topic. Take water for example. There's the Ministry for the Environment and Ministry for Primary Industries, along with the Ministry for Business, Innovation and Employment and the Department of Internal Affairs – and that's just listing the biggest agencies.

But when I talk with Government, they equally say it is very difficult working with the horticulture industry, because we are diverse and there are many seemingly contradictory voices. When I have reflected on this past six months, it is discussion about the differences that I remember not discussion about common challenges, I am afraid.

Many of the conversations I am part of start with the differences not the similarities and often, we never get beyond the differences. There are exceptions, however, for example, biosecurity being a long-term example, and how we have come together to ensure continuation of the Recognised Seasonal Employer (RSE) scheme, despite the border situation, being more short term.

Unity is what we need more of if we are to influence the Government. That doesn't mean forgetting our differences but it does mean focusing on our similarities, of which there are many, so we can get traction with the Government, in terms of policy, regulation and funding.

We also need to be positive because that in turn will foster a positive reception. There are so many things about our industry that are positive and align with Government outcomes, for the environment as well as the economy, to say nothing of the health of New Zealanders.

My last point is on perception. We need to be professional, lead by example, and be mindful of Government and public perception. Once again, there are many examples of how we do this well. For instance, how – as an essential industry – we have continued to grow while keeping us, our workers and the New Zealand public safe. That's been no mean feat and is something we can be very proud of.

Next year, I hope as an industry we can become more unified and make more use of what the Government is making available to us, in terms of support for innovation and problem solving. Yes, on the one hand the Government seems like a handbrake, but on the other, there is a genuine desire to support our industry and assist it to reach its potential, as we adapt to Covid and climate change.

Let's make 2022 the year for unity and positivity so we can leverage all the opportunities available to us!

Changes at New Zealand Apples and Pears

I would like to take this opportunity to farewell Alan Pollard and welcome Terry Meikle as the new Chief Executive of New Zealand Apples and Pears.

Alan has worked tirelessly to advocate for the apple and pear industry over the past ten years. I was fortunate enough to be Alan's first chairperson, when we set the strategy of "a billion dollars by 2022". At the time in 2012, we were a circa $320 million industry.

Apples and pears were the first sector to reach the Government's business growth agenda goal of doubling export value. This milestone was achieved in the 2016/17 season with $720 million and had it not been for the hail event in Nelson on Boxing Day 2020, apples and pears would have hit the billion this season, a year ahead of target.

There have been many other achievements during Alan's tenure, including bedding in the Recognised Seasonal Employer (RSE) programme, to the envy of many other sectors.

I would like to congratulate Alan on a fantastic decade and several outstanding achievements. As the horticulture industry, we wish you all the best in your next chapter. Thank you for your service and dedication.

HortNZ looks forward to working with Terry and his team to meet the challenges of the next ten years, to ensure continued growth in returns to apple and pear growers.

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YOUR LEVY AT WORK

INDUSTRY WIDE ISSUES FOR INDUSTRY GOOD

08 BIOSECURITY

NATURAL RESOURCES AND ENVIRONMENT

Words by Michelle Sands : HortNZ environment manager

Wetland Guidance

Hort NZ has made a submission on the government's discussion document on Managing Wetlands. HortNZ generally supports the protection of natural wetlands of ecological value, and enhancement of those degraded natural wetlands that have identified ecological value.

Our submission made the following key points:

Definition of wetland

- Generally, HortNZ supports the definition and proposed amendments within the National Policy Statement for Freshwater Management (NPS-FM), but seeks that riparian margins with a functional purpose are included as constructed wetlands.
- HortNZ does not support the interpretation that constructed wetlands are deemed natural wetlands where they have not been maintained over time. HortNZ seeks that this be removed from the Minister for the Environment's (MfE) interpretation guidance.

Restoration, maintenance and biosecurity

- HortNZ supports provision of maintenance and biosecurity works as permitted activities, but seeks separate regulation that enables rapid response from the agricultural sector to unknown biosecurity incursions.

Additional pathways

- HortNZ seeks an additional Discretionary Activity pathway for vegetation clearance, earthworks or land disturbance associated with arable and horticultural land uses outside but within 10 metres of a natural wetland that meet specific criteria.

> "The next steps will be District Plan hearings of submission, this is expected to get underway in mid-March 2022

Greater Wellington Regional Plan

The Proposed Natural Resources Plan (PNRP) decision version was notified in 2019. Since then, appellants, interested parties and the Council have been working to resolve appeals, after which the plan will become fully operative.

The last outstanding appeals are almost resolved, meaning the plan will fully replace the previous regional plans. Through the appeal process, a new framework is being introduced to manage diffuse discharges when there are land use changes enabled by irrigation (through a consenting process) and a phased-in requirement for Farm Environment Plans or Freshwater Farm Plans in catchments most impacted by diffuse discharges. HortNZ will prepare a summary of the new requirements for growers.

> "HortNZ does not support the interpretation that constructed wetlands are deemed natural wetlands where they have not been maintained over time

Central Hawke's Bay District Plan

The Proposed Central Hawke's Bay District Plan was notified in May 2021 – HortNZ made a submission and a further submission. The key topics HortNZ has an interest in are ensuring Highly Productive Land is appropriately protected, that horticultural structures (such as artificial crop protection structures) are provided for in the rural environment to enable horticulture, that there are provisions which enable a timely biosecurity response and that rules for greenhouses are appropriate.

The next steps will be District Plan hearings of submission, this is expected to get underway in mid-March 2022.

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BIOSECURITY – THE YEAR IN REVIEW 2021

Words by Anna Rathé : HortNZ biosecurity manager

The Covid-19 pandemic has made the general public much more aware of terms that were already familiar to those of us involved in horticulture, pest management and biosecurity. Terms like transmission, quarantine, vectors, latent periods, slowing the spread and virulence.

Hopefully the whole nation (and world) experiencing a human health biosecurity event will help with better biosecurity understanding and behaviours from the public in the future – which will, in turn, help to protect the sector.

Whilst passenger numbers remain low, online shopping has boomed. E-commerce is an increasingly important pathway and with international packages comes biosecurity risk that needs to be managed carefully. Supply chain disruption has resulted in major delays with getting important goods and equipment into the country. Despite these challenging delays it is important to take the time to inspect any item from overseas carefully in an enclosed space before taking it out into the field or packhouse.

It is critical to keep up with what is happening with pests, diseases and weeds overseas. International experts have been kind enough to virtually share their knowledge and learnings with New Zealand scientists, industry and officials this year to help us better prepare. Examples include spotted lanternfly, which is present in Pennsylvania and brown marmorated stink bug perspectives from Chile, Italy and the US. We are also watching what is happening over the ditch in terms of emerging risks. Australia has recently seen the rapid spread of fall armyworm as well as detections of two types of leafminer and a shot-hole borer – all pests that we don't want to arrive here in New Zealand.

The usual focus on readiness has continued, with both government and industry recognising how important it is to use 'peace time' to get prepared for what may come. Collaborative readiness work has progressed for high-risk organisms such as fruit flies, brown marmorated stink bug, *Xylella fastidiosa* and Lepidoptera. Those in the biosecurity space are constantly working to reduce the risk of new organisms arriving and preparing for the incursions which do inevitably come.

Whilst zero biosecurity risk might be nice, it simply is not realistic with trade, travel and natural wind and water currents; all of which can inadvertently bring pests and pathogens into our country despite New Zealand's strong biosecurity system.

Unfortunately, responses have also featured this year, such as the pepino mosaic virus that the tomato sector and other Government Industry Agreement signatories have been responding to.

Feeding into government consultations has been a big focus in 2021 too, with HortNZ lodging more than ten submissions (and counting) in the biosecurity space. Topics ranged from border levies, to importation of plant germplasm, to pathogen testing and the need to provide biosecurity information to passengers on their way to New Zealand.

Biosecurity submissions were lodged with the Ministry for Primary Industries, Customs and the Primary Production Select Committee.

The biosecurity business pledge has gained significant momentum this year. The signatories now number over 100 and include a very diverse range of organisations spanning all parts of the supply chain. Signatory organisations have spent the year improving their own biosecurity practices and sharing their learnings along the way.

Looking forward into 2022, we'd like to encourage all growers to play your (very important) part in New Zealand's biosecurity system. You can do this by:

- Committing to the preparation of an on farm/orchard biosecurity plan. Guidance that steps you through how to prepare a plan is available from specific product groups and on the HortNZ website.
- Making yourself familiar with the most unwanted pests, pathogens and weeds for your crop(s).
- Downloading the find-a-pest app and reporting anything unusual. You can use the app or the MPI pest and disease hotline (0800 80 99 66) to report, whichever you prefer.
- Remaining vigilant when you open packages, mail or freight from overseas (including Christmas presents!). Unpack imported goods in an enclosed space and inspect them carefully for any unwanted hitchhikers.

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The wage contribution is paid to you, the employer, and will generally be either:
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Flexi-wage can also include ongoing advice and support to help new team members settle into your workplace and help with the cost of pre-employment, in-work or short-term training and NZQA training up to level three (in addition to the wage contribution).

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To find out more visit:
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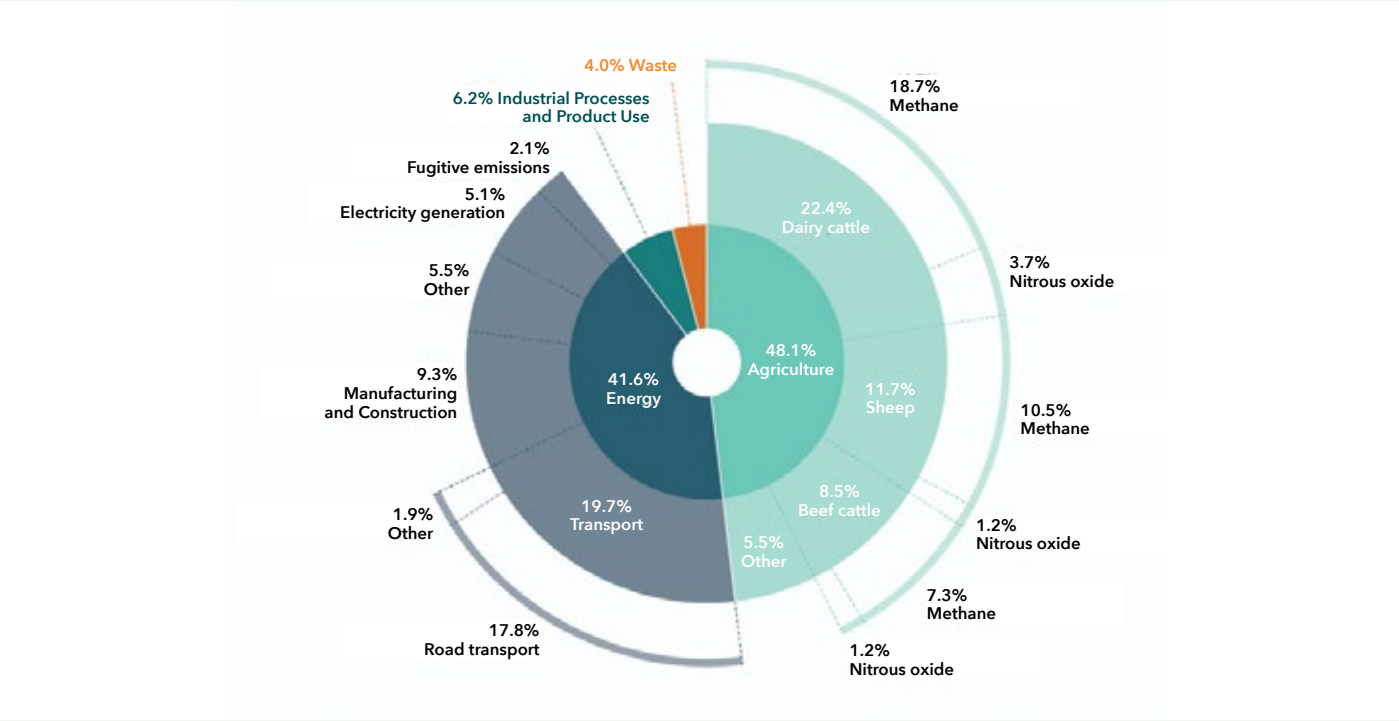
MINISTRY OF SOCIAL DEVELOPMENT
TE MANATŪ WHAKAHIATO ORA

WORK AND INCOME
TE HIRANGA TANGATA

PUTTING A PRICE ON AGRICULTURAL GREENHOUSE GAS EMISSIONS

Words by Ailsa Robertson : HortNZ sustainability and extension manager



Image; Ministry for the Environment[1]

The buildup of greenhouse gases (GHGs) in the Earth's atmosphere as a result of human activities is causing the Earth's climate to change.

These gases trap heat in the Earth's surface and warm the planet. Different GHGs have different lifetimes, with some short-lived gases present for a few years and some longer-lived gases present for thousands of years. GHGs accumulate in the atmosphere over time, with each year's emissions added to the preceding year's emissions.

New Zealand's share of global GHG emissions is small, but our gross emissions per person are high, remaining relatively unchanged since 2005. In 2019, New Zealand's gross GHG emissions were 82.3 million tonnes of carbon dioxide equivalent (Mt CO_2-e), comprising 45% carbon dioxide, 42% methane, 10% nitrous oxide and 2% fluorinated gases.

The figure above shows the breakdown of New Zealand's 2019 emissions by sector, sub-category, and gas type.

The agricultural sector is responsible for 48.1% of New Zealand's gross emissions. Within the agricultural sector, 22.4% of emissions are from dairy cattle, 11.7% are from sheep, 8.5% are from beef cattle, and the remaining 5.5% are from other sources. Nitrous oxide emission from the application of synthetic nitrogen fertiliser is part of the 'other', accounting for 2.8% of New Zealand's gross emissions, and 5.7% of New Zealand's agricultural GHG emissions.[2]

New Zealand has several domestic and international GHG emissions reduction targets.[3] Domestic targets under the Climate Change Response Act are:

- Net zero emissions (i.e. emissions are matched by removals) of all GHG other than biogenic methane by 2050, and
- 24 to 47% reduction below 2017 biogenic methane emissions by 2050, including 10% reduction below 2017 biogenic methane emissions by 2030.

He Waka Eke Noa – a partnership to reduce agricultural GHG emissions

New Zealand's agricultural GHG emissions aren't currently priced in the NZ Emissions Trading Scheme (ETS), whereas emissions from other sources, like fuel and electricity, are priced in the ETS.

He Waka Eke Noa is a partnership between primary sector, government and iwi/Māori to develop a system for measuring, managing, pricing and reducing agricultural GHG emissions, rather than simply putting farm products in the ETS.

He Waka Eke Noa is concerned with methane and nitrous oxide from animal emissions, and nitrous oxide from synthetic nitrogen fertiliser. *He Waka Eke Noa* is designing options for an alternative pricing system to the ETS for methane and nitrous oxide, and a process to recognise sequestration from a broader range of woody vegetation than is currently eligible for the ETS, such as native vegetation, shelterbelts and orchards.

A (methane)	+	B (nitrous oxide)	–	C (sequestration)

For growers that don't have animals, this means from 2025 there will be a price on synthetic nitrogen fertiliser emissions either at the farm level based on annual quantities applied, or for all fertiliser sold at the point of purchase, either the processor or fertiliser company.

There are two pricing options in addition to the 'backstop' default ETS option. The two alternatives are a farm-level levy or a hybrid-processor levy.

The *He Waka Eke Noa* partners, including HortNZ, are planning engagement with farmers and growers in February 2022 on these pricing system options. Feedback from this engagement will form part of the final policy recommendations to the Minister of Climate Change and the Minister of Agriculture in April 2022.

The following table summarises the elements of each pricing system, followed by some examples of prices that growers could face based on the price of carbon in the ETS.

As the partner organisation representing horticulture in *He Waka Eke Noa*, HortNZ has remained relatively neutral on the three pricing options to date, so long as they do not disadvantage horticulture with disproportionate cost relative to emissions.
We want to hear growers' views and feedback on these options when we go out for engagement in February 2022.

Pricing system options in *He Waka Eke Noa*

	'Backstop' ETS	Farm-level levy	Hybrid-Processor levy
Who pays the bill each year	Processor or fertiliser company	Individual grower or collective	Processor or fertiliser company or collective
Tax Type	Trading Scheme	Levy	Levy
Pricing: **1. Approach** **2. Setting** **3. Exposure**	1. Carbon Equivalent 2. ETS Market 3. Free Allocation – 95% in 2025 and 1% phase-out per year	1. Split Gas 2. Independent Body 3. To be determined	1. Split Gas 2. Independent Body 3. To be determined
Who reports	Processor or fertiliser company	Individual grower (landowner or business owner – to be determined)	Voluntary through an Emissions Management Contract
Farm Plan	No	GAP farm plan	Voluntary through an Emissions Management Contract
Sequestration	Earn units for ETS eligible forestry	Offset with *He Waka Eke Noa* eligible woody vegetation	Offset with *He Waka Eke Noa* eligible woody vegetation
Revenue invested back in R&D and technology	Yes		
Administrative cost to participate and operate the system (not including the cost of emissions) per annum	$10,000,000	$113,000,000	To be determined
Emission reduction achieved by 2030	1%	1%	1%

[1] *https://environment.govt.nz/publications/new-zealands-greenhouse-gas-inventory-1990-2019-snapshot/key-findings-of-the-2021-inventory/*
[2] *http://flrc.massey.ac.nz/workshops/19/Manuscripts/Paper_Gibbs_2019.pdf*
[3] *https://www.mfe.govt.nz/climate-change/climate-change-and-government/emissions-reduction-targets/about-our-emissions*

YOUR INDUSTRY

ACROSS THE SECTOR – ACROSS THE COUNTRY

36 MIGHTY MICROGREENS

WEATHER BOMB HIGHLIGHTS THE NEED TO FOCUS ON FUTURE OF FARMING

Words by Kristine Walsh

Steel framing for LeaderBrand's new greenhouse has arrived and the first poles have been installed

Increasing competitiveness in the domestic market and the goal of reducing environmental footprints will be key for farming in the future, says LeaderBrand chief executive Richard Burke.

So too will be the need to adapt and innovate as climate change impacts the way we farm. This reality was reinforced in the first week of November, when the heavens opened. MetService recorded 174 millimetres of rain, nearly three times the average for November, at its Gisborne Airport site in the 36 hours leading up to 4pm on 4 November.

A state of emergency was declared and paddocks around the region were flooded.

As the mop up began, Richard said damage from the storm would have short-term impacts on LeaderBrand's spinach and rocket crops and could lead to supply gaps for corn early in the New Year.

"It was not the worst storm we've seen but weather events like that are becoming more frequent as the country's climate continues to be impacted," Richard says.

"Monitoring weather is a daily practice for us and we're continuously looking to mitigate negative impacts where possible. We're also extremely lucky to be able to distribute our crop supply across our multiple farms growing across the country."

As well as growing 300 hectares of Pinot Gris, Chardonnay and Gewürztraminer grapes, LeaderBrand is the largest broccoli grower in New Zealand; is a big exporter of squash and processed sweetcorn; grows tomatoes for processing; and supplies about a third of the country's bagged salad products.

The company employs around 450 permanent staff, plus an extra 150 seasonal workers during the harvest. With farms in the South Island, Matamata and Pukekohe, LeaderBrand was able to increase production at its other farms to secure supplies of spinach, broccoli and lettuce in the weeks after the storm.

However, had there not been pandemic-related delays to the construction of its massive greenhouse development at Makauri, the weather bomb would have been easier to manage.

"We know agricultural practices are going to have to adapt to the country's increasingly variable climate and we hope our new greenhouse will ensure that big weather events of the future won't be as destructive as this was," Richard says.

"If we'd had the greenhouse built already, that shelter would have saved everything under cover, and we wouldn't have lost as many crops as we did.

"It will be a massive change to the way we farm but we think that this style of farming will be the way of the future. Adapting and changing is our only way forward to ensure

LeaderBrand chief executive, Richard Burke, on-site at the 40 million-litre water dam that will be filled with rain from the cropping house

we can continue to provide fresh produce all year round, while mitigating the environmental impact of all that water and soil running out to sea."

Richard says as well as addressing issues around climate and the environment, the greenhouse development will help LeaderBrand remain a competitive supplier to the domestic market.

Though the company has a summer production of up to 90,000 bags of salad a day – around 30% of New Zealand's bagged salads – interruptions to supply could turn consumers off (or to another product) so shoring up consistent, year-round supply is important.

> **"Though the company has a summer production of up to 90,000 bags of salad a day – around 30% of New Zealand's bagged salads – interruptions to supply could turn consumers off**

"In addition, Gisborne has seen the influx of a lot of growers targeting the export market so competition for land, for people and for water is really high," says Richard. "That's the space we are operating in as we try to cater for the domestic market and it's not getting any easier."

With around 3,000ha under cultivation at its various farms, the covered facility will be just a small part of LeaderBrand's operation, but a big part of the company's future.

The project got the go-ahead in October 2019, when Kānoa – Regional Economic Development and Investment Unit confirmed the company had secured a $15 million loan to part-fund the construction of its planned 11-hectare undercover growing facility.

The first Covid-19 lockdown in March 2020 impacted construction, as did subsequent lockdowns, international shipping delays and border restrictions.

Fast-forward to December 2021 and on-site work on the infrastructure is now complete; the steel framing has arrived from France; and the first poles have been installed and are stretching towards the sky.

"We had planned to be operational by this time, but no one had anticipated a global pandemic, borders closed and shipping impacted," Richard says.

"As it stands, we aim to complete the build by June 2022, with a view to harvesting our first undercover crop ten weeks after completion."

MetService recorded 174mm of rain in Gisborne in the 36 hours leading up to 4pm, 4 November

Stage one of the project consists of one, giant 11-hectare greenhouse that will be serviced by the already-installed one-million-litre treated water tank and 40-million-litre dam, fed by catchment from the greenhouse roof.

That will make the facility self-sufficient for water, while the controlled environment will make for more accurate nutrient management.

In many ways, it will operate just like a traditional farm, with seed planted directly into the soil and tractors trundling about under the six-metre-high structure.

"But in reality, the project will revolutionise the way we farm in the future, accelerating year-round crop growth in a more sustainable manner; helping mitigate weather impacts; and creating more consistent product that will secure more jobs across the year," Richard says.

"And we'll continuously be looking at ways we can make it even better, such as through the use of electric vehicles."

However, there is still much to be learned before they move towards completion of a total 15ha of covered cropping.

"Those first 11 hectares will need to prove their worth as, while there are examples overseas, an operation of this scale has not been done in New Zealand," says Richard.

A 40-million-litre dam and one-million-litre watertank will service the new greenhouse

A big unknown for LeaderBrand will be crop rotation. Will they get four crop rotations in a year? Seven? Overseas examples have achieved up to nine, but they won't know until they do it.

"The opportunity here is tremendous, so our focus is firmly on nailing down what will work," says Richard.

"For us, this is a learning period that gives us a good look at what the future of farming could look like."

ALL THAT GLITTERS IS NOT ALWAYS GOLD

Words by Mike Nichols

A handful of growers across New Zealand are trying their hand at cultivating the highly prized, exotic red spice, saffron.

Extracted from the flower Crocus sativus, it is one of the most expensive spices in the world, with a per gram value similar to that of gold.

The cost is justified when you consider that it is harvested entirely by hand. Each individual saffron thread must be carefully removed from the flower, with each flower producing just three strands of the delicate red threads. More than 150 flowers are required to produce just a single gram of saffron. It is an Incredibly labour-intensive crop. For this reason, 90% of the world's saffron is produced in Iran by peasant farmers.

Harvesting occurs over a period of four to five weeks in autumn, when the corms begin to flower and grass-like leaves appear. In the spring, replacement corms are produced in the ground, just above the mother corm.

On the surface, saffron would appear to be an ideal crop to grow in New Zealand – where distance from market and freight costs are major constraints – but in fact, our high labour costs and the intensive labour required means few operations opt to grow such a crop.

Owner-operators of Kiwi Saffron, Jo and Steve Daley, are among the bold who decided to try their hand at growing saffron on a site in Te Anau.

"Steve and I began growing saffron in 2013," says Jo. "I wanted to order 500 corms to plant for home use, but Steve placed an order for 40,000 corms… that's really how Kiwi Saffron Ltd was born."

Their farm has proved to be an ideal climate for growing the sought-after spice.

Red gold - saffron holds a similar per gram value to gold

Steve (left) and Jo Daley are among the few growers in New Zealand harvesting saffron and have built a successful business from their crop

Kiwi Saffron's corms in flower

"Our site is technically too far south to be considered for corm growing due to higher rainfall. Constant wet feet would promote rot or botrytis in the corms," says Jo. "But with our site's high elevation and rather sandy soil, drainage has not proved to be a huge problem."

> **Flowers are picked and processed on the same day to preserve freshness and vitality**

A bonus of their southern location is also the high level of ultraviolet (UV) light.

"High UV exposure results in higher colour, flavour and aroma in the saffron, the three most sought after attributes of great saffron," says Jo.

Processing involves handpicking flowers in the early morning, plucking stigmas from the flowers indoors and drying via dehydrators for a consistent time, at an even temperature.

"High temperature drying prevents bacteria and ensures long shelf life if kept away from heat and light in storage," says Jo.

Flowers are picked and processed on the same day to preserve freshness and vitality. Kiwi Saffron processes only the tips of the saffron thread, discarding the white and orange parts of the stigma. The result is a product called Sargol, which is recognised by its rich red colouring and considered as the highest quality saffron available on the market.

"We do lose a little volume with not including yellow parts of the stigma, but the result is one of the purest saffron products available," says Jo.

"Our Sargol consistently scores highly against ISO 3632-2 standards, placing it into pharmaceutical grade. It lends itself to many medicinal and nutritional supplements too."

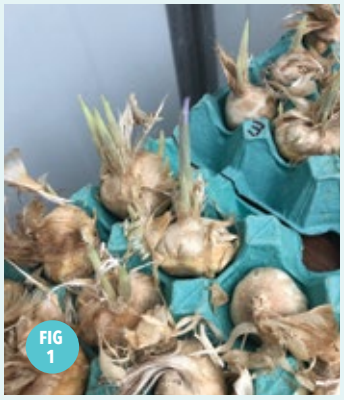
Despite being a labour-intensive crop, Steve and Jo say they still enjoy the job.

"But we both enjoy the time in the paddock and spent around the table plucking the stigmas with our helpers," says Jo. "Folk have gathered in this way for centuries to process saffron. The camaraderie is great and a lot is learned and shared by all involved."

> **More than 150 flowers are required to produce just a single gram of saffron. It is an Incredibly labour-intensive crop**

Like other growers around the country, the biggest challenge for the Daleys right now is labour.

"Covid-19 has hugely affected our harvest and we do not have ready access to the WWOOFing [Worldwide Opportunities on Organic Farms] community that we normally enjoy or travelling backpackers looking for seasonal work."



Saffron corms in egg trays

If saffron is to become a more profitable and more commonly grown crop in New Zealand, it will require considerable effort to develop growing processes and production methods that address these labour shortages and improve harvesting efficiency.

Robotics would certainly make the harvesting of saffron less laborious, but it remains to be seen whether such technology could be used without compromising the flowers and the quality of the delicate red threads housed inside them.

"We feel robotics is perhaps the way forward," says Jo. "But that technology is currently very expensive and out of reach to small companies and growers. It would be great to see research and development easily accessible and shared by growers as the industry progresses."

> **"If saffron is to become a more profitable and more commonly grown crop in New Zealand, it will require considerable effort to develop growing processes and production methods that address these labour shortages and improve harvesting efficiency**

Technology might also be considered for creating an ideal growing environment for the corms. Is it possible to 'persuade' saffron to flower at any time of the year? After corms have experienced a period of high temperature in summer, saffron begins to flower in autumn as the temperature falls. The challenge would be to mimic this environment for different sets of corms throughout the year in order to achieve a continuous supply of flowers.

We also know that under appropriate temperature conditions, saffron will flower in egg trays without any growing medium (**Figures 1, 2, 3 & 4**).

Saffron corms flowering in egg trays

This flowering occurred under incandescent lights, posing the question of whether the flowering process actually requires light. It also poses the question of whether the chemical content of the saffron spice might be enhanced by using lights with specific wavelengths (ultraviolet?) or whether this is already pre-determined by the chemical content of the corm.

Immediately after flowering, the corms can then be planted into deep trays filled with growing medium to complete their growth and develop replacement corms (**Figure 5**). The Daleys have experienced light enhancing the crop themselves, with Te Anau's higher than usual level of UV light intensifying the colour, flavour and aroma of their saffron.

With dried saffron spice currently valued at a whopping $US2,500/kg, a peasant industry may finally be coming of age.

Table 1. Effect of corm size (weight) on flower production

Corm weight (g)	Flowers/corm
>30	4.0
20–30	2.7
10–20	2.4
<10	1.6

Saffron growing in greenhouse after flowering

A GROWER'S STORY, HOW THE CLARKES ARE GETTING TO GRIPS WITH GHG EMISSIONS

Words by Ailsa Robertson : HortNZ sustainability and extension manager

Woodhaven Gardens in the Horowhenua has been figuring out how to reduce their impact on the climate. The Clarke family has been growing vegetables since the 1970s, growing 24 different crops across approximately 900 hectares. Woodhaven employs around 250 staff and sells 27 million individual vegetable units each year, accounting for about 10% of the national supply.

"In order to understand our environmental impact, we've had to get to know all of our paddocks individually," says Jay Clarke. Their journey to understanding their emissions began when they were looking at ways to reduce nutrient leaching to freshwater.

Nitrous oxide is a potent and long-lived greenhouse gas that comes from a range of sources, including farming. In agriculture, it is emitted into the atmosphere when micro-organisms in the soil act on nitrogen introduced either by animal urine or dung, legume plants or nitrogen-based fertilisers.

"Figuring that out was actually really helpful for us because it meant we were getting a two-pronged approach," says Jay. "We were already looking at nitrogen for freshwater quality. By tackling that, we've also been able to lower our greenhouse gas emissions."

In 2019–20, Woodhaven Gardens emitted 588 tonnes of nitrous oxide, expressed as 'carbon dioxide-equivalent' – just under half what they emitted two years prior, and the equivalent of taking over 300 cars off the road.

Carbon dioxide equivalent describes the amount of carbon dioxide emissions that would provide the same warming effect over a specified period of time as the gas in question, in this case nitrous oxide.

On-farm actions

The team at Woodhaven Gardens works hard to produce the most amount of food for the least amount of fertiliser.

Here are the main things they've been doing to manage their nitrogen use:

- Tractor in a ploughed paddock with a planting unit on the back planting the next crop.
- Developed expertise in the crops they grow – understanding each one's growth cycle and fertiliser requirements.
- Regular soil testing (via a Nitrate Quick test) to find out how much nitrogen is already in the root zone.
- Investment in precision agriculture systems to ensure fertiliser is applied exactly where it is needed and tight to the root zone, at the right rate and the right time.

"We GPS'ed our tractors so we know that our inputs go exactly where we want them to, and we don't get fertiliser in the parts of the farm that don't need it," says Jay.

The Clarkes also pay attention to the health of their soil, using crop rotation and cover crops to further minimise the need for fertiliser.

"I never thought we'd get as far as this," says Jay. "But by changing a whole lot of little things, and being willing to try different things, we've been able to add it all up and have a major impact. It's something we're really proud of."

Jay says they are continuing to learn as they go and there are still parts of the system that need work, including monitoring whether the new, lower levels of fertiliser are sustainable across all seasons in the longer term.

Graphic showing tonnes of nitrous oxide emissions from Woodhaven Gardens, 2017–2020

HYDROPONICS A FOCUS IN CONTROLLED-ENVIRONMENT GROWING

Words by Geoff Lewis. Photos by Trefor Ward

Cody McNaughton with an injection manifold for an inline '3 part plus ph' injection system

There is a surprising amount going on in Tirau – a small but growing south Waikato town halfway between Hamilton and Rotorua. Among the activity is PGO Horticulture, a business that combines a mix of garden supplies, electronics and plumbing.

Technical director, Neville Stocker, is the second-in-line for the three-generation business and has "absorbed chemistry by osmosis.'

Son of British immigrants in the early 1970s, it all started with Neville's dad, Grenville Stocker who was an industrial chemist working for Dominion Salt at Mount Maunganui. He had access to an atomic absorption spectrograph which could give quick analysis of water samples, and quickly realised how accurate water analysis was imperative in the increasingly popular hydroponics sector.

Hydroponics is an agricultural system growing without soil by feeding plants a carefully formulated and monitored solution of nutrients dissolved in water.

A form of closed-system growing, hydroponics holds a variety of advantages over growing in soil and the outdoors. It is not dependent on the vagaries of the weather and a defined amount of water can be recycled, with nutrients that have not been picked up by the plants filtered out. Water use is greatly reduced, and nutrient run-off minimised, with many recirculating systems having no run-off. It is far easier to control nutrients and keep plant pests and diseases at bay rather than dealing with the random factors delivered in the natural environment.

Being able to control the majority of growing factors in an operation allows for far greater crop yields than can be achieved by other means.

> "Hydroponics is an agricultural system growing without soil by feeding plants a carefully formulated and monitored solution of nutrients dissolved in water

Solar-powered hydroponics systems are currently being studied by Elon Musk's SpaceX organisation as a means of growing food for future colonists of Mars too.

However, in earlier days, Stocker found himself the target of terse comments at times, even having hydroponics compared with 'black magic'.

Neville Stocker demonstrating the use of the Autogrow 'MultiGrow' controller made by Autogrow Systems Ltd Northshore and an iHydro unit made by Electronics Ltd Christchurch

LED Grow lights that can be tailored to the needs of a customer's specific crop

"I would be abused," says Neville. "The perception was that the system was unnatural, and the public's awareness of hydroponics meant the quality of tomatoes was blamed on hydroponics. But it is resource efficient, creates minimal run-off, and can make growing pesticide-free easier. The grower can grow what the buyer wants."

Stocker says hydroponics are amenable to many crops, widely used by big growers of capsicum, tomatoes and chillies and are now booming in the berry industry. A large proportion of salad and culinary herbs are produced this way too. Watercress is a great example, as it cannot be 'quality assured' if gathered from a natural stream. The system has become critical to growers growing for specialist buyers like big fast-food outlets that require consistency of product.

The progressive banning of ozone-depleting Methyl Bromide, a once popular soil steriliser used for outdoor crops, also hastened the move indoors to controlled-environment growing, Stocker explains.

"You have to forget what you learned about growing in soil," he says. "In a closed system, you measure the electrical conductivity of the solution to determine the quantity of minerals in it. If you're controlling electrical conductivity and pH [acidity/alkalinity] of the solution, you know how and when plants absorb nutrients and learn to put in what the plant wants.

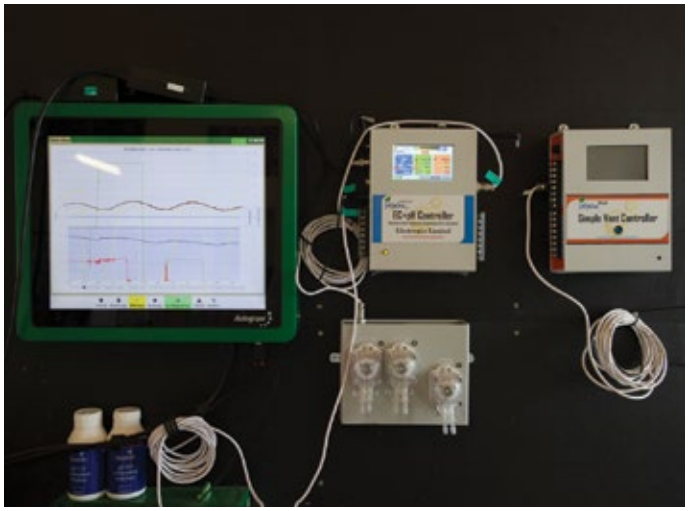
"PGO Horticulture makes a replenishing mix which is relative to what the plants are taking out and creates mixtures tailored to the needs of different growers in crops including lettuce, culinary herbs, salad greens and watercress.

"I haven't built a greenhouse system in eight years that hasn't captured all the run-off. A lot of growers are getting into recirculation and aim to minimise root and vegetative growth and maximise yield. One of our strawberry growers was getting 1.5 kgs per plant last season, where growers commonly would be aiming for around 1kg."

PGO Horticulture works closely with greenhouse and tunnel house builders supplying equipment and designing systems which has seen them contracted to design and supply hydroponic systems in India, the United States, the Philippines, Indonesia and Nuie.

> **"One of our strawberry growers was getting 1.5 kgs per plant last season, where growers commonly would be aiming for around 1kg**

Currently the business is keeping a careful watch on its raw material supply situation due to uncertainties around the supply of phosphoric acid from China. Phosphoric acid is commonly used to control pH levels in hydroponic systems. ●



Autogrow 'MultiGrow' controller made by Autogrow Systems Ltd Northshore and an iHydro unit smart hydroponics controller with climate control and monitoring made by Electronics Ltd Christchurch

WORKING TOGETHER INTO 2022

Words by Ray Smith : MPI director-general

I'd like to extend a heartfelt thanks to the horticulture sector for your continued efforts to supply nutritious produce across New Zealand and overseas, contributing significantly to export revenue, and keeping your families, staff and communities safe from Covid-19.

I'd also like to acknowledge Hort NZ's ongoing commitment towards supporting the sector and working with the Ministry for Primary Industries (MPI) to help navigate the challenges presented by the pandemic, such as integrating Covid-19 measures into work practises and addressing workforce matters.

As you will know, the food and fibre sector is leading the charge in New Zealand's economic recovery from Covid-19 – and the horticulture sector continues to play a vital role in these efforts.

Last year we launched the *Fit for a Better World* roadmap to accelerate New Zealand's economic recovery by boosting productivity, value, sustainability and jobs. For the horticulture sector, this roadmap recognises the opportunity to sustainably grow sector export revenue by $2.6 billion over the next ten years.

Despite Covid-19, the sector continues to meet demand for high-quality, delicious and nutritious produce. We are seeing strong demand for our fresh fruit and vegetables as consumers turn to healthy food options, based on strong environmental credentials. But new growth will require innovation and the development of new products and varieties.

Fit for a Better World contains some clear priorities for horticulture, such as new plant varieties, water storage and market access. At MPI we are committed to supporting this work, including through our Sustainable Food and Fibre Futures fund.

This includes our support to the $27 million *A Lighter Touch programme*, which aims to shift our horticulture sector to more biological and ecological processes. The goal is to meet consumer demands for food produced through more sustainable pest management practices.

We have also backed the horticulture sector through our *Opportunity Grows Here* campaign to attract New Zealanders to primary sector jobs, careers and training.

Outside these flagship projects there is a significant amount of other work underway to grow the horticulture sector. This includes development of the *Horticulture Action Plan*.

At the heart of this Action Plan is ensuring government and industry take a coordinated approach towards the future of horticulture in New Zealand. It will create a clear vision for future growth of the sector and identify a series of shared priorities that will make a difference.

> **"For the horticulture sector, this roadmap recognises the opportunity to sustainably grow sector export revenue by $2.6 billion over the next ten years**

It will also identify areas of alignment between government, industry, Māori and science, and help to coordinate policy, investment and science priorities and programmes. Importantly, it will result in clear and actionable implementation and investment plans to grow both value and volume.

Looking to 2022, I'm excited by the opportunity that a focused strategy could bring for New Zealand's horticulture sector and our wider recovery from Covid-19. MPI is committed to supporting the horticulture sector in 2022 and beyond.

Judging by the past two years, 2022 will also present Covid-related challenges, but I am delighted at the sector's resilience and confident we will continue to work well together to overcome obstacles.

For that reason – and for the health of yourself, your whānau and friends, workmates and the wider community – I strongly recommend getting double-jabbed with the vaccine. It is a key tool in New Zealand's quest for life to return to the way we want it.

Finally, I'd like to wish you all a safe and enjoyable Christmas and a successful New Year.

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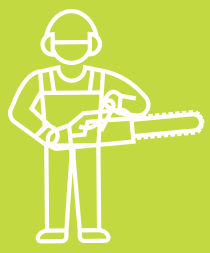

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'TORNADO TWINS' TAKE RSE SCHEME BY STORM

Words by Glenys Christian

Amy Miller (left) and Tanya Pouwhare

Once you have met the tornado twins, you will never forget them.

Hort NZ's events manager, Amy Miller, and chair of New Zealand Ethical Employers, Tanya Pouwhare, are the duo who have worked tirelessly behind the scenes to ensure seasonal workers from the Pacific Islands could continue to travel to New Zealand for work despite a worldwide pandemic.

In the space of just four months, the pair have coordinated eight flights, bringing more than 1,500 Recognised Seasonal Employer (RSE) scheme workers into the country once border exemptions were in place. Amy concentrates on Managed Isolation and Quarantine (MIQ), flights and internal travel while Tanya, who is an employer herself, liaises with employers and Pacific Labour Sending Units bringing RSE workers in.

Their efforts were equally fundamental in the successful execution of the one-way Quarantine Free Travel (QFT) scheme approved on 10 September, which facilitated a much-needed influx of RSE workers from Tonga, Samoa and Vanuatu, without the need to pass through MIQ.

"The RSE workers were coming from Covid free countries, meaning they could bypass MIQ and make valuable MIQ spaces available to others." Amy says.

What seemed like a simple process in the public eye involved a great deal of detail.

"We dealt with a myriad of different government departments," says Tanya. "Along with travel agents from World Travellers in Motueka, we collaborated with international airports, two MIQ facilities, labour sending units in the Pacific and employers just to get the workers to the growing operations where they were so desperately required.

> **"We collaborated with international airports, two MIQ facilities, labour sending units in the Pacific and employers just to get the workers to the growing operations where they were so desperately required**

"With such a myriad of stakeholders involved, it was a 24/7 job with a lot of moving parts."

Before the border exemption was in place, no RSE worker from the Pacific was permitted to come to New Zealand due to Covid-19 restrictions.

One of the RSE worker groups travelling from Vanuatu

"It doesn't seem like a long time, but the beginning of the year was an anxious period for employers who weren't sure whether they would have the labour they needed for harvest," Tanya says. "In the workers' case, it was a matter of these warm hearts wanting to be here working, so they could support their families by sending much needed money home."

Tanya and Amy say the opportunity for industry to sit down with Immigration minister, Kris Faafoi, every two weeks was invaluable, as was former HortNZ chief executive Mike Chapman's involvement and confident leadership.

"The minister is extremely engaged and open, he understood our pain points. Without his push we wouldn't have been able to do it," says Tanya.

For each flight, Tanya and Amy had just a seven-week timeline to gather over 40 pieces of data per worker. This included allocation of flights, gathering Approval To Recruit (ATR) details, gathering visa and passport numbers, full medicals, police checks, vaccination details and room pairing preferences and then teeing up where they would be placed for work in New Zealand. All that before those workers could even step onto a plane bound for New Zealand.

"It was a huge task," says Amy. "In one instance, 85 of the soon to be departing workers didn't have the required chest x-ray. We had to phone the New Zealand High Commission in Port Vila to help organise an emergency clinic at the health centre on a Saturday.

"Every worker's passport also needed to be scanned but achieving that was a challenge in itself, as not every office on those islands has a scanner."

Landing schedules were tight, with MIQ providing a rigid window of 9am to 3pm to land the flights.

"It sounds simple, but when you're in the midst of a pandemic those landing slots simply aren't available," says Amy. "Three scheduled flights needed to be deferred indefinitely to allow space in MIQ for the evacuation of New Zealanders from Afghanistan.

"With growers having paid $8,000 each for the workers to come, excluding the cost of the flights, it was a tense time."

Having some flexibility to ensure emergency spaces were made available gained the horticulture industry some valuable Brownie points with government, says Amy. The trust government invested in the industry's MIQ scheme served as a trial run for the new, shorter MIQ stays for all arrivals which were announced recently.

"We are both very passionate people that think broadly, so we were able to work all those things out," she says.

"The people and their welfare were at the forefront of our minds the whole time" says Amy. From dealing with workers' difficult personal circumstances, to working with Pacific Island Liaison representatives and providing warm clothing – it was all part of the role.

Looking back, they agree they spent a "freakish" amount of time collaborating and communicating.

"We are both mums with busy schedules so have restricted time in our offices, and somehow managed to juggle all that and working remotely during a pandemic," Tanya says.

The duo spent hours emailing and texting one another, timetabling Zoom meetings and spending a lot of time on their phones working with employers, officials, government stakeholders and other invested parties, until they sensibly imposed an 8pm curfew.

"At one stage we did a tag team, working different hours throughout the day to cover everything" Amy says. "We were good support for each other."

Thinking back to where we started and what we have both achieved, it is pretty amazing. It took a great deal of effort, collaboration and commitment from all involved, but we got there.

"The RSE scheme has been a win-win. For growers on the field in New Zealand, to the people in the Pacific, their families and both our economies – we have all benefited."

RSE worker, Maxson Foethao, gifting two of his paintings to MIQ and Ibis Hotel staff in Hamilton

PLENTY OF HOSPITALITY AT RSE WORKER HĀNGI

There was plenty of manaakitanga (hospitality) extended to the 147 Recognised Seasonal Employer (RSE) workers from the Solomon Islands as they completed their stay in Managed Isolation and Quarantine (MIQ) on Friday 12 November.

Workers were treated to a New Zealand hāngi, known as 'motu' in the Solomon Islands, organised by Ibis Tainui, Jet Park Hamilton and the Waikato MIQ Pou Tiaki (wellbeing coordinators) team. The hāngi marked the end of Pacific RSE workers having to pass through MIQ thanks to the new Quarantine Free Travel scheme.

The workers responded with their own expressions of appreciation, including a mighty Solomon Island haka performance.

RSE worker, Maxson Foethao, also gifted two symbolic paintings to the Ibis hotel on behalf of the Salomon Islands group in recognition of the respect and kindness shown during the group's stay.

Maxson says that the painting represents the journey of the RSE workers coming to New Zealand to work. The blue symbolises the Pacific Ocean and the ants people coming from Pacific countries. The ants form a line towards the fish, a cultural symbol typically used to decorate canoes. In this instance the fish represents the plane Maxson and his group flew in on.

Waikato MIQ Pou Tiaki team leader, Trent Brown, says there is a wonderful spread of knowledge and experiences within the Pou Tiaki group who supported the 147 RSE workers from the Solomon Islands.

As well as the Pou Tiaki team, K'aute Pasifika support workers and dedicated translators from Straker assisted with communicating with workers in Pidgin during their stay.

They also designed special menus to make the workers feel at home, before the group left the Waikato.

"I am absolutely humbled to be a part of this team servicing the needs of our Pasifika cousins who are currently completing their managed isolation in the Waikato," Trent says.

BOYSENBERRY HARVEST A THREE-GENERATION LABOUR OF LOVE

Words by Anne Hardie

Jono Sutton, a third generation boysenberry grower, is hoping for the right weather during the brief harvest this year

Three generations of the Sutton family will be involved in the "organised chaos" of the boysenberry harvest that is about to crank into action on their Nelson orchard.

Jono Sutton has always associated summer with the frantic pace of the boysenberry harvest, working alongside his father, Stephen, and grandfather, David, to get the berries off the vines at the point they are ready to drop to the ground. And he thrives on it.

"I'm a bit of a freak in the sense that I enjoy being under the pump."

Winner of the 2019 Young Grower of the Year competition, Jono is the younger generation on the family's horticulture enterprise which grows 30 hectares of boysenberries and 30 hectares of apples.

Today, Eden's Road Fruit sits on the Waimea Plains west of Richmond where the family moved the business after urban sprawl overtook their original Daelyn's Orchard. Back then, the business was largely selling fruit direct to the public and it was a summer destination for locals and visitors. Despite the site shift, boysenberries have remained part of the family's operation, with a transition to five harvest machines instead of hand picking.

For 11 months of the year the machines sit in the shed but come December 15 they are powered up to take the crop off the vines. Jono says the technology for the machines has been around since the 1980s but the newer models still have the same picking apparatus that was designed back then.

> "Early morning is the best time for the harvesters to shake the soft fruit from the vines. Jono says it's all about the physiology of the plants; capturing the fruit when the plant is relaxed

A limited window for harvesting means the harvesters are working whenever the crop and weather allow. Consequently, the orchard needs a fully stocked spare parts department to rectify any failure on the machines as quickly as possible.

The harvesters start at 4am, weather permitting, and continue through to midday with a team of regular staff – many of whom only work for the Suttons during the boysenberry harvest.

Jono's grandfather, David Sutton (left), amongst the boysenberry vines with the harvester machines at work

One or two of the staff even take annual leave from other jobs to spend a month in the berry garden.

Early morning is the best time for the harvesters to shake the soft fruit from the vines. Jono says it's all about the physiology of the plants; capturing the fruit when the plant is relaxed.

> **"Boysenberries fall off and they either fall on the ground or fall into a box, and you have to be there to catch them**

"Plant activity is driven by heat," says Jono. "So, when it's hot the plant is active, whereas at night it's not hot and the plant isn't respiring and doesn't have to do anything. It's like relaxing its grip on the fruit.

"Boysenberries fall off and they either fall on the ground or fall into a box, and you have to be there to catch them."

The family grows three boysenberry cultivars with the regionally apt names of Tasman, Mapua and Riwaka. The slight difference in their maturities helps spread the harvest over the month.

Weather has been the cause of three poor crops in a row now, including the wet, cold growing season last year. The Suttons were hoping for better boysenberry conditions this year and were grateful when the sun shone through much of flowering – a fortunate change given it was an extremely wet spring.

Wet weather is not only challenging for pollination, but can also let disease into the plant, says Jono.

The orchard passed their average annual rainfall by mid-spring, so he is optimistic for a dry summer for the arid-loving boysenberries.

When there is wind and rain, the fruit becomes heavy and can be blown off the vine by the wind before it can be harvested. The crop needs constant assessing. Leaving the berry on the plant a little longer can significantly increase yield but when a big weather event is imminent,

Doing the pollination work

Eden's Road Fruit also use crab apples for pollination of its 30ha of apples

it is better to tighten up harvest, says Jono. However, this means they lose yield.

> **The 30ha of apples on the family's orchard complements the boysenberry harvest and helps to diversify the business too**

Rain or shine, it's a balancing act between leaving fruit as long as possible – when brix is also up – and harvesting it before it falls to the ground. David, now in his mid-80s, has a good eye for timing harvest on each block of boysenberries and Jono says he is trying to learn everything he can from both his grandfather and father.

Harvested boysenberries head to Boysenberries New Zealand where they end up block frozen, individually quick frozen (IQF), or made into juice concentrate or purée for local and export markets.

The 30ha of apples on the family's orchard complements the boysenberry harvest and helps to diversify the business too, says Jono.

"Often one crop will prop up the other during a tough year."

The Suttons are fortunate to have a good team of permanent staff who manage apple thinning when the boysenberry harvest is in full swing too.

As much as Jono enjoys the organised chaos of the boysenberry harvest, he says one of the best things about growing boysenberries is the long down time after harvest.

> **One of the best things about growing boysenberries is the long down time after harvest**

"There's nothing we need to do through to May, whereas apples never have a down time."

When Jono isn't on the orchard, he is helping to organise and facilitate the Nelson Young Grower competition to give other contestants the opportunity to broaden their horizons in the horticulture sector. ●

KŪMARA GROWERS LOOK TO TECHNOLOGY

Words by Glenys Christian

Doug Nilsson, chairman of the Northern Wairoa Growers' Association

While Dargaville kūmara growers struggled with an oversupply that resulted in low prices last season, their passion for growing the crop remains.

These kūmara growers are busy working on ways to use new technology that will not only alleviate an ongoing labour shortage but also remove a lot of the hard work that accompanies growing.

Doug Nilsson, chairman of the Northern Wairoa Growers' Association, says a good growing season with good crop volumes and quality, has seen a drop in prices. Many growers' returns were well below the cost of production, putting them in a holding pattern this year after a number of good seasons. The response from growers was to plant less land in kūmara. Doug decided to leave some of his land fallow, run some lambs and concentrate on eradicating weed problems such as alligator weed.

With the continuing wet weather in mid-November all growers are well behind on their planting schedule.

"We had three times our usual October rainfall with it being one of the wettest on record," Doug said.

This meant he had only planted around 12 to 15 hectares when usually he would have 55–60 ha in the ground in a good year.

"The first plantings took a hammering but it's not all gloom and doom as there is a long way to go."

Growers also reduced their kūmara plantings due the ongoing labour supply issue. Many had built accommodation on-farm or are looking at doing so to attract or hold onto out-of-town workers who they could provide with better pastoral care. Growers are also looking to contractors to provide more labour from outside the immediate area. Doug is the only Recognised Seasonal Employer (RSE) in the area, employing up to 13 workers in previous years and is hopeful some will still arrive by December. RSE workers will all be vaccinated against Covid-19 and Doug is encouraging his workers to get vaccinated and if they are willing, offering to run them into the local vaccination centre during their lunch hour.

> "The demand for orange kūmara keeps growing, now making up around half of the market

"They're not anti-vaxxers but they don't understand that Covid will be at a door near them," Doug says.

All growers are aware of the impact a two-week or longer lockdown in the middle of the harvesting season would

have, and hope that the government will give some assurances and a timeframe for this control measure being phased out.

Previous Auckland and Northland lockdowns had caused some delays – "but supplies get through eventually."

The demand for orange kūmara keeps growing, now making up around half of the market.

"It polarises people – they either love it or hate it," Doug says.

"It's a heavy yielder and growers like the fact they can plant less land and get more yield."

Red kūmara makes up around 45% of the crop, with gold – which had accounted for up to 20% of the market previously – decreasing to less than 5%.

"But there are still die-hard gold lovers," says Doug.

Some growers had looked at alternative crops such as onions, sweetcorn and buttercup squash to reduce labour requirements.

"But we're very aware of our soil types and what they can do."

> **"Red kūmara makes up around 45% of the crop, with gold – which had accounted for up to 20% of the market previously – decreasing to less than 5%**

He was keen to trial peanuts as part of the Kaipara Kai programme investigating different crops which may suit the area. Due to supply problems, he has only received a couple of kilos of seed to grow so far.

"Most growers are pretty passionate about growing kūmara," he said. "But the labour wears you down."

Doug hopes part of the answer will be delivered through new technology.

He's imported a planter from Italy which he says just needs to be tweaked before further trials take place. It takes some of the physical work out of planting, meaning more workers can be rotated around different tasks.

He's also experimenting with a piece of machinery, based on one in North America, which will enable cutting of kūmara seedlings in nursery beds before lifting them on to a table.

"It should improve hygiene and allow workers to stand upright," Doug says. "If it works it will be a big tick."

LABOUR, LABOUR, LABOUR – PREPARING FOR 2022

Words by Geoff Lewis

New Zealand's horticultural sector survived last year's Covid-19 lockdowns, but this season has added stress through labour shortages, changing consumer habits and the costs of exporting.

The Recognised Seasonal Employer (RSE) scheme enables the horticulture and viticulture industries to recruit workers from the Pacific Islands for seasonal work, when there are not enough New Zealand workers.

However, the government retained the 14,400-worker cap for 2020–21, due to the impact of Covid-19 on employment, economic conditions and international travel. This has been compounded by a gradual loss of foreign backpackers on working holidays.

Waikato-based Strawberry Fields owner, Darien McFadden, says labour was a big issue in early November and he is still a long way from full production and already short-staffed.

"A lot of growers are going to walk away from blocks," says Darien. "I usually have 30 to 40 staff but this year I've got five with another 13 or so regulars coming back. The big loss is 20 to 30 people on working holiday visas who usually just rock up. We have record low unemployment. WINZ (Work and Income New Zealand) refers people, but we're lucky to get any that turn-up."

PickMee Fresh director, John Altham, says the labour market is tight, the biggest shortage being in foreign holiday visa workers. The leading apple and stonefruit producer is hoping to get the same number of RSE workers they had in 2019 – as promised by the government.

"We usually use about 30 to 40 backpackers, but they have been slowly going home," says John. "Unemployment is very low. The Ministry of Social Development (MSD) did a survey asking how many people were interested in working in horticulture and 80% said they weren't interested. A lot still think it's low wages and long hours, but there is good money to be made."

PickMee, with a 120ha orchard in the Waikato and 350ha in Hawke's Bay, usually employs 112 RSE workers with 70 needed by late November and another 50 in February. The company's production season begins with peaches, nectarines and plums in December and moves into apples in February.

Brent Wilcox, director with Pukekohe and Waikato onion and potato growers A.S. Wilcox and Sons Ltd, says the earlier part of the season had been favourable but the labour market had tightened up in the last six months as had the difficulties and costs of shipping export onions.

"We got through last season quite well but I'm anxious looking forward to the coming crop. We need skilled [machinery] operators and we employ full-time crews when we reach the season's peak. Many skilled operators come from offshore as there are very few available locally."

'Pinch points' will arrive from November through to Christmas and then with the start of the onion season which requires workers from January to March.

> "Bond says the labour shortage issue urgently needs solutions to create certainty, and RSE workers from the Pacific Islands are critical for the near future

Wilcox says the company is lucky to have good regional teams and many of its administrative staff have been working from home due to Covid disruptions.

The kiwifruit industry has successfully reached the end of its 2020 harvest and packing season with a record crop now headed for overseas markets – if not already there.

New Zealand Kiwifruit Growers Inc. (NZKGI) represents 2,813 growers on 13,334 producing hectares across New Zealand.

NZKGI chief executive, Colin Bond, says this season will be short due to border closures which have resulted in the industry facing a critical situation with seasonal labour.

"A very wet and long season slowed and disrupted the harvest," Colin says. "But the sector coped with the labour crisis well – through a combination of good practice and good fortune.

"The continued border closures mean Working Holiday Visa (WHV) holder numbers were down significantly and RSE worker numbers were limited – meaning an even heavier reliance on Kiwis filling the roles this season.

> **"We usually use about 30 to 40 backpackers, but they have been slowly going home**

"We continued our labour attraction strategies using a range of media and social media programmes. We were bolstered this year by the support from MSD and the Ministry for Primary Industries, which worked hard to get unemployed Kiwis into the industry.

"We see kiwifruit, along with the other horticultural crops, needing certainty of labour supply, and one way we can encourage this is by supporting employment of a workforce that can be on the orchards almost year round."

Bond says the labour shortage issue urgently needs solutions to create certainty, and RSE workers from the Pacific Islands are critical for the near future.

Pukekohe Vegetable Growers Association president and director of broccoli and lettuce growers D&J Sutherland Ltd, Kylie Faulkner, says the ongoing lockdowns had become taxing for growers and labour.

"Everything costs more and takes longer," she says. "Capacity-wise, some growers have decided to cut back. Nobody likes being stopped by the police. It's hard to employ people, even interviews have to be done outdoors. We've got the new saliva tests but it takes three days to get the results."

The effects on growers differ depending on their crops, and whether they are selling into the local market or exporting. Shipping had become "diabolical" as with perishable products no one could take the risk of booking shipping space to find the vessels didn't turn up on time, Kylie says.

Of all the lessons to be learned from Covid-19, the reliance of New Zealand's horticulture industry on foreign labour and the distended logistics at the far end of the Earth, are the foremost. It has also highlighted the need for innovative long-term industry and labour development policies if we wish to continue surging production in existing and new product lines.

MARKET DEMAND REMAINS STRONG DESPITE A TURBULENT GROWING SEASON FOR NELSON

Words by Anne Hardie

Harvesting lettuces which have grown through the wet period

The challenges came thick and fast for Nelson growers through the year as weather, labour, Covid-19 associated effects and shipping all made it harder to produce a good crop, get it harvested and off to market.

The year began with many growers across a variety of crops counting their losses after the Motueka hailstorm, then the bittersweet irony of needing less labour for the lower crop volumes. On a more positive note, hail-damaged fruit prompted innovation with the likes of Golden Bay Fruit's Stormy Fruit brand, Chia Sisters' pear juice and Mad Melon's diversification into apple juice, to name a few.

Getting export fruit to market was the next battle – a battle experienced around the country but doubly so in Nelson where fewer ships called into the port and a shortage of containers was followed by delays for shipments getting to markets.

FreshCo Nelson South Island regional manager, Grant Osmond, says a shipment usually takes seven weeks to get apples to Europe but that was pushed out to 11 or 12 weeks as ships worked their way through congested ports en route due to Covid-19 restrictions.

Grant is not expecting it to get any better next year and anticipates shipping costs will increase by 100% on this year. Shipping lines that have been losing money over the years due to the sheer number of ships on the water are lifting prices dramatically now they have less competition, he says.

It is going to be a significant challenge again for apples next year, Grant says. One option under consideration is refrigerated charter ships that take bulk pallets rather than containers. It would be "hellishly expensive" and daunting logistics once the ships reach their destination and pallets have to be unloaded, then transported to other parts of Europe. He says growers are aware of the increasing shipping costs they face.

On the labour front, Freshco Nelson's general manager, Peter O'Sullivan, says labour incentives worked well to attract and maintain a crew through the season and they were finally able to get many of its Recognised Seasonal Employer (RSE) scheme workers back home. He is hopeful the industry will get back to its pre-Covid-19 RSE levels next year but worries about less Working Holiday Visa workers and the very low unemployment rates in New Zealand. Especially now Australia has opened the border for workers to go there.

Motueka Fruitgrowers Association chairman, Richard Clarkson, reiterated those labour concerns and says there is still no certainty about bringing RSE workers in easily because of Covid-19. There are also those RSE workers on apple orchards now who still need to be repatriated.

Richard says growers will also have the added pressure of dealing with vaccinated versus unvaccinated staff, or the possibility of enforcing a vaccine mandate.

Many growers have experienced the ongoing effects from the Boxing Day hailstorm and Mother Nature tossed them a wet winter and spring as well. Richard says parts of the region had 2.5 times the five-year-average rainfall through that period, creating ground issues for machinery and affecting pollination and fruit set in places. Early apple varieties such as Jazz and Braeburn were particularly hard hit, while Royal Gala on the other hand, has had a heavy fruit set. Despite a lower fruit set on some varieties and hail-damaged trees producing less flowers, he says the region looks like it has a good crop out there.

Kiwifruit is also shaping up to have a good crop on the vines after warm, sunny weather through pollination and a better than expected result on blocks of severely hail-damaged vines.

Mainland Kiwi's chairman, Evan Baigent, says last year's hailstorm destroyed 2.3 million trays of the region's gold kiwifruit – nearly half of its total kiwifruit crop – and then growers struggled with a cool summer for the remaining fruit. It meant harvest was dragged out as growers waited for the dry matter content to increase and some couldn't pack their smaller-sized fruit.

Though many growers will not have a full crop this season on hail-damaged blocks, he says the overall crop is pleasing considering the level of damage.

Due to the hail, labour wasn't the expected issue this year, but Evan says there are concerns going into this next season. Even though some RSE workers are coming into New Zealand, there is still a lack of travellers with Working Holiday Visas.

That combined with record-low unemployment levels, plus increasing production from a range of horticulture crops – it seems the labour shortage will likely persist.

On the O'Connors' family-owned market garden near Nelson, the soil tells the story of the wet spring, but co-owner Mark O'Connor is philosophical about its effect on loss of production and the late start for planting other crops.

Unpredictable weather is a familiar challenge for growers; the greater challenges today, he says, are labour, environmental issues, Covid-19 and now Three Waters which could take over governance of the Waimea Community Dam that is expected to be completed next year.

For the first time in Mark's 22 years as a market gardener, he has struggled to find staff this year. The business employs about 50 permanent employees including many from the local Thai, Myanmar and Vietnamese communities. Staff numbers swell to 100 at the height of the growing season. In the past, seasonal workers have been predominantly international travellers with Working Holiday Visas (WHV), plus a sprinkling of university students and Kiwi travellers.

As price takers, he says market gardeners cannot compete with other jobs luring the dwindling numbers of WHV workers or the local job market. Wages are the single biggest cost for the business, but fertiliser costs have increased significantly, and he says fuel has nearly doubled in price since April last year.

Weather has also been an issue for the region's boysenberries, beginning with the Boxing Day hailstorm that destroyed crops in the Moutere in the middle of harvest, while wind and rain took its toll across the region during the brief harvest.

Boysenberries New Zealand managing director Julian Raine says just two-thirds of the crop was harvested last summer and he describes it as the worst outcome in his 40 years growing the berry.

On the plus side, the weather was good for pollination this season and he says the market is crying out for fruit. The grower-owned co-operative has had requests for 1,000 tonnes of boysenberries from the United States alone, which usually sources fruit from its own domestic supply and from Chile. Climatic issues have plagued crops around the world and he says that has pushed up demand.

At the same time, Covid-19 has prompted people around the globe to seek all types of berries for their health benefits. Ideally, Julian would like 50ha to 100ha planted in boysenberries straight away to meet the increased demand.

"There are a lot of markets crying out for fruit," Julian says.

SMALL BUT MIGHTY: LOCAL MICROGREENS OPERATION TAKES OFF

Words by Mike Nichols

Matthew Keltie and his market garden

In the centre of Wellington sits an intensive market garden, supplying fresh vegetables to many high-end restaurants and several supermarkets in our capital city.

There are no tractors visible. None are required because the whole operation occurs in the basement of a large building. The venture, named 26 Seasons (previously ShootsNZ), is the brainchild of a former Lands and Survey agronomist, Matthew Keltie, who saw a gap in the market and decided to fill it.

"We saw the opportunity to present to the market a unique product in all aspects, taste, appearance, nutrient profile," Matthew says. "We also wanted the product to bring about a new consumer experience where the customer was purchasing a living product that they were able to harvest on demand at home."

The company currently grows 23 types of microgreens: Amaranth red, basil, broccoli, coriander, kale, lemon balm, mustard, red mizuna, nasturtium, snow peas, oyster plant, radish, shiso, sorrel, curly cress, chia, pak choi, dill, wheat grass, chives, fennel, pea shoots and lettuce.

They also grow microgreen mixes for supermarkets – two or three different plants for different occasions, including a micro salad mix, a smoothie mix and a sandwich mix.

It is not a potential crop to export, says Matthew, as the microgreens industry is invested in the product being fresh and locally grown.

What are microgreens? They have been defined by the USDA (United States Department of Agriculture) as edible greens which germinate from seeds and are harvested without roots at the seedling stage when the cotyledons are fully expanded. These very young seedlings have a more intense and different flavour profile than their mature plant counterparts.

While microgreens were not designed to feed the world, they do provide a high level of nutrition – up to 100 times more nutrition than mature plants, in fact.

Much of the growth is derived directly from the stored food in the seed, although there is some accumulation of dry matter in the seedlings before they are harvested. This is because the plants are grown under LED (light-emitting diode) lighting with an emphasis on red and blue light at a 4:1 ratio. A small amount of white light is also provided. Many of the flavours developing in the young seedlings can be further enhanced by using specific wavelengths of light, but this can only be determined with a detailed knowledge of how specific species respond to a particular wavelength.

26 Seasons uses a combination of vertical growing and LED technology to grow its microgreens in a more efficient, controlled environment.

"Through trial and error, we discovered that the growth

26 Seasons' microgreen varieties are grown on racks using a 'vertical growing system'

and taste of individual plants are influenced by different lighting programmes," says Matthew.

"We have used that knowledge to maximise the growth and taste profile of the products we grow.

Seed is sown at high density onto specially developed biodegradable woollen mats and placed into kerbside recyclable plastic trays. The trays are stacked high, in layers on ebb and flow benches, which provide the seedlings with an intermittent supply of a standard hydroponic nutrient solution which acts as insurance in case the plants are grown further than normal.

"Our growing racks are layered in stacks that are a minimum of four levels high and arranged in a manner that maximises available space, resulting in four times the growing area.

"Our lighting programme also means the plants are able to maximise their growth potential, even if it's the middle of winter. Because we grow our plants in an indoor, controlled environment, the challenges of outdoor growing don't affect us."

Crop rotations average 14 days across all the company's sites, resulting in a very productive and busy operation with a near-constant supply of microgreens.

Kings Seeds in Katikati supply top quality seed for 26 Seasons' microgreen production. The seed must have a high percentage of germination but should also all germinate at the same time. If the germination is spread over a long period, there will be a mix of maturities in the seedlings.

With demand for microgreens strong, Matt and his co-founders recently expanded their operation to Auckland and are now looking across the Tasman to Sydney and Melbourne for further expansion in the near future.

Matthew says the microgreens experience continues to be one of continuous learning and adaptation.

"Controlled Environment Agriculture (CEA) is a developing industry. We think of New Zealand as having unlimited land and no issues of food security, but the recent events of Covid-19 have perhaps indicated that food security is an issue even for well-resourced economies.

"I don't think CEA is the complete answer, but it is one that is part of the answer and we are pleased to be at the leading edge of it." ●

26 Seasons' microgreen mixes can be found in supermarkets around New Zealand

NZGAP YEAR IN REVIEW

Words by Damien Farrelly : NZGAP manager

It has been another challenging yet successful year for the New Zealand Good Agricultural Practice (NZGAP) scheme where we have continued the recognition, development and improvement of our integrated certification system.

The system provides growers assurance for the safe and sustainable production of fruit and vegetables in New Zealand.

Strategy

This year NZGAP embarked on a strategic review to help establish the future direction of the scheme, to ensure that NZGAP continues to service existing certificate holders and to pursue emerging needs and opportunities. Key considerations for the review were:

- The long-term vision and purpose of NZGAP
- Future scope of certification (i.e., what range of crops and products)
- Future scope of standards (i.e., Food Safety, Social Practice, Environment)
- Understanding future certification needs and drivers for members and stakeholders.

Extensive stakeholder consultation was involved in the review, with all feedback collated by Primary Purpose for consideration by the NZGAP committee. Lockdowns have hindered workshops and delayed drafting of the new strategy, but the draft will be shared with key stakeholders in the new year for consultation before it is finalised and launched.

Global Food Safety Initiative (GFSI)

NZGAP will soon commence the process for attaining GFSI recognition which is increasingly becoming a retailer requirement of GAP schemes worldwide. GFSI is an organisation run by the Consumer Goods Forum which benchmarks and recognises GAP standards so that grower certification can be accepted by retailers (e.g., GLOBALG.A.P.). The project will commence before the end of 2021, and it will take until September 2022 to complete the benchmarking, consultation, trialling, assessment and recognition process.

From that point onwards, growers will be able to attain certification to the GFSI recognised NZGAP standard. Many markets are already requiring GFSI, so NZGAP and stakeholders are negotiating on a transitional phase to allow time for recognition and grower certification.

NZGAP remote

With the unfortunate return of lockdowns, NZGAP has had to reinstate processes for remote auditing and certification. The 'NZGAP Remote' module enables off-site audit (record checks) and remote audits (interview and visual evidence of implementation), to ensure the continued credibility in certification where on-site audits were not possible. The module also enables blended audits under Alert Level 2, which are a combination of off-site (record checks) and on-site audits (interview and visual evidence of implementation). Like in 2020, registrations and certifications were also processed remotely, so growers could continue to produce and supply to market while operating as an essential service during lockdown.

GLOBALG.A.P.

GLOBALG.A.P. is currently undertaking a major review of the standard for fruit and vegetables and the GLOBALG.A.P. Risk Assessment for Social Practice (GRASP). NZGAP has provided feedback on the development of version 6 via the New Zealand GLOBALG.A.P. National Technical Working Group. Once version 6 has been finalised, NZGAP can commence benchmarking of NZGAP GLOBALG.A.P. Equivalent so it maintains recognition. The new standards for GLOBALG.A.P. and GRASP are in the final stages of development and will be finalised in mid-2022, then implemented by growers in early 2023.

Food Act add-on

New Zealand Food Safety has renewed recognition of NZGAP (and GLOBALG.A.P.) under the Food Act 2014. NZGAP GLOBALG.A.P. Equivalent has also been added as a recognised standard. Continued recognition of the GAP standards is another major milestone in the development and delivery of an integrated assurance system that is effective and efficient for growers, while delivering on the outcome of producing safe and suitable food under the Food Act 2014.

NZGAP has been working with growers to renew over 1,600 registrations for the Food Act this year. Registration has to be renewed every two years, and this seamless process has saved growers a lot of administration and over $270,000 in direct costs.

NZGAP has also been collaborating with industry, the GLOBALG.A.P. working group and New Zealand Food Safety, to review and improve the implementation of Food Act via GAP schemes, with a particular focus on auditor training and oversight. This collaborative approach has been successful in making several improvements to the system which will ultimately benefit growers and lead to better food safety outcomes for consumers.

Environment Management System (EMS) add-on

Uptake of the Environment Management System was greatly increased this year with an additional 16,500 hectares registering for certification. It has generally been a proactive approach from growers with the support of Hort NZ, district associations and product groups which are preparing for impending Freshwater Farm Plan regulations. Uptake has been driven by regulations in Gisborne / Tairāwhiti, for example, where vegetable and cropping growers are now required to develop a Farm Environment Plan (FEP) and establish setbacks or soil loss mitigations along waterways.

NZGAP is intending for the EMS to be recognised as a pathway for growers to meet upcoming regulations for Freshwater Farm Plans. The Ministry for the Environment consulted publicly on Freshwater Farm Plans earlier this year, so NZGAP prepared a submission in support of the HortNZ submission to enable growers to develop and implement Freshwater Farm Plans using the industry assurance programmes. However, the proposed framework and assurance processes are not currently well aligned with GAP. As a result, NZGAP has proposed an alternative pathway, which recognises the existing GAP framework and standards like the EMS add-on which is a robust and credible system which is already being adopted by growers across New Zealand. Draft regulations are expected in early 2022 so there will be some clarity soon on whether the EMS can be nationally recognised as a relevant, credible and integrated compliance pathway for growers.

The EMS has also attained 'conditional approval' for *He Waka Eke Noa* as a pathway for growers to measure and manage their nitrous oxide emissions from fertiliser use. Minor development is required to the EMS within the next year to attain an 'approved' status. This development can commence in mid-2022 when there is clarity in policy on the long-term options for measuring and managing agricultural emissions. In the interim, HortNZ will engage with large growers (those with over 80 hectares) to measure and manage their nitrous oxide emissions to meet current He Waka Eke Noa commitments.

Social Practice add-on

Over 200 additional growers have registered for the Social Practice add-on this year. Audits and certifications have been rolled out since version 2.0 was launched in November 2020, with 23 certificates issued so far despite lockdown disruptions. Registered businesses can expect Social Practice to be audited as part of their next NZGAP audit.

The priority for 2022 will be to attain recognition of the Social Practice add-on in international markets which sometimes require a Sedex Members Ethical Trade Audit (SMETA), which is not practical or affordable for growers.

> **"The 'NZGAP Remote' module enables off-site audit (record checks) and remote audits (interview and visual evidence of implementation), to ensure the continued credibility in certification where on-site audits were not possible**

Contractor Standard

There are now 20 contractors registered for the NZGAP Contractor Standard and six have been certified so far. This standard has been developed specifically for contractors providing services to NZGAP, Social Practice add-on, GLOBALG.A.P. and GRASP certified growers or supply chain operators. It is not a NZGAP requirement for growers to use certified contractors, but is demanded for some sectors and markets.

The aim of the contractor standard is to reduce the burden of growers having to check a contractor's compliance to Social Practice requirement themselves and enable them to check the status of contractors on the new NZGAP public register for contractors (e.g., those registered, approved, suspended, cancelled).

Looking forward to 2022, there is likely significant development needed to attain recognition for GFSI and Freshwater Farm Plans. NZGAP is looking to better integrate standards and processes for add-ons too, while also using tools and technology to minimise the compliance burden for growers.

Check the website or contact us for more information:
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NZ SQUASH MILK
MAKING A SPLASH IN JAPAN

Words by Rose Mannering

Shane Newman is a second-generation Hawke's Bay squash grower who runs his business NH Packing Ltd from Whakatu

Shane Newman had a bright idea. After reading an article on the development of avocado milk, the Hawke's Bay squash grower and packer thought 'why not try squash milk?'

He contacted the developers of an award-winning avocado milk, Auckland power couple Sachie Nomura and her husband Nick Siu, to see if they would collaborate on a new product.

The idea Shane posed to Sachie and Nick was a perfect fit: developing a product to capture the New Zealand growing story and adding value to product that was not destined for export. Health attributes of the milk would have wide consumer appeal.

They partnered with the Ministry for Primary Industries who assisted with $95,000 in funding through its Sustainable Food and Fibres Fund for development of the innovative new product.

"Between the three of us, we have come together to form this fantastic model to bring this product to life," Shane says.

A year later, Kabocha Milk was born.

Comprising 95% buttercup squash, the milk is vegan, free from artificial colours and flavours and has a subtle flavour profile of fresh squash. It's also sustainable, says Shane.

"Our Kabocha Milk uses the unexported [sic] tag-3 fruit, creating a high-value, sustainable and exportable product from produce that would otherwise go to waste."

The brand name, Kabocha Milk – Kabocha being the Japanese name for buttercup squash – was later developed by a fourth business partner and co-founder, Terry Daly, who is now in charge of brand design and marketing.

After some thorough market testing, today, Kabocha Milk is available in two high-end retail chains in Japan, as well as markets in Korea and Hong Kong.

Development of the new product and brand has piggy-backed on fresh squash export channels used by Three Good Men fresh squash exporters, of which Shane is a member.

"We have used our relationships with key retailers to engage them in this new product. It made sense to combine marketing for the story of our fresh squash and squash milk," Shane says.

It also made sense to promote fresh New Zealand buttercup squash and fresh New Zealand kabocha milk together, rather than using traditional beverage channels. After just one production run, Kabocha Milk has been very successful.

"It is a different product," says Shane. "We have supplied a range of recipes to support its use."

Kabocha Milk speaks to today's food demands, supplying the high-end health market, the product is 100% vegan, non-dairy and high in Vitamin A and even has a shelf life of 15 months.

> **"Kabocha Milk speaks to today's food demands, supplying the high-end health market, the product is 100% vegan, non-dairy and high in Vitamin A and even has a shelf life of 15 months**

Ironically, Shane's quest to produce squash milk led him just over the fence of his Whakatu base, to a business called Milk Kitchen. Milk Kitchen also processed Sachie and Nick's avocado milk and were able to process the raw squash material into kabocha milk.

In just two and a half years, Kabocha Milk has been transformed from a random thought into a production formula.

Shane credits the knowledge he has gained from Sachie and Nick for the smooth and rapid development of the product.

"Without this input we would not be anywhere near where we are at in this short space of time."

Although still in its infancy, Kabocha Milk is unique, the first of its kind, and ticks all the sustainability boxes with a great New Zealand brand story to be told.

But there is still plenty to do.

"We have bigger plans going forward to develop further markets," Shane says.

Kabocha Milk is free from artificial colours and flavours and made of 95 percent buttercup squash, grown right here in New Zealand

Initially developed for Asian markets, Shane is looking to expand Kabocha Milk to the United States, following on from its cousin, Avocadomilk, as well as markets in China, Malaysia, Singapore and Thailand.

Shane is planning for Kabocha Milk to follow the same path and trajectory as avocado milk with the advantage of Kabocha Milk avoiding possible pitfalls.

Nick is raising capital for the project and for establishment of an in-market team too.

Everything has been done on a shoestring budget up to this point, but Shane says now the gearing will be changing as the business scales up.

"There are fantastic opportunities open to us with new markets, bigger bottles, variations in flavour profiles," he says.

COMPRISING 95% BUTTERCUP SQUASH, THE MILK IS VEGAN, FREE FROM ARTIFICIAL COLOURS AND FLAVOURS AND HAS A SUBTLE FLAVOUR PROFILE OF FRESH SQUASH

THREE GOOD MEN REAP REWARDS IN JAPAN

Words by Rose Mannering

Freshco general manager sales, Greg Cross, at work in Japan

Two growers and a marketer are reaping the rewards from a partnership formed eight years ago to deliver top quality squash to Japan and other Asian markets.

Three Good Men was born over a beer, an effort by the trio to move squash out of the 'commodity' space and into a consumer-focused business. The partners are the marketer, Freshco, NH Packing in Hawke's Bay and grower Coxco Farming in Gisborne.

Freshco general manager sales, Greg Cross, says after spending five years working for the company as Asian sales manager and living in Tokyo, he was even keener on his return to New Zealand to further build on the Three Good Men value-added story. New Zealand grows Kabocha (Japanese buttercup squash) in the off season, with a supply window through January to April.

"Rather than fight it out in the commodity space, we wanted to bring our expertise together to create something better," he says. The Three Good Men tagline "Happy Squash" is played out in all their marketing material.

"We have worked hard to create an added-value story around our two growers," Greg says.

Family-owned NH Packing has been in the business of growing, supplying and exporting squash for more than 20 years and principal, Shane Newman, is enthusiastic about the marketing possibilities created by Three Good Men. His business is one of New Zealand's largest packers of premium squash for the fresh market.

The third good man is Omi Badsar who manages the squash business for Coxco Farming – part of Craigmore Sustainables. Coxco grows and packs 700 hectares of squash on the Poverty Bay Plains.

Dry kabocha grown

Three Good Men has focused its growing and marketing efforts on the preferred dry style of Japanese squash, known locally in Japan as kabocha.

"They are not the easiest to grow but we have focused on producing this low moisture squash that is the drier, nuttier and sweeter varieties, because that is what our consumers want," Greg says.

Seventy percent of the production of Three Good Men is on the dry-style squash, offering hokkori, ebisu, ajihei, kuriyutaka and kuranotakumi varieties. All the squash grown by the partnership have come out of Japanese breeding programmes and from Japanese seed suppliers.

Shane Newman, NH Packing Ltd (left); Omi Badsar, Coxco Group; and John Mangan, Freshco (right)

NZ buttercup squash with logo etched in

These varieties are higher risk (lower yielding and more prone to disease) but can produce a higher return.

To meet the preferences of Japanese customers, the squash sent to Japan is all medium to large, with a minimum weight of 1.2 kg. Markets have been developed for smaller sizes, with 15% of their total sales going to Korea, and 5% going to developing markets including China.

Other trial markets include Malaysia, Thailand and Vietnam. The New Zealand Buttercup Squash Council has been working with the Ministry for Primary Industries (MPI) to negotiate access to Thailand and Vietnam.

The trio export around 20,000 metric tonnes a season and hold a 25% market share of the New Zealand export squash market. Increased production costs and shipping costs have necessitated increased prices to the buyers for the coming season.

Pandemic disrupts flow

Aiming for higher value product could not have come at a better time with the Covid-19 pandemic playing havoc with normal distribution channels.

"We have been working through the flow on effects of disrupted logistics, with shipping delays resulting in long transit times." Greg says. This has put pressure on the whole supply chain.

Production costs have also increased, driven by a labour shortage for harvesting and packing. Internal freight and packaging prices have shot up, with timber prices for bins increasing significantly. Competition for land from permanent crops in both Hawke's Bay and Gisborne has meant growers have had to work hard to secure suitable land.

The weather gods have also played their part with flooding in Gisborne this year affecting crops and planting.

Hawke's Bay suffered the same fate last year.

The Three Good Men growing partners have a long-term commitment to the squash industry and are looking at different production systems to minimise labour, particularly with weeding.

"There is demand for our product, we need to continue to find ways to make it work; we want sustainable environmental and economic growth," Greg says.

> **"The trio export around 20,000 metric tonnes a season and hold a 25% market share of the New Zealand export squash market**

Branding key

Branding and imagery form a critical part of the Three Good Men marketing strategy, with stories about the two growers, the traceability of the product and nutritional aspects of kabocha.

Their website reads: *"Every squash packed by Three Good Men knows where it came from. Not just the paddock where it grew up, but the exact position in the paddock. It also knows who did the weeding, the feeding and the picking".*

Existing sales channels developed by Freshco were used to market the product. Greg worked with in-store partners, providing QR (Quick Response) codes to recipes and other in-store promotions.

"Our collaboration has worked really well; it is a success story what we have achieved in the market in the last eight years," Greg says.

OPINION

MAINTAINING GROWERS' SOCIAL LICENCE WHILE TAKING RISK

Words by Richard Palmer

The Impossible Burger, no meat involved

November 15 marks the day on which individuals in select sectors are to feel the effects of Social Licence to Operate. Whilst this may be new to teachers and healthcare workers, it's a different story for producers of one of humankind's basic needs: food.

So how is it that when faced with the choice to get on board with societal expectations or not, many are choosing the 'my choice' road to financial disruption as they are locked out of their jobs and income? When facing that choice as growers we may have grumbled but we well understand the importance of being part of the solution to many of the contemporary issues, as well as being pragmatic enough to accept it has to be done to ensure we have a future for our businesses. The actions of the government to mandate Covid-19 vaccination, whilst directly affecting the very person, are really then no different from those on emissions, land use, water quality – they're about a societal response to societal expectations.

Earlier this month, the Impossible Burger finally made its way to New Zealand. I sought one out a couple of years ago in Singapore, and for those who haven't tried one, what an experience! Quite possibly the best burger patty I've ever eaten and impossible to tell apart from the perfectly cooked real meat version. Why did it take so long to get an amazing meat-free alternative into New Zealand? Because the secret ingredient that makes the Impossible Burger so bloody and meaty needed approval from FSANZ (Food Standards Australia New Zealand) – that ingredient called leghemoglobin is derived from genetically engineered soy. So, what a great success that approval was granted, and the New Zealand plant industry can capitalise on innovative and awesome food production… well not quite.

As discussed earlier, New Zealand willingly sets rules that benefit society – most societies and governments do.

But we're still some way off accepting all the available tools in our tool bag to give food production the support it needs to address some of our world's most pressing issues.

Take gene-editing as an example. I'm sure the first outcry will be that this is mankind playing God. Well in case you missed it we're doing that already: Fukushima and Chernobyl, climate change, over-fishing, plastic in our oceans. Just maybe we need to have a new debate about the necessity for utilisation of new tools that can produce more innovative plant products from which to derive a whole range of food and fibre solutions that address some of these issues. And we need to take consumers with us because this isn't a black and white issue, it's matter of degree, perception and relative benefit.

Already what some other countries call GMO (genetically modified organisms), we're quite happy with, and vice-versa. Current plant breeding techniques are genetic modification just through natural crosses, which takes time and massive investment. Speeding up that process because society can see the value in it is crucial to our responding to the world's challenges.

So perhaps, given our demonstrated willingness to act for the greater good,

The Impossible Burger, no meat involved

New Zealand can respond more quickly, more innovatively, and with attendant economic benefit for New Zealanders, to meet the demands for more food, produced in an increasingly sustainable way.

This piece reflects personal opinion only and is in no way the position of HortNZ or Processed Vegetables New Zealand.

NEW OFF-LABEL USE POSTER TO HELP GUIDE VEGETABLE GROWERS

Vegetable RESEARCH+ INNOVATION

Words by Rebecca Fisher : Market Access Solutionz Ltd crop protection manager

The Vegetable Research & Innovation Board commissioned Market Access Solutionz to design a poster summarising the important steps that vegetable growers must follow when using crop protection products off-label to ensure that off-label use complies with regulations.

While off-label use is legal for most products, growers are responsible for ensuring that off-label use is necessary, safe and compliant with all regulatory controls.

Off-label use occurs when growers need to use a product to control a pest, disease or weed – but the label does not carry a claim for that crop or target organism. While the flexibility of being able to use crop protection products off-label is critical to New Zealand growers, they are unable to rely on label directions to ensure regulatory controls are complied with.

Without label guidance, there is a risk that off-label use may result in exceedance of Maximum Residue Levels (MRLs).

Off-label use is severely restricted, especially for newer actives and some older products that have been reassessed by the Environmental Protection Agency (EPA).

This poster provides a step-by-step guide to off-label use and highlights the key steps that all growers should follow when using products off-label.

Step 1:	Check the Agricultural Compounds & Veterinary Medicines (ACVM) regulations which provide guidance on food residues for MRL compliance, and the Environmental Protection Authority (EPA) for environmental compliance first.
Step 2:	Growers should record their considerations. NZGAP (Good Agricultural Practice) has a template for off-label use that is available on the NZGAP website. Growers should be aware there may be further restrictions on products and should also check the WorkSafe website for restricted entry intervals.
Step 3:	It is important to check if any control prohibits off-label use. Actives with off-label restrictions include: Organophosphate and carbamate insecticides such as *acephate, diazinon, fenamiphos and methamidophos.*
Step 4:	When designing or updating spray plans, growers should carefully consider what products may need to be used off-label. Growers are strongly encouraged to design a spray programme ahead of the season and to account for any off-label uses that may be required as a result of unanticipated pest or disease outbreaks.

This poster should be read in conjunction with the NZGAP off-label guidance document.

This information is updated annually and available on the NZGAP website: **www.nzgap.co.nz.** This includes a decision tree and checklist.

This poster is available to download from the Vegetable Research & Innovation website: **www.vri.org.nz,** or can be obtained by contacting your Product Group Manager.

Thinking vegetable seeds? Think **Terranova.**

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WORLD SOIL DAY – ORGANIC CARBON KEY TO SOIL PRODUCTIVITY

Words by Robin Boom : Member of the Institute of Professional Soil Scientists

The United Nations Food and Agriculture Organisation (FAO) through its Global Soil Partnership has deemed the 5th of December to be World Soil Day.

This initiative is to raise awareness of the fragility of our productive soils upon which not just human, but all terrestrial life depends, and the importance of their preservation and enhancement through sustainable management practices for food production.

This year's theme is *'Halt soil salinisation, boost soil productivity'*.

Fortunately, in New Zealand our temperate climate with enough natural rainfall means we are not totally dependent on irrigation, and with relatively good soil organic matter levels, soil salinity is not yet a problem here.

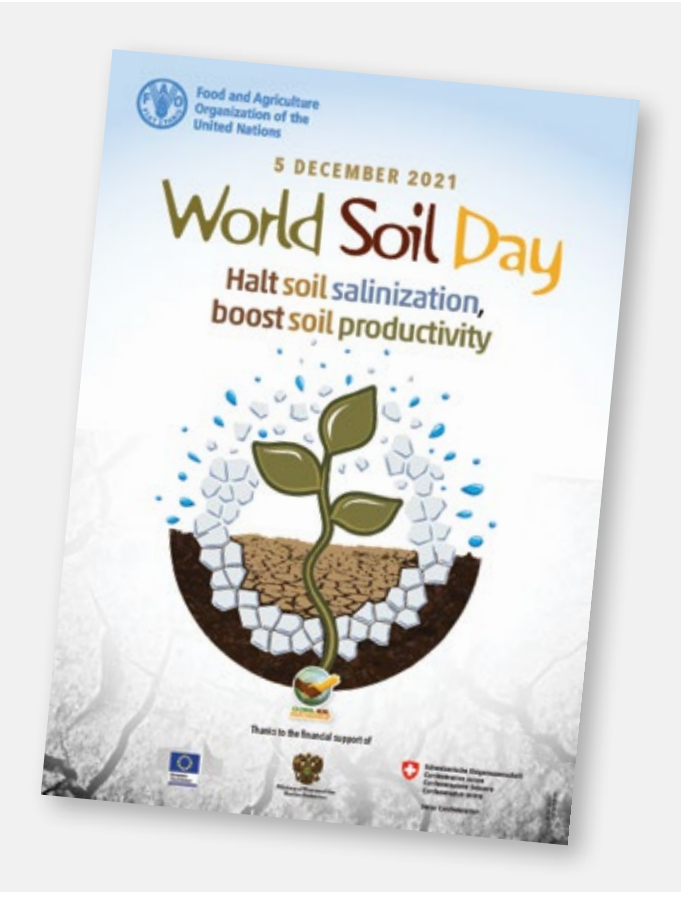
Increased salinity (build-up of salts) is making what was once a lot of productive land around the globe, unproductive. Large parts of the United States, Argentina, North Africa and the Middle East, former Russian Eastern block countries, the Indo-China region and small pockets of Southern Australia have salt levels so high that crops can no longer be grown in them.

> **"Carbon makes up approximately 58% of soil organic matter and this is a combination of dead and living organisms including plant roots, exudates, fungi, microbes, decaying plant materials and animal manure**

Salt layers can build up from the use of irrigation water high in salt, causing sodification, but also high bicarbonate and carbonated water in semi-arid and arid regions can cause salinity problems. White crusting on the soil surface, or white spots and streaks in the soil profile, are indicative of salinity issues. Improving drainage, reducing compaction and adding large amounts of compost and other soil amendments high in organic matter, are vital in the reclamation of saline soils.

Last year, the United Nations World Soil Day theme was *'Keep soil alive, protect soil biodiversity'*, to encourage people around the world to engage in proactively improving soil health. Soil health is often measured by the amount of organic matter in the soil, as this provides many 'soil ecosystem services' such as regulating the flow and quality of water, providing clean air, filtering pollutants and contaminants and supporting biodiversity. In general, soils with more organic carbon have a more stable structure through better aggregation, are less prone to run-off and erosion, have greater water infiltration and retention and increased biological activity and nutrient supply compared to similar soils with lower organic matter levels.

At last month's COP26 United Nations Climate Change conference in Glasgow, British soil scientists were able to present information on the importance of preserving and building up soil carbon as a contributing solution to mitigating climate change.



ALL LIVING PLANT MATTER ABOVE AND BELOW GROUND CONTAINS

700 GIGATONNES

OF CARBON

WHEREAS THE OCEANS CONTAIN A WHOPPING

40,000 GIGATONNES

OF INORGANIC CARBON

Currently there is around 800 gigatonnes of CO_2 in the atmosphere, whereas the topsoils (up to one metre depth) currently hold approximately 1,500 gigatonnes of carbon, and the subsoil (one to three metre depth) holds a further 800 gigatonnes of carbon. All living plant matter above and below ground contains 700 gigatonnes of carbon, whereas the oceans contain a whopping 40,000 gigatonnes of inorganic carbon. One cause of concern is the potential uncontrolled escalation of global warming that could occur from the release of carbon held in the permafrost areas of northern Russia and Canada which are estimated to be as high as 1,000 gigatonnes. As the planet warms and these permafrost areas melt, some of this carbon will escape into the atmosphere as carbon dioxide through mineralisation of the organic matter and also as methane gas.

Carbon makes up approximately 58% of soil organic matter and this is a combination of dead and living organisms including plant roots, exudates, fungi, microbes, decaying plant materials and animal manure. With the cutting down of forests and development of agriculture worldwide through cultivation practices that have occurred for many decades and in some cases millennia, the soil organic matter levels in many countries are only a fraction of what they had previously been for thousands of years. On New Zealand's pastoral farms, the loss of soil carbon has been minimal except on peat soils, where carbon losses have been significantly greater due to drainage and the resultant oxidising and mineralising of the organic materials peat is composed of.

Under cropping and intensive horticulture, carbon losses have been and continue to be greater due to cultivation and fallowing practices. Degraded soils have the greatest potential to sequester carbon from the atmosphere, but this process takes a long time and can quickly be reversed and degrade through rapid carbon losses though cultivation. Carbon has the ability to form bonds with other essential elements such as nitrogen, phosphorus and sulphur to create large complex molecules. These bonds trap energy as a source of fuel for micro-organisms.

To help circumvent the loss of soil carbon, management practices such as strip tillage, minimum tillage or zero tillage, rather than fully inverting the soil, results in less oxidisation of soil carbon. Using green manure cover crops, such as lupins or winter ryegrasses, between commercial crops to minimise fallowing losses and also add additional plant material to the soil, is another tool. Adding compost and other organic waste amendments such as animal manures and vermicast type materials will also help in developing a soil's resilience to adverse climatic events and any potential build-up of soil salinity.

With our current Emissions Trading Scheme and the rapid lift in international carbon prices driven by carbon trading schemes, planting vast swathes of our productive New Zealand soils in rapid carbon sequestering pine trees is unlikely to have any net benefit to global CO_2 emissions. We are among the most carbon efficient producers of food in the world and any global shortage of these foods will only be produced elsewhere using more greenhouse gases in the process. COP26 strategists will hopefully realise the error of some of their policies and ideas which have been decided upon in previous conferences.

A better solution to my way of thinking is for us to aim to become even more carbon and energy efficient, not resting on our laurels, and keep doing what we have always done – while looking at improving our already world leading innovativeness.

Planting our good productive soils into exotic trees is a total waste of resource, even though the temporary economics of carbon trading make it extremely attractive to do so. Our climate and soils are too valuable for this, and future generations will likely have to swallow a bitter pill as a consequence. Such loss of food producing soils to carbon farming here in New Zealand should be a consideration on this World Soil Day.

TECHNICAL

THE LATEST INNOVATIONS AND IMPROVEMENTS

ALTERNATIVE ENERGY OPTIONS

Words by Elly Nederhoff : Crophouse Ltd

Decarbonisation is a huge challenge for the greenhouse industry worldwide

Decarbonisation and setbacks in natural gas supply are causing incredibly tough challenges for the greenhouse industry in New Zealand and abroad.

Growers are confronted with absurd price hikes, imminent reductions in supply and a steep rise in predicted carbon emission charges. Greenhouse operations in the North Island, including large corporates, are unable to get a reasonable natural gas contract for next winter. There is no time for a gradual energy transition, only for a fast switch.

This article outlines some energy solutions currently on offer in the Netherlands, where decarbonisation started several years ago. Finding a fitting solution and implementing it in the New Zealand situation will be difficult.

Decarbonisation

The energy transition has its own jargon: decarbonisation, zero-carbon, carbon-neutral, fossil-free, renewable, sustainable. New Zealand aims to considerably reduce the emission of greenhouse gases to the atmosphere, including the emission of carbon dioxide (CO_2).

Decarbonisation of a sector may lead to zero carbon emissions and being carbon-neutral over time. To this end, the use of fossil fuel must be minimised or ended, so processes become nearly fossil-free. An example is the adoption of electric vehicles powered by green electricity from renewable sources leading to fossil-free transport. Something similar is expected from the greenhouse industry. Note that biomass such as wood waste is not a fossil-fuel, as it was not formed millions of years ago. Thus, the decarbonisation plan allows the use of biofuels because the biological matter would decay quickly and release CO_2 anyway.

Energy transition

Over the last few decades, many glasshouse operations in the Netherlands installed a gas-fired co-generator and a heat buffer tank. This set-up allows for efficient control of the temperature and humidity (by heating), as well as enabling CO_2 enrichment and lighting. Transitioning to another energy arrangement will have a great impact on CO_2 enrichment which will not be possible with most new energy solutions. Often, various technologies must be combined to achieve what is needed.

Water in ponds or canals is often warmer than the air in cold winter nights, and can serve as a low-grade heat source

Looking at the greenhouse industry in the Netherlands, it appears that different situations require different solutions, depending on:

- Size: large versus small glasshouses
- Heat availability: potential access to heat supply
- Networks: option to join a cluster or stay independent
- CO_2 availability: whether CO_2 can be supplied via a pipe network or road tankers
- Electricity requirement: e.g., for lighting.

Solutions in New Zealand

The situation in New Zealand is very different and there is not one solution that fits all situations. Potential energy alternatives could involve the use of:

- High-grade heat from a geothermal or industrial source
- Low-grade heat from a wide variety of sources (e.g., seasonal heat storage underground)
- Green electricity from solar, wind, hydro or biomass, produced on-site or off-site
- Heat pumps in combination with low grade heat and electricity
- Bioenergy including waste wood
- Hydrogen, a promising option for the future
- A combination of the above.

Bioenergy

Bioenergy is being trialled by greenhouse growers worldwide. The obvious biofuel in New Zealand is waste wood from forestry but securing sufficient supply and reliable transport for future years may prove to be a challenge. Multi-hectare greenhouse operations will struggle with the sheer volume of waste wood needed. The use of other types of biomass and innovative ways of pre-processing it, are being investigated. It must be noted that burning raw biomass produces flue gases with an inconsistent composition.

Standard purification of flue gases to make them suitable for CO_2 enrichment is expensive. Perhaps the Hot Lime system will provide a solution.

Large glasshouses

For large greenhouses with significant heat demand, waste wood is practically unfeasible. Large greenhouses require a compact and powerful energy supply. The best solution so far appears to be the use of hot water at 80–100°C, either from a geothermal bore or industrial source. Overseas, reliable heat producers are industries and large waste incineration plants, but in New Zealand industrial heat sources are hard to find.

> **“Geothermal heat is found relatively close to the surface in New Zealand. Some large greenhouse operators in the North Island have been using geothermal heat for greenhouse heating for at least 30 years**

Geothermal heat is found relatively close to the surface in New Zealand. Some large greenhouse operators in the North Island have been using geothermal heat for greenhouse heating for at least 30 years. The Netherlands have adopted the use of geothermal heat on a large scale, even though the hot water must be pumped up from 1.5 to 2.5km deep. The enormous investment costs of a deep bore are shared between a cluster of users. Geothermal bores produce a lot of CO_2 gas, but it is mixed with huge amounts of sulphur, and it is unfeasible to separate the CO_2 and sulphur gases.

Cluster or network (overseas)

In the Netherlands, where glasshouses are located relatively close to urban and industrial environments, growers have formed 'clusters' and 'networks.' A cluster consists of a combination of energy users and suppliers, e.g., large-scale glasshouses, industries, office buildings, hundreds of homes, as well as a reliable and powerful supply of hot water at 80–100°C. This heat is circulated through a heat distribution network that can stretch several hundreds of kilometres. A cluster can also have a CO_2 distribution network. A cluster forms a strong consortium that can realise the extremely expensive infrastructure and geothermal bore.

Independent sustainable glasshouses

Glasshouses that are not part of a cluster are considered 'independent sustainable glasshouses', with their own heat and CO_2 supply. In the Netherlands, there are two energy options used for these independent glasshouses: A) electricity, heat pump and water from which to extract heat, and B) bioenergy, such as biogas, green gas, biomass e.g., waste wood or agricultural waste burned in a boiler.

Many Dutch growers have a facility for warm and cold storage in the aquifer (deeper groundwater), consisting of two bores about 300 metres deep. These enable growers to store excess heat underground in summer and retrieve that heat in winter, with the use of heat pumps. Carbon dioxide is often purchased and supplied by road tanker.

> **In freezing winter conditions, water of 12–20°C is relatively warm. This stream can be fed into a heat pump, which extracts the heat from the incoming stream and transfers it to the outgoing stream**

Low-grade heat and a heat pump

Low-grade heat is a stream of water or air with a moderate temperature. In freezing winter conditions, water of 12–20°C is relatively warm. This stream can be fed into a heat pump, which extracts the heat from the incoming stream and transfers it to the outgoing stream. The outgoing stream has an increased temperature, for example 35°C, and can be used for greenhouse heating. The heat pump uses electricity for this process in an efficient way: every 1 kWh of electricity input produces 3 to 4 kWh of heat output.

In cold climates, the input for a heat pump must be water, because a heat pump cannot efficiently extract heat from freezing cold air. In milder climates, the input for a heat pump can be lukewarm outside air.

Low-grade heat is taken from a canal at Koppert Cress in The Netherlands

Four types of heat pumps can be distinguished: air-to-air, air-to-water, water-to-air, and water-to-water. Lukewarm water can come from many sources, such as a milk factory, data centre, water treatment plant, aquifer (underground water bubble) or surface water (canals, ponds). In warmer regions of New Zealand, it may be possible to use outside air as a low-grade heat source from which to extract heat. This opens possibilities for sustainable greenhouse heating. A greenhouse can have one very large heat pump or multiple small heat pumps.

> **In cold climates, the input for a heat pump must be water, because a heat pump cannot efficiently extract heat from freezing cold air. In milder climates, the input for a heat pump can be lukewarm outside air**

Future solutions

This is a very dynamic field, with new, innovative approaches being developed and tested at a rapid pace. There are new developments in electricity generation, heat storage, heat pumps, climate (humidity) control, CO_2 enrichment, greenhouse structures and more.

Hydrogen is a promising energy carrier for the future – more about this in next year's article.

CANTERBURY SOILS DRYING OUT

Words by Georgina Griffiths : MetService meteorologist

Soil moisture deficits (SMD) in Canterbury typically start dropping rapidly through October and November, due to the drying spring westerlies.

This year was no exception, although modest rain at the time of writing in South Canterbury has briefly put the brakes on this decline. Ashburton recorded 20mm of rainfall in mid-November, while Rangiora recorded just 7mm over the same period.

As of 15 November, a 'snapshot' of estimated soil moisture (fig. 1A) highlights how Hurunui and the Kaikoura coast, as well as Nelson, Blenheim, and central Hawke's Bay, are showing significant soil moisture deficits. The definition of 'significant' soil moisture deficit is more than 110mm of deficit. These maps are useful to compile a national picture of where it is dry and where it is not.

A zoomed-in version of the same map (fig. 1B) shows some of the detail available in the 4km resolution SMD estimates at the time. However, estimates are estimates, so always 'ground truth' the soil state-of-play for yourself.

Figures 2 and 3 tell an interesting story about just how hard 2021 has been for Canterbury farmers. The plots show the unusually prolonged drought during summer and through autumn of 2021. Soils remained extremely dry until the end of May, when extreme flooding in Canterbury on 31 May caused widespread damage.

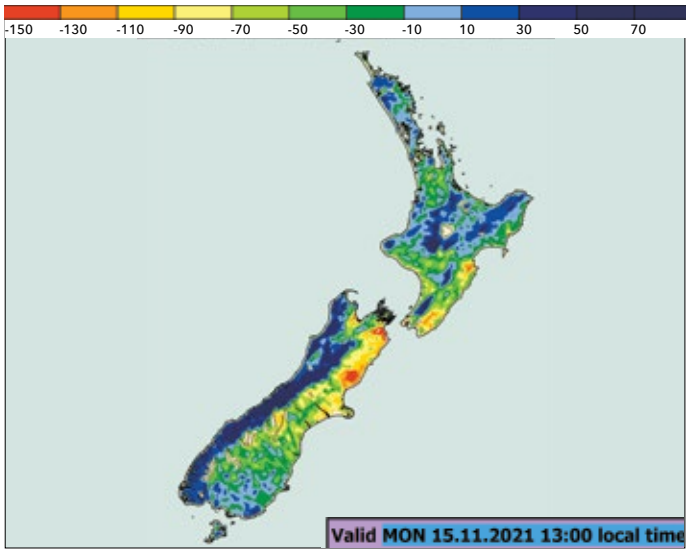


Figure 1A: *A national 'snapshot' of soil moisture deficit (SMD), shown in mm of deficit (orange, yellow, green colours) and mm of surplus (blue colours), from mid-November. (The snapshot is estimated as at 1pm, 15 November 2021). This is an estimated SMD based on 4 km resolution weather modelling, based on estimated daily rainfall (mm), outgoing daily potential evapotranspiration (PET, mm), and a fixed soil available water capacity of 150 mm. 'Significant soil moisture deficit' is defined as more than 110mm of deficit, and 'severe soil moisture deficit' is defined as more than 130mm of deficit*

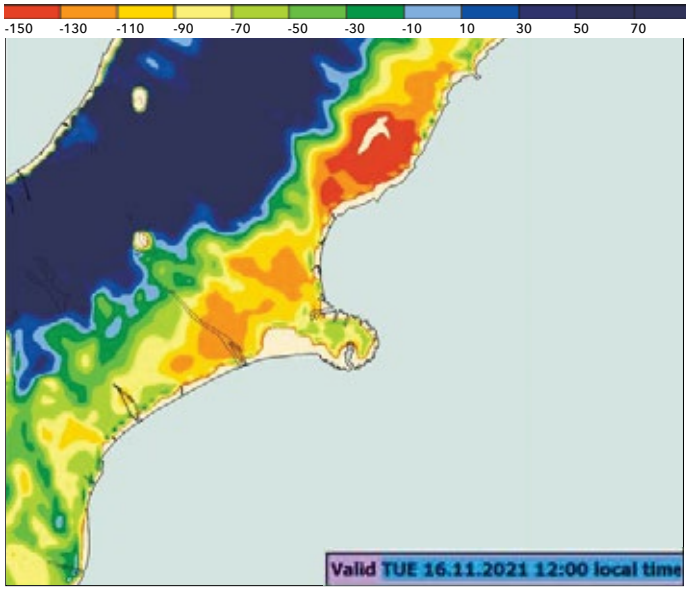


Figure 1B: *A zoomed-in 'snapshot' of soil moisture deficit (SMD) across Canterbury, exactly as described in Figure 1A*

New Zealand really breaks a drought savagely, doesn't it?

The rapid change in soil moisture levels at both Rangiora and Ashburton during the first half of November also caught my eye (figures 2 and 3). By mid-November, soil moisture deficits had accelerated higher than five of the six years shown, and were comparable to 2017 at the same time of year. The year 2021 sure has been a rollercoaster for Canterbury!

With La Niña forecast for the coming summer and the associated risk of higher-than-usual pressures over the South Island, there is a very real likelihood that this weather rollercoaster is not yet over for the region.

As always, you should keep up to date with the MetService long-range forecast at **http://metservice.com/rural/monthly-outlook,** or ask us questions on the MetService Facebook or Twitter feeds.

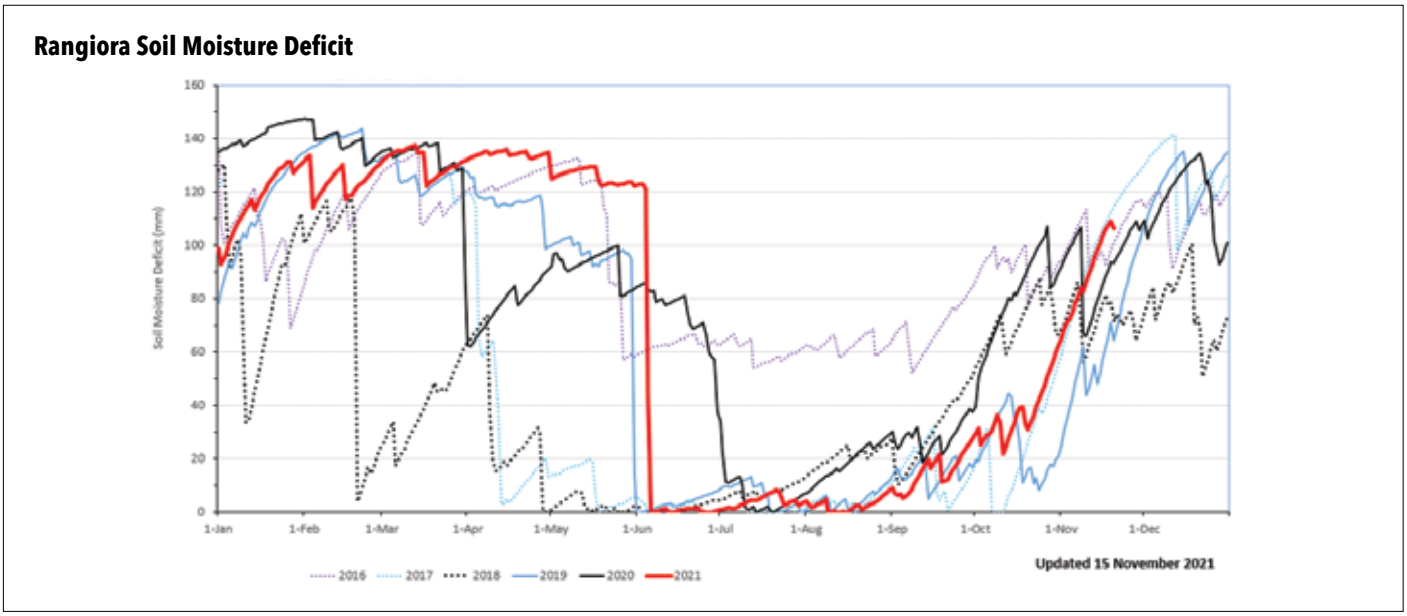


Figure 2: *Rangiora soil moisture deficit (SMD), shown in mm of deficit, for the last six years (2016 to 2021-so-far). SMD is calculated based on incoming daily rainfall (mm), outgoing daily potential evapotranspiration (PET, mm), and a fixed available water capacity of 150 mm. (This is the amount of water in a theoretical soil 'reservoir' that plants could utilise). Soil moisture deficit in Rangiora in 2021 remained in 'extreme' soil moisture deficit (more than 130mm of deficit) through most of summer and all of autumn, until the extreme Canterbury floods on 31 May shot soils straight to run-off (saturation) for winter and early spring. Since mid-October, soil moisture levels have started to drop quickly again*

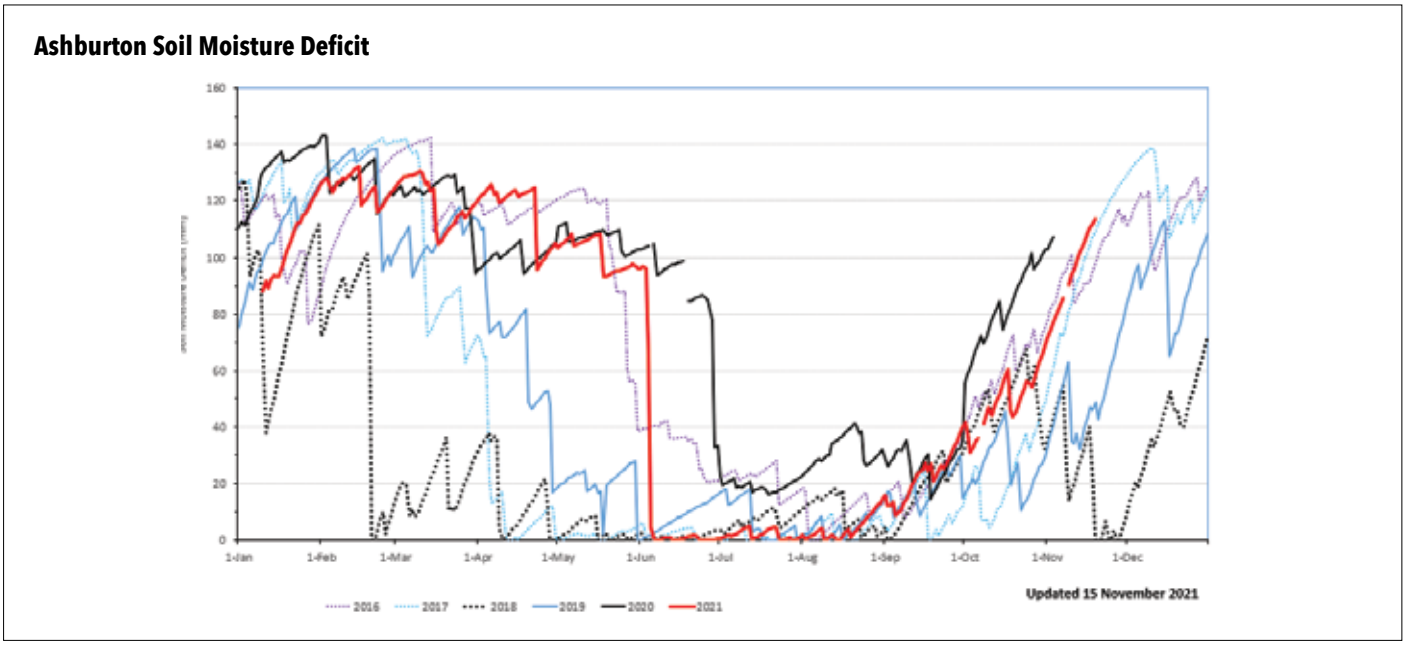


Figure 3: *Ashburton soil moisture deficit (SMD)*

EMPOWERING GROWERS TO MANAGE THRIPS IN STRAWBERRIES

Words by Emma Smith : Plant & Food Research Ltd

A tiny insect that feeds on strawberry leaves, pollen and fruit is causing a huge amount of damage.

Thrips, a pest causing reduced fruit production, removal of plants and rejection of fruit, costs New Zealand strawberry growers $37,500 per hectare.

Current practices to manage thrips in New Zealand are heavily reliant on insecticides.

A Sustainable Future Farming project *'Future-proofing thrips management in strawberries'* is working to address this problem by developing an Integrated Pest Management (IPM) programme for the strawberry industry. This is a collaborative project with Berryworld Ltd, Strawberry Growers New Zealand and the biological and agrichemical industries.

"IPM programmes require knowledge of the whole ecosystem," says Plant & Food Research (PFR) science team leader, Jessica Vereijssen. "You have to understand the pest organism, where they live, and their seasonality. There will not be one single management solution, but a combination of tools that together have an effect on reducing the pest population."

The three-year project will empower strawberry growers to adopt IPM strategies for more sustainable and profitable growing.

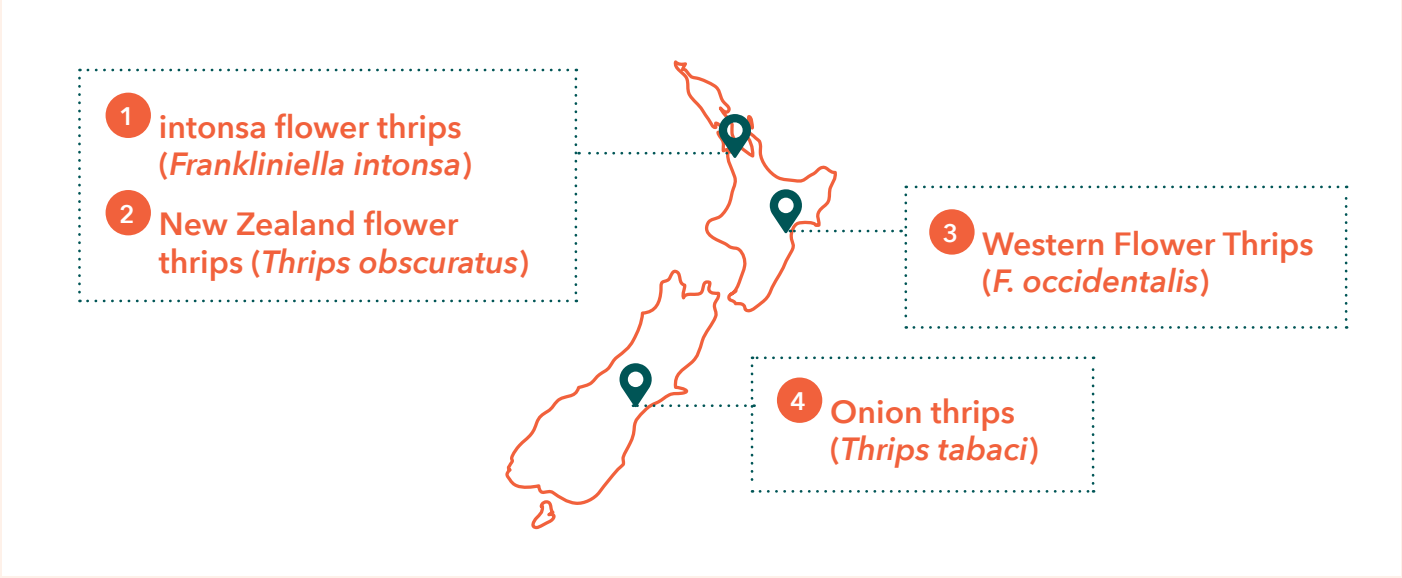
"We want to take a proactive approach and start working on sustainable solutions for thrips management now, before we need to," says PFR scientist and project lead, Mette Nielsen.

> **"The aim of the first year of the project was to find what species, of the 6,000 thrip species worldwide, are present in New Zealand strawberry crops, so they can be targeted effectively**

"We have learnt from growers in parts of Australia who reached a point where the sprays weren't working at all, and they were forced to change to an IPM programme almost overnight, scrambling to reform."

The aim of the first year of the project was to find what species, of the 6,000 thrip species worldwide, are present in New Zealand strawberry crops, so they can be targeted effectively.

FOUR SPECIES OF THRIPS WERE FOUND IN AUCKLAND, HAWKE'S BAY AND LINCOLN



Researchers at PFR collected flowers and leaves from strawberry blocks across Auckland, Hawke's Bay and Lincoln and found four species of thrips present. The species varied by region, by growing system and over the season. In Auckland, the most dominant species present were intonsa flower thrips (*Frankliniella intonsa*) along with New Zealand flower thrips (*Thrips obscuratus*), whereas western flower thrips (*F. occidentalis*) dominated Hawke's Bay. In Canterbury, strawberries grown in greenhouses were predominantly infested with onion thrips (*Thrips tabaci*).

Before management solutions to target thrips could be developed, a trial was conducted in the lab to assess the potential damage the different thrips species could cause.

"The intonsa flower thrips were found to create the most damage, causing the scarring that downgrades the fruit," says Mette. "Western flower thrips were also found to cause damage, while the effects of onion thrips were not conclusive."

The second year of the project comprised a demonstration trial at an Auckland strawberry grower to showcase implementation of a full IPM programme. Beneficial insects were released to manage the thrips and sticky traps were used for mass trapping and to monitor the thrips' abundance and the species present.

"Even though there was still some damage to the fruit, the grower was very happy with the results," says Mette. "We only put on a single IPM-friendly insecticide spray."

This year, the final year of the project, a similar trial is being run with three Auckland growers, who each use a different growing system, to see if similar results can be achieved.

Monitoring of pests and beneficial insects will again be a very important part of the trial, on which to base management decisions.

Another trial is being conducted to test how efficient different types of predators are at attacking and killing the thrips pests that we know are causing this economic damage to New Zealand strawberries. The trial will further researchers' understanding of how well the predators are performing before their release into the strawberry crops.

Collaborating with growers is a significant part of the solution to managing thrips. Workshops were planned for growers in Auckland, Waikato and Lincoln to provide knowledge of why and how to build an IPM programme, as well as how to find and identify thrips and beneficial species in their crops. Due to Covid-19 restrictions, workshops have been placed on hold, with videos and online tutorials planned instead.

"The strawberry growers have been wonderful to work with and provided great feedback," Mette says. "They have jumped to be part of the trials and have a great attitude toward doing things better. It has made a huge difference to the success of the project."

Ultimately, the researchers would like to see as many tools available as possible so growers can build their own tailored IPM programmes. Each strawberry block is different and will need a different combination of tools for IPM to be successful.

"We want to enable growers to make their own decisions," says Mette. "IPM is more dynamic than a spray programme, so you need excellent monitoring systems put in place to have an understanding of what is going on in your crop and the ability to respond to changes as soon as possible."

TRIALLING ACOUSTIC LURES FOR THE MANAGEMENT OF BLACK CRICKETS

Words by Sophie Hunt : Plant & Food Research Ltd research associate

Close up of a black field cricket

Plant & Food Research has been breeding colonies of insects for more than 60 years. The institute deals mainly with fruit and vegetable pests, indigenous or introduced, as well as some more helpful insects such as parasitoids – tiny wasps that attack and kill other insects. The team researches new ways to deal with pests, from parasitoids to acoustics.

Black field crickets (*Teleogryllus commodus*) are significant pests of vegetable crops and pasture in northern areas of New Zealand. In kūmara crops, valued at around $25 million per year, black field crickets can damage the tubers and make them unsaleable. Given rising temperatures, the population of black field crickets may become more dense and widespread in future.

Black field crickets are currently controlled using bait containing maldison, limited to two applications per year owing to toxicity. This is supplemented with the use of broad-spectrum pesticides.

However, pesticide resistance is a risk, and some pesticides are under review and may not be available in future.

With kūmara growers potentially facing limited options for controlling cricket pests, developing an additional low-cost, non-chemical control for crickets could offer significant benefits for the industry, local communities and the environment.

One safe, reliable option would be to use acoustic lures, which are effective overseas for other pests. Funded by an Agribusiness Innovation Grant from AGMARDT, Plant & Food Research recently conducted a collaborative investigation with kūmara grower Simpson Gardens in Ruawai, near Dargaville. The research explored the potential use of an acoustic lure/trap to control black field crickets.

> “In kūmara crops, valued at around $25 million per year, black field crickets can damage the tubers and make them unsaleable

Sophie Hunt sets the night vision camera to film the cricket trap overnight

Black field crickets eat kūmara tubers

Male black field crickets attract females for mating using chirps and trills. The males who produce the most attractive sound are the most likely to be selected by the females. Plant & Food Research has been trialling an acoustic lure that makes the female think there's an attractive male nearby.

> **Male black field crickets attract females for mating using chirps and trills. The males who produce the most attractive sound are the most likely to be selected by the females**

The preference of female crickets for different male cricket calls was tested in the lab, with the most popular call selected for electronic replication in the field.

The field trial found that the lure/trap was successful in capturing female crickets. Given that a single female can produce around 2,000 eggs, even modestly reducing the numbers of females through capture could significantly reduce the following year's population and their impact on kūmara crops.

It is expected that these findings will provide a foundation for a larger research project in future and potentially lead to the development of a tool that could be used nationally and internationally.

Further research will look to refine the caller and trap combination for optimal effectiveness.

A SINGLE FEMALE CRICKET CAN PRODUCE AROUND 2,000 EGGS

UNDERSTANDING SOIL NITROGEN

Words by Trish Fraser

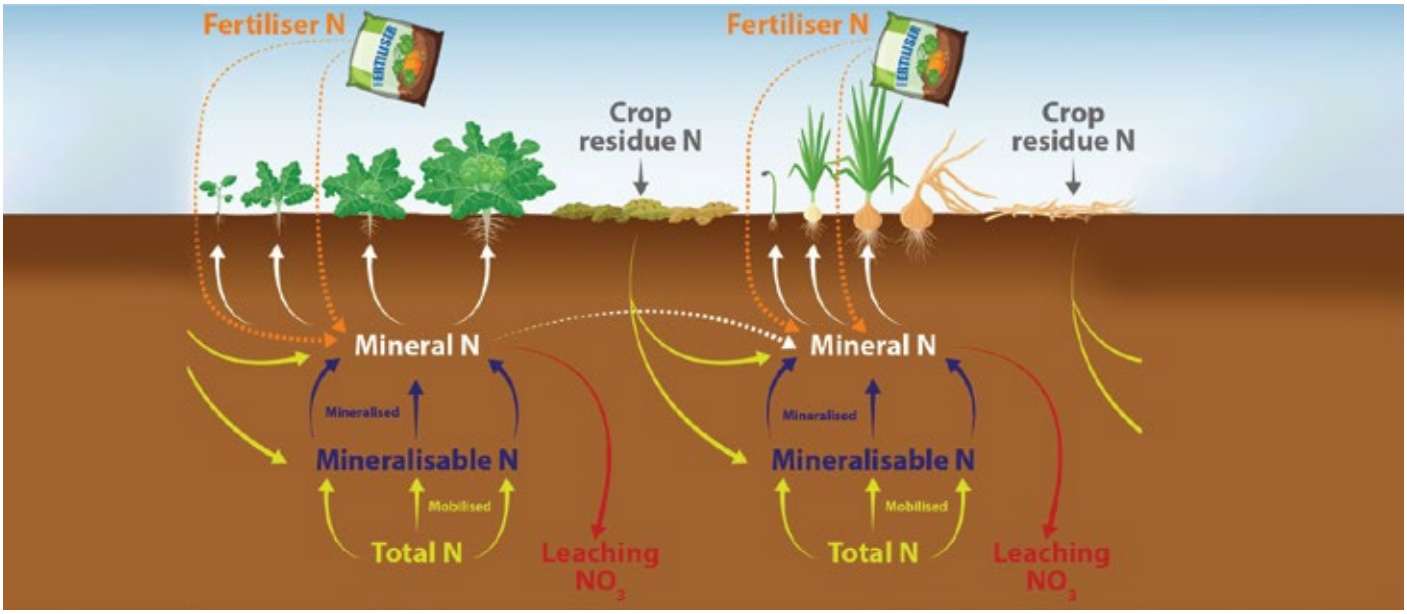


Figure 1. A schematic diagram showing the movement of nitrogen in soil (gaseous losses not shown) during growth of a broccoli crop, followed by an onion crop, within a cropping rotation. Illustration by Donna Gibson, © Plant & Food Research

Nitrogen is found in soils and plants, in the water we drink and in the air we breathe. It is a critical limiting element for plant growth and production. But just like other things, balance is key. Too little nitrogen will limit a plant's ability to grow, whereas too much can be toxic to plant growth and can harm our environment. Understanding how soil supplies nitrogen to plants can therefore help us grow healthy crops and protect our environment.

Soils in New Zealand typically contain between 5,000 and 9,000 kilograms of total nitrogen (N) per hectare in the top 30cm of soil.

Most (97–99%) of the total soil N exists as a component of soil organic matter called the ***organic nitrogen fraction*** (included as part of ***Total N*** in Figure 1), which includes humus and soil organisms. This organic portion of soil N is not immediately available for plants to take up via their roots and is often described as being 'immobilised'.

The other <1–3% of total soil N is in a soluble form present either as ammonium (NH_4) and/or nitrate (NO_3) depending upon the soil and environmental conditions.

This portion of soil N is known as ***mineral nitrogen*** (Figure 1) and is the soil N that is immediately available for plants to use.

The NO_3 component of ***mineral N*** is the primary source of N that is at risk of being lost if excess water (rainfall or irrigation) drains through (leaches) or runs off the soil. It is also the main source of N that contributes to nitrous oxide (N_2O) emissions to the atmosphere, Nitrous oxide is a greenhouse gas.

> "Soils in New Zealand typically contain between 5,000 and 9,000 kilograms of total nitrogen (N) per hectare in the top 30cm of soil

There are three primary sources of N that contribute to accumulation of ***mineral N*** in soil: soil organic matter, crop residues and nitrogenous fertiliser. The breakdown of soil organic matter by soil microbes can release between 40 and 300 kg N/ha/yr through a process known as ***mineralisation***. The rate of mineral N release is dictated by soil temperature and moisture, being faster when soils are warm and moist (but not saturated).

Plant & Food Research Ltd soil scientist, Trish Fraser

The ***mineralisable N*** fraction makes up about 1–4% of the total organic N in most soils but varies depending on soil type and land use history. In annual cropping systems, the plant residues that remain after crop harvest also contribute to the release of mineral N through the process of decomposition. In addition to ***mineral N*** release, crop residue breakdown also contributes to replenishing the pool of organic N held in soil organic matter.

Growers need to calculate whether or not there is going to be sufficient ***mineral N*** in the soil to make their next crop grow to its full potential. Before they add any ***fertiliser N***, they need to measure how much nitrogen is currently present (***soil mineral N***) and how much nitrogen will become available during the growing season (***mineralisable N*** from soil organic matter, plus ***crop residue N*** from decomposing residues). Then the right amount of fertiliser can be added to match the upcoming crop's needs and to ensure too much N is not applied – so that N does not end up misplaced in the environment. There are also economic considerations associated with applying more N than is actually needed. Although there are well established methods for soil ***mineral N*** testing and recent advances in testing for ***mineralisable N*** (see the Potentially Mineralisable Nitrogen test below), there are no well-established methods for predicting the supply of N from crop residues.

Though often overlooked, crop residues (including all unharvested plant tops and roots) can be a key source of N to feed the next crop. The amount of this N in residues will vary though, depending on the crop grown.

For some crops that are known for luxury uptake of N, it also depends on the amount of N the crop had available to it during the growing season, so it pays to understand not only how much N is in the soil, but also how much N might be contained in crop residues.

The timing of when this N becomes available and how much is released to the next crop therefore varies depending on the crop type that was grown, as well as the environmental conditions.

The rate of ***mineral N*** released from fertiliser will depend on the type and amount of the fertiliser applied as well as its placement (whether it is on the soil surface or buried in the soil).

Soil test results can be used to help understand how much soil N is available to plants and to work out how much fertiliser N might need to be added to supplement N that is already in the soil.

- ***Total N*** – this measures the total amount of *organic and mineral N* in the soil. Because there is so much stable N in the soil, it is not possible to measure a change in total N from one year to the next, so it is not a very useful test for growers.
- ***Mineral N*** – this measures the *combined amount of ammonium and nitrate* in a soil sample. This is the only form of N that is taken up by plants as well as the main form of N lost via leaching and gaseous emissions, and the test result tells you how much N is immediately available to plants. *Mineral N* needs to be measured as soon as possible after sampling. Either refrigerate or freeze samples if they cannot be delivered to the laboratory immediately. The amount of ***mineral N*** in the soil changes during the year mainly due to plant uptake, gaseous losses or leaching.
- ***Mineralisable N*** – this is the small portion (1–4%) of the total organic N that is broken down each year by a process called *mineralisation* to mineral N by the action of soil microbes. ***Mineralisation*** occurs most rapidly when the soil is moist and warm. The new *Potentially Mineralisable* N (PMN) test provides the best measure of the ***mineralisable N*** pool in soil. Information on how to convert PMN to the kg N/ha that can be released over a crop growing season is available from most of the commercial testing laboratories in New Zealand.
- ***Crop Residue N*** – there are currently no reliable methods to predict the release of mineral N from crop residues. This is an important of focus for future research.

Understanding how soil nitrogen becomes available and matching soil N supply with crop demand can therefore provide both economic and environmental benefits for growers.

This article is a joint contribution from the 'Sustainable Vegetable Systems' and 'Mineralisable N to improve on-farm N management' projects, with funding from the Ministry for Primary Industries, the Vegetable Research and Innovation Board, and Horticulture New Zealand. Other co-funders include: Potatoes New Zealand, the Foundation for Arable Research, commercial testing laboratories (Hill, ARL, Eurofins) and regional councils (Canterbury, Waikato and Hawke's Bay).

PRODUCT GROUPS

ALL THE LATEST NEWS FROM YOUR PRODUCT GROUPS

New Zealand Asparagus Council

NEW ZEALAND ASPARAGUS COUNCIL LEVY 2021 SEASON

Words by Karen Orr : HortNZ business manager

During the 2021 New Zealand Asparagus Council (NZAC) Annual General Meeting (AGM), growers voted in support of the following levy rate for this asparagus season:

- That the levy rate for 2021/2022 is increased to $200 per hectare of planted asparagus (excluding GST).

All asparagus growers were contacted in November and advised that a decision was made to waive the additional subscription rate that was also voted on at the AGM.

Funds raised by the levy will be used towards the operating costs and agreed activities of NZAC (as per the approved budget) which includes a variety trial programme, asparagus promotion, crop protection and environment management.

Under the Commodity Levies (Asparagus) Order 2018, the final date for payment is 28 February 2022.

For any grower queries please contact **info@hortnz.co.nz**.

ARE WE HELPING YOUR GROWING BUSINESS TO THRIVE?

Words by John Murphy : Vegetables New Zealand chair

Across all Vegetable product groups there seems to be a renewed determination to get more done. For Vegetables New Zealand Inc, this is all about enabling our growers' businesses to thrive, so that we can continue to feed New Zealand and contribute to our local communities.

We have all heard about those 'inside the tent' getting the lollies. At VNZI, we want our growers inside – and we need your help to get us there. When regulators, the public and the customer want to boost business, we need them to be thinking of vegetable growers.

> "As growers, it's clear that labour issues are significantly affecting our viability

With this in mind we take **your** money for industry initiatives every time you make a sale. Are we putting this to good use? Our strategy is about Biosecurity and GIA (Government Industry Agreement for Biosecurity Readiness and Response), EPA (Environmental Protection Authority) reassessments, NZGAP (Good Agricultural Practice), promotions and education, grower/government relations, and research and development that can improve what we do.

As growers, it's clear that labour issues are significantly affecting our viability – VNZI needs to look at how we can help with this.

An irritated grower recently challenged me to involve them more in VNZI because they are "very passionate about vegetables and committed to getting the information and promotion of the product to the everyday consumer."

This is absolutely what we want – our growers keeping us relevant and driving us to deliver. Making it easier for you to do what you're good at is what we're about.

> "Vegetable growers are remarkably innovative, and particularly good at coming up with practical ways to make a difference

Our Crop Advisory Groups Zoom every two months to talk through the issues facing us and what we can do about them. This gives us boots on the ground, technically sound advice. If you're interested in simply listening in, or having a say, email or call us and we will get you involved.

We've also started getting out to the provinces and will be working with local associations to get growers together. We're heading to gumboot catch-ups for pizza and a chat, so that we can hear what our people need.

Vegetable growers are remarkably innovative, and particularly good at coming up with practical ways to make a difference. Let us know about them so we can get more done for you.

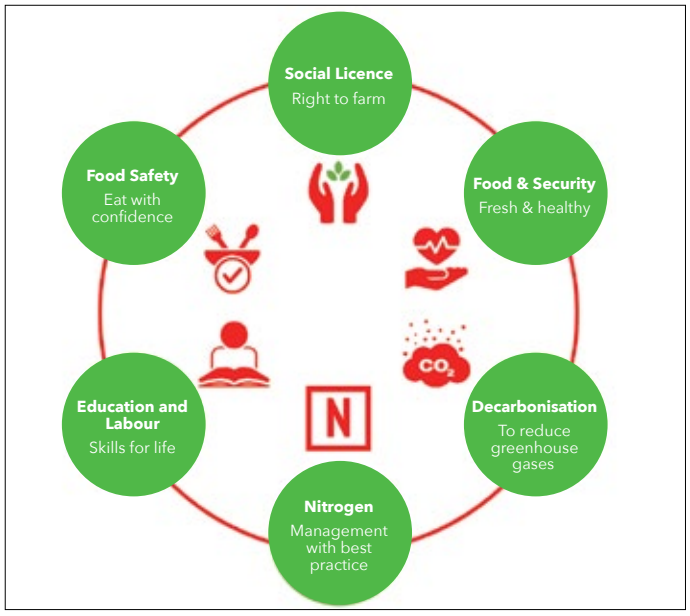
BUILDING ENGAGEMENT AND SOCIAL LICENCE FOR VEGETABLE GROWERS

Words by Antony Heywood : Vegetables New Zealand Inc. general manager

At the heart of the Vegetables New Zealand (VNZI) strategy is engaging with growers, our external stakeholders including government, but also a wider public audience.

The VNZI manifesto forms the workplan for the next 12 months. The information shown in the manifesto demonstrates the key issues growers face and what VNZI plans to do to help overcome some of these core issues.

VNZI is active in the work Hort NZ are doing in rolling out the NZGAP (Good Agricultural Practice) Environmental Management System (EMS) Farm Environment Plan (FEP) modules across the country. The NZGAP EMS will give growers a FEP which will help in meeting freshwater management requirements.

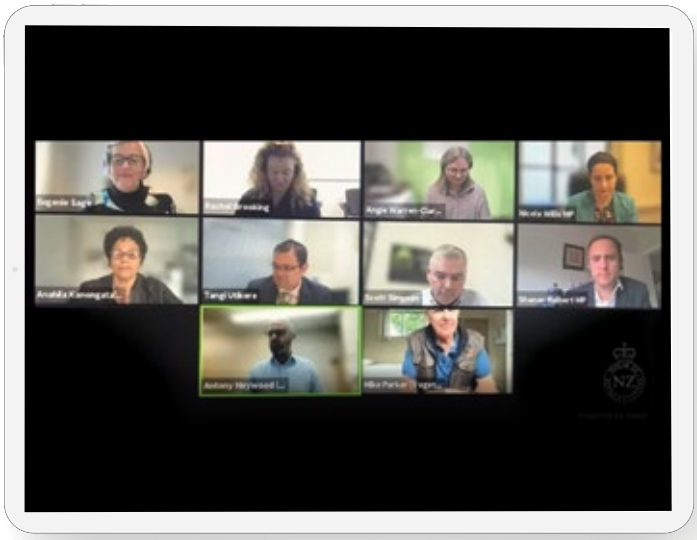


VNZI manifesto for 2021

> **The information shown in the manifesto demonstrates the key issues growers face and what VNZI plans to do to help overcome some of these core issues**

At the HSNO (Hazardous Substances and New Organisms Act) parliamentary Select Committee hearing, VNZI director, Mike Parker, explained the grower implications to the HSNO amendment bill. Mike spoke on the need to ensure growers have access to new, softer chemistry by making registration processes pragmatic and less costly for all parties.

To facilitate this, VNZI Covered Cropping are promoting a transition pathway where growers can access government support now, at the expense of gaining carbon credits in the future. It is akin to paying it forward, whereby government will be encouraged to fund a transition



Select Committee hearing on the HSNO Amendment Act

plan to give confidence to our covered crop industry to invest in their future. VNZI consider this a fundamental factor to sustaining food security our country can count on in any crisis.

VNZI is of the view that New Zealand's current grocery model also needs to be improved with growers in mind. Suppliers need an environment where they can negotiate with retailers and wholesalers on equal terms. This environment needs to be transparent and without a power imbalance to the purchaser. VNZI considers the best mechanism to achieve a transparent system is with a Code of Conduct. While the final framework has not yet been decided, both the United Kingdom Code of Conduct and parts of the Australian Code of Conduct, hold a lot of merit.


INFORMATION FOR SUPPLIERS

Market study into the grocery sector

In November 2020, the Commerce Commission began a year-long study into whether competition in the grocery sector is working well, and if not, what can be done to improve it.

GROCERY STORE

In this paper we outline why it is important we hear from suppliers, what we want to know, and how we may be able to protect the confidentiality of information you supply us.

You can contribute to the study by sending us information, meeting with us, or making submissions when we ask for them during the study.

What is the study looking at?

The Government has asked us to look at a range of things including:

- How retailers deal with their suppliers such as manufacturers, producers, farmers and growers
- Competition at the supplier level of the grocery market
- Who consumers buy groceries from and who supplies those retailers
- Competition between retailers when selling groceries to consumers
- What retailers charge consumers for groceries and how they decide on their prices, as well as the associated levels of service, product ranges and quality of groceries.

A grower membership organisation needs a functional information system to ensure it remains connected to its membership and to monitor key factors to prove its economic impact. VNZI is reviewing how its grower data needs to be reported. VNZI is currently looking at options to ensure it can deliver a grower mandate of representing its members' economic, environment, social and cultural information to government and to the public.

> **"VNZI Covered Cropping are promoting a transition pathway where growers can access government support now, at the expense of gaining carbon credits in the future**

Grower information is an important tool facilitating social licence.

As we conclude this year, Vegetables New Zealand would like to thank all vegetable growers for their participation in the many virtual forums of 2021. With your help, we feel we have made a difference in how people think about vegetables and ultimately, how people value vegetables. We hope that value will come back to you as growers in 2022 and beyond.

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FOOD SKILLS FOR LIFE – CURRICULUM PROJECT UPDATE FOR TEACHERS

Words by Julie North : Vegetables.co.nz

You will know of the flagship cooking in schools programme developed by vegetables.co.nz a few years ago in partnership with the Heart Foundation. You may have noticed a subtle change in the title above, as we now call this programme *Food Skills for Life – a curriculum project*, focussing on the importance of food and cooking as a life skill.

As part of this programme, we provide a professional learning day for teachers every year. The day includes an update on nutrition guidelines and science, issues in the food regulatory space and topical food trends. Linking it all back to the *Food Skills for Life* programme and giving useful resources or tips for teachers to take back to the classroom and integrate into their lesson plans.

While Covid-19 put a stop to the planned session in Auckland, vegetables.co.nz recently held one of these sessions in Wellington and have a further session in Christchurch soon.

Focussed on *Chinese style cooking with Asian greens*, it was a wonderful opportunity to launch the new lesson plan, theme presentations and the hands-on kitchen demonstration.

> **“ Did you know online shopping was available 25 years ago? You could use your fax machine to place orders**

The lesson plan is the result of a Masters student project earlier this year through Otago University, with review by external professionals and completed in partnership with the Heart Foundation who provide the design elements.

Wellington's session was a jam-packed day. We presented on the United Nations' 2021 the *International Year of Fruits and Vegetables* with an overview of food systems

Asian greens from John Young, a grower in Levin, were used for the cooking session

All in all – a great day with fantastic feedback from all who attended:

> "Totally relevant to our classroom practices – thank you."

> "Keep doing what you're doing."

> "Very interesting – great variety of presentations and great to be provided with new resources."

and the role of vegetable production beyond health and nutrition. General manager of Food Standards Australia New Zealand (FSANZ), Glen Neal, gave an engaging presentation on risk management and the dilemma they manage where the risks that kill people and the risks that alarm them are completely different.

Nutritionist for Countdown, Deb Sue, covered trends in retail. Did you know online shopping was available 25 years ago? You could use your fax machine to place orders! Auckland dietitian, Yuhan Zhang, who was born in China and immigrated here as a young girl, also spoke about food in the New Zealand Chinese culture, celebrations and family traditions.

To really bring our new lesson plan to life, food development chef, Di Swann, led a hands-on kitchen session.

The day prior she visited Levin grower, John Young, to pick up bundles of fresh delicious Asian greens; shanghai bok choy, gai lan and choi sum. The teachers thoroughly enjoyed a sensory session, cooking demonstration, then a friendly 'dumpling pleating' competition while listening to Di's stories of John's garden and their growing practises.

> **The lesson plan is the result of a Masters student project earlier this year through Otago University, with review by external professionals…**

PNZ BUILDING A SECURE AND SUSTAINABLE INDUSTRY

Words by Gemma Carroll : Potatoes NZ Inc. communications & engagement officer

The New Zealand potato industry experienced supply chain disruptions in 2021, changing protocols for health and safety and a polarisation of political and health ideologies in the last 21 months of the pandemic response.

NZ potato growers across the country have been under immense pressure due to imminent Regional Plan Changes, ongoing pest challenges, weather events, the threat to our processing sector due to cut-price European imports (deemed not of enough material threat to respond to by our government), and in the Pukekohe, Waikato and Northland regions, massive disruption due to ongoing lockdowns and the spread of the Covid-19 Delta variant.

Through it all we have continued to deliver the best New Zealand potatoes to our markets and produce the best New Zealand potato products.

The data from 2020, presented in our Annual Report, shows continued value growth despite pandemic setbacks in the export market, thanks to a strong domestic market. The industry value is now $1.160 million, representing 58% growth since 2013 when industry targets were set.

The sustainability challenge for our industry is how to both adapt to the climate crisis and mitigate any threats such as extreme weather or pest and disease events. This will, in part, be driven by regulatory compliance, but most farmers are aware of the environmental and climate challenges on their own farms, as we've heard at the PNZ grower insight meetings held this year.

The solutions are being sought in our research and development programme.

The NZ Potato Growers' Levy is only spent on research, development, and extension (RD&E) activities.

In the last year $1.7 million was spent on RD&E which amounts to 112% of the levy.

For every dollar of levy, we spend $1.12 on RD&E as we were directed to by growers at the time of the last levy vote in 2019.

There are currently nine projects on the go:

1. Potato Breeding
2. Spectral Imaging
3. Consumer Desired Flavour
4. Identifying Potato Metabolites with high potential value
5. Impact of potato varieties
6. Chemical Strategy
7. Potato Tuber Moth
8. Canterbury Psyllid Liberibacter Initiative (CPLI)
9. Sustainable Vegetable Systems (SVS)

Our two biggest projects, CPLI and SVS, address both sustainable quality and environmental sustainability.

Canterbury Psyllid Liberibacter Initiative

The new CPLI programme was launched in November this year to extend the work already done in previous psyllid projects, and is led by the newly formed Canterbury Psyllid Liberibacter Initiative – a collective of like-minded farmers and industry representatives wanting to combat the devastating impact of the Liberibacter (*Candidatus* Liberibacter solanacearum or Lso) bacterium which causes Zebra-chip in potato crops. CPLI is funded with a special Canterbury grower and processor levy and in-kind support from Potatoes New Zealand.

Research from the programme will be shared with the whole of industry. There are multiple workstreams planned to include: a short-term examination of chemical resistance, medium-term work on alternative control measures, integrated pest management, over-wintering plant hosts, biostimulants, and reducing psyllid impact once it is in the potato crop.

There are also long-term projects to breed for resistance and identify alternative control strategies.

The work is being undertaken both at Plant & Food Research Ltd (PFR) and on growers' properties. This all builds on the previous projects which examined the spray programme, degree day monitoring and psyllid behavioural research.

You can read more about CPLI here https://potatoesnz.co.nz/rd-project/canterbury-psyllid-liberibacter-initiative/

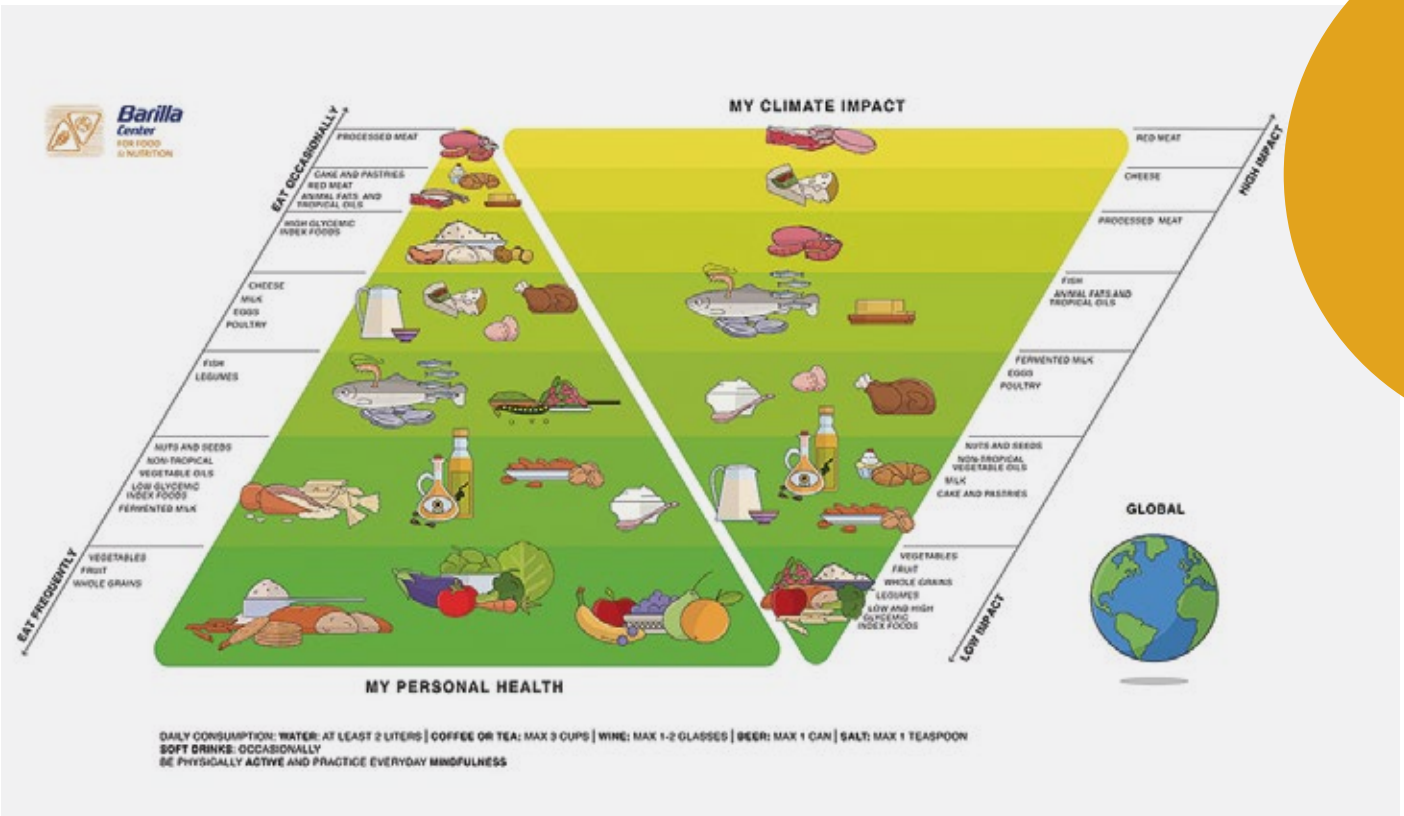
Sustainable Vegetable Systems

The $7.5 million *Sustainable Vegetable Systems* (SVS) project is over a year underway and aims to:

- Reduce the impact of crop farming on the environment and water quality while maintaining grower licence to operate through national, regional and farm programmes.
- Enhance industries' ability to grow, process and export products, while meeting environmental standards and maintaining international competitiveness.
- Maintain social licence to operate for vegetable growers and industries.

SVS has multiple workstreams, $4.5 million funding from the Ministry for Primary Industries, is led by Potatoes NZ and partners with Vegetable Research and Innovation and Hort NZ. Trials and monitoring take place both at PFR and on growers' properties.

Potatoes will play a major role in helping sustainably feed Aotearoa and the world, using fewer resources and requiring less land. Key takeaways from a recent World Potato Market article, written in response to the 2019 Eat Lancet report,[1] indicate that potatoes score very well on environmental impact, producing less CO_2, lower nitrate leaching and requiring less water to produce than legumes, wheat or rice. Potatoes also require less area to grow, as 5kg can be produced in 1m², about one quarter



of the area for the equivalent in rice, and much less than is needed to produce a kilogram of legumes.

The Barilla Center's (sic) double food pyramid depicts the nutritional value of food and its environmental impact, with potatoes appearing in the base layer of the nutrition pyramid denoting high nutritional value and in the tip of the environmental pyramid denoting low impact.

New Season

New Season potatoes are in store now. It is the happiest time of year for spud lovers and the busiest time of year for our growers in Northland, Pukekohe, Manawatu and Canterbury.

Not only do our growers provide some of the best food for New Zealand consumers, but our industry has sustainability themed initiatives and strategic targets of net zero emissions by 2035.

We are a $1-billion-dollar-plus industry and we ensure our grower levies are used to continue to improve potato breeding, environmental management, sustainable practices and to encourage healthy consumer choices by including free online foodservice training.

We wish all our growers, processors and the wider industry a Merry Christmas and a very Happy New Year!

[1] *https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/*

POTASSIUM NITRATE BENEFITS ON TOP DRESSING APPLICATION IN POTATO

Prilled potassium nitrate (12% N – 38.2% K) is a potassium source that provides rapidly absorbed nitrate-nitrogen, plant's preferred nitrogen source, with 2-4 mm prill size.

Prilled potassium nitrate (12% N - 38.2% K)

Prilled potassium nitrate provides the ideal N:K ratio for potato

After tuberization, potatoes start to accumulate starch in tubers, this process requires large amounts of potassium and nitrogen in comparison with the other nutrients:

Nutrient	Removal of nutrients in kg/mt of fresh tubers		
N	3.0	-	5.3
P	0.6	-	1.1
K	7.4	-	9.8
Ca	0.10	-	1.5
Mg	0.25	-	0.45
Zn	0.002	-	0.003

CHARACTERISTICS	N	P	K	Ca	Mg	S	Mn	B	Zn
SIZE OF TUBERS	⊕	⊕	⊕		⊕		⊕	⊕	
NUMBER OF TUBERS		⊕	⊕						
STARCH			⊕		⊕			⊕	
SKIN QUALITY				⊕	⊕	⊕	⊕	⊕	⊕
STORAGE			⊕	⊕				⊕	

Prilled potassium nitrate contains exclusively nitrate nitrogen

- Fast acting and readily soluble source of nitrogen, directly available for uptake by the roots, independent of the activity of nitrifying bacteria, resulting in faster uptake and greater efficiency for the plant.
- Promotes the uptake of potassium (K), calcium (Ca), magnesium (Mg), copper (Cu), iron (Fe), manganese (Mn) and zinc (Zn).

Prilled potassium nitrate is virtually free of chloride

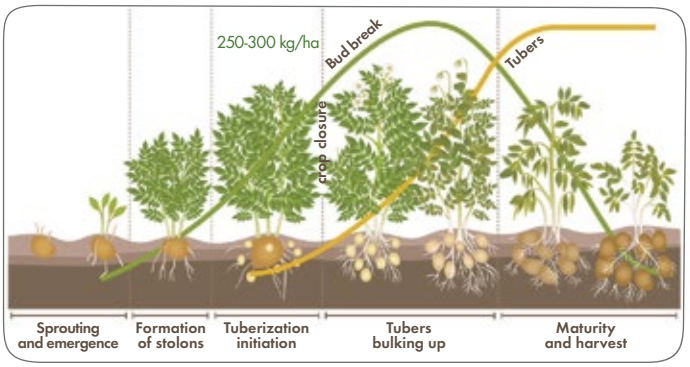
- Increases dry matter and starch content, specific gravity of tubers and improve quality in processing and chipping potatoes.
- Yield and quality are negatively affected by chloride. Nitrate nitrogen (NO_3^-) acts antagonistically to chlorides (Cl^-) present in the soil or water.

Proven benefits of prilled potassium nitrate in potato:

- Total yield increase (tuber size and weight)
- Uniform % of commercial tubers (desirable size)
- Decrease darkening, hollow heart, scabies, blight and bruising
- Less reductive sugars in tubers = less coloration during frying
- Higher dry matter content
- Reduced weight loss during storage

Recommendation of use:

Apply prilled potassium nitrate at **250 to 300 kg / ha**, as top dressing, at the beginning of tuberization period:



Prilled potassium nitrate is sold by Yara Fertilizers (New Zealand) Ltd under the brand UNIKA® PLUS. For additional information, please visit: **www.sqmnutrition.com**

SUMMER PROMOTIONS

Words by Helen Barnes : TomatoesNZ Inc. general manager

Over summer, TomatoesNZ has plans in place to showcase the wonderful tomatoes you grow and try a few new and creative ideas to entice more people to enjoy tomatoes through promotions.

TNZ has engaged food writer and previous MasterChef contestant, Vanessa Baxter, to put together a full marketing campaign using social, digital and traditional media. An expert with food, Vanessa's passion for freshly grown tomatoes shines through in the work she produces. Vanessa will be publishing content regularly on TNZ's Facebook and Instagram pages and plans to have a bit of fun with tomatoes on TikTok.

"I'm passionate about fresh food and have loads of exciting ideas I'd love to develop for TomatoesNZ," says Vanessa. "I'm excited to be your dedicated digital social media manager to devise a social strategy, write and schedule eye-catching and engaging posts and curate your social channels.

"I look forward to working with you all and maybe we can *ketchup* soon."

Please like, follow, and share our social media pages using the handle: **@nztomatoes.**

Our friends at 5+ A Day are sharing beautiful photos and recipes using tomatoes in the lead up to Christmas too. You can share their great work by going to **@5adaynz.**

Popular chef, Simon Gault, will also be on board to complement the great work Vanessa and 5+ A Day are doing. Many of you will recognise Simon from his frequent media appearances and as a celebrity chef judge on MasterChef New Zealand. He has been busy over the past few months honing his filming skills and has been publishing lots of helpful short cooking videos on his social media and YouTube channels. Simon will be filming a series of tomato and summer vegetable videos during January and February which we will share with you via our social media. We'd love you to share these too. We can't wait to see what fresh creations he comes up with for us!

Vanessa Baxter will be executing a full marketing campaign through social, digital and traditional media on behalf of TomatoesNZ

Sector decarbonisation and emissions reduction plan update

If it feels like TNZ has spent most of this year talking about energy use and lowering emissions, it is because we have! There have been several rounds of consultation this year, the most recent being a discussion paper on the government's draft *Emissions Reduction Plan* to which at the time of writing we are finalising our response.

In February, the Climate Change Commission (CCC) released their Draft Advice for consultation which included advice on the first three emissions budgets and on policy direction for the government's first emissions reduction plan. Their finalised advice was tabled in Parliament at the end of May and made public early June. It incorporates feedback from approximately 15,000 submissions received on their initial draft advice.

In May, TNZ submitted on a proposal by the Ministry for the Environment (MfE) for phasing out fossil fuels in process heat, with a phasing out of coal in existing sites by 2037 for low and medium temperature process heat. And in September, we provided feedback on MfE's consultation to reform some aspects of the Emissions Trading Scheme (ETS) industrial allocations including eligibility criteria, calculations, data and how best to support growers.

To help with solutions, TomatoesNZ and Vegetables NZ (representing other greenhouse vegetable growers), partnered in an industry collaboration agreement with the Energy Efficiency Conservation Authority (EECA). The collaborative agreement supports projects helping the sector with energy efficiency measures and renewable energy conversions. So far EECA have co-funded sector data analysis, a technology scan, and work on a sector decarbonisation plan. We will share information on this plan to improve energy efficiency and transition to low emission fuels with growers over the next few months.

This year saw the start of government-run quarterly ETS auctions to allocate New Zealand units (NZUs) to market participants. We have seen the price of units rise this year from $35 to $65 on the spot market, with the next auction on 1 December. This rapid increase in carbon pricing, on top of other cost increases, is very much starting to bite.

To help access useful information on greenhouse energy efficiency measures for New Zealand growers, we have published a series of articles written by local greenhouse specialist Elly Nederhoff. There are now 14 articles covering areas from humidity control to climate screens. This series of articles is also available on our website under *Energy efficiency for growers*. We encourage you to read them if you haven't already done so. The webpage is: https://www.tomatoesnz.co.nz/hot-topics/energy-efficiency-for-growers/

Crates

TNZ had a constructive meeting with PACT Group (owner of Viscount FCC) in early November to discuss concerns raised by growers on crate supply and to gain a better understanding of their crate cleaning process to help avoid spread of diseases such as PepMV (Pepino Mosaic Virus). We were reassured that they are fully aware of the situation and working hard to improve supply. They have 90,000 new crates due to start arriving from early December and they will be aiming to get these crates fed into the supply circuit as soon as possible.

They also take crate cleaning very seriously and are open to feedback so they can trace any issues in this area. They have improved their crate washing process quite substantially over the past few months and will soon trial a new steam cleaning unit in their Auckland plant.

They did raise some concern that growers may be over-ordering crates to ensure they had enough supply on hand for orders. This creates a vicious circle when crates are tight and they do request that growers work closely with them to only order what they need.

WSP: Creating Resilience in the Face of Climate Change

The consensus of the COP26 summit is clear. The world's weather patterns are shifting - and Aotearoa New Zealand's climate is no exception. The Intergovernmental Panel on Climate Change indicates that, even if we reached net zero greenhouse gas emissions today, we would still have to live with climate change impacts already in motion, for centuries to come.

Experts point to our 'new normal' as an intensified version of what Aotearoa New Zealand's growers are already experiencing: shorter patches of heavier rainfall and lengthier, more intense dry periods.

We may be facing an accelerating, irregular weather pattern but we are not beholden to it. Our future resilience will rely on how well we protect two critical resources: soil and water.

Our solutions don't need to be over-complicated. It is important that we understand the water flow pathway – where water enters and leaves our property - to identify where there is risk of soil and nutrient loss under heavy rainfall conditions. A good drainage system can re-direct the water flow and a vegetated strip or riparian margin can provide a buffer to protect against surface runoff and soil loss into waterways.

Under dry conditions, a well-maintained and efficient irrigation system used in combination with soil moisture monitoring will allow the crop to receive the right amount of water it needs, at the right time, without wastage. Water storage is also an important consideration – capturing moisture when it is abundant is a common-sense strategy to mitigate against drought.

Besides adopting good management practices to protect our soil and water, future crop selection and diversification can strengthen our resilience. Diversifying operations to include a less commonly grown crop – which will cope with wet or dry intensification depending on the climate – could bolster overall resilience and bring in extra income in a tough year.

For example: in dryer regions, deeper rooting grain crops such as quinoa and amaranth could become viable options for growers to supplement their usual crop rotation. Conversely, figs, persimmons and pecans are all tree crops that will tolerate wetter soils or occasional flooding which would benefit growers in regions experiencing more intense rainfall.

Although these measures may not carry us through a '100-year' event, they will help us to mitigate the frequent and amplified wet and dry periods heading our way. In turn, it ensures we are doing what we can to protect our resources and minimise the impact that we have on the wider environment. By implementing good management practices and diversifying what we grow, we can improve our chances of weathering the coming storms together.

WSP's work in the horticulture and agriculture sectors focuses on the establishment and operation of water storage and distribution infrastructure and improving nutrient and sediment management through adoption of efficient environmental management practices.

The WSP Primary Industries team combines practical experience in growing systems with industry recognised qualifications and up-to-date knowledge of regulatory change and certification programs. Our team can offer pragmatic advice to enable the horticultural sector to stay ahead of the game and move forward with future-proof solutions.

Get in touch today to discuss how we can help you to cultivate a thriving future in Aotearoa New Zealand.

Lisa Arnold

Primary Industries Consultant - Horticulture

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