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| Summer - 2021/22

COVER STORY | MESSAGE FROM AGRICULTURE MINISTER DAVID LITTLEPROUD

FEATURE | INDUSTRY LEADERS LOOK TO 2022

VEGNET 3.0 | VITAL EXTENSION WORK TO CONTINUE FOR AUSTRALIA'S VEGETABLE GROWERS

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Editorial

As we draw the curtain on another challenging year, it is important to reflect on the resilience and tireless work that has been demonstrated by you, our vegetable growers.

It is you who have continued to produce some of the world's cleanest, greenest and fresh produce to consumers during a global pandemic.

You have navigated your way through COVID-19 restrictions and outbreaks, state and international border restrictions and closures, labour shortages, hospitality closures, the rise of input costs, and much more. For this, you must be commended.

Federal Agriculture Minister David Littleproud has noted that the Australian vegetable industry is an economic powerhouse, pointing to 2019-2020 when the industry produced 3.7 million tonnes of vegetables, valued at over $4.8 billion.

He added that the average Australian consumer eats almost 87 kilograms of vegetables a year, with 99 per cent of the vegetables consumed grown here.

By navigating your way through the ongoing issues and finding new ways to overcome them, you have ensured that we will continue to grow the best produce in the world and consumers will keep putting Australian vegetables on their plates.

In the meantime, AUSVEG will keep listening to your concerns about the range of challenges being faced. We are aware that growers are seeing a 25-40 per cent overall increase in production costs including fertilisers, chemicals, and fuel, and we will continue to monitor this situation.

A Federal Election is also looming in 2022. AUSVEG has been working on its priorities, with a document set to be released in December 2021. The major themes of our priorities are:

- Driving increased consumption.
- Developing more efficient businesses.
- Becoming a more resilient industry.

Our focus is to develop strong long-term solutions for persistent issues such as labour, biosecurity, and low vegetable consumption. Please turn to page 12 to read a full list of AUSVEG's advocacy activities and how to get in touch with our team to voice your suggestions or concerns.

Meanwhile, AUSVEG is gearing up for Hort Connections 2022, which will be held from 6-8 June 2022 at the Brisbane Convention and Exhibition Centre. We are looking forward to returning to Brisbane and can't wait to reconnect with the horticulture industry, especially those members who missed out on attending the 2021 event due to COVID restrictions and lockdowns.

There is much to look forward to in 2022 as the country and world opens up. Times are tough, but our industry's resilience continues to shine through.

Christmas will be a busy time for many, with the demand for produce set to increase due to gatherings and hospitality functions, and it is hoped that 2020 and 2021 are a distant memory when the new year gets underway – and industry can thrive and move on to bigger and better things in a post-COVID world.

Message from the Chair

Vegetable growers across Australia are set to benefit from the next generation of a national extension program aimed to boost productivity and deliver the latest research and development on-farm.

In October 2021, AUSVEG was pleased to announce that it will be leading the new $14.1 million VegNET 3.0 program, which is being delivered through Hort Innovation using the vegetable industry levy and funds from the Australian Government.

We have already seen the benefits that this project has produced during its first two iterations. However, this nationally-coordinated approach will help ensure that growers all around Australia have access to a consistent, industry-focused extension program that will put their needs first in their efforts to be productive, profitable and more competitive in an ever-increasingly global marketplace.

While growers are currently facing significant issues with labour shortages, rising input costs and an increasingly volatile climate, the industry is well-placed to overcome these challenges and take advantage of the research and services on offer in Australia to improve its productivity and increase its value to help the agriculture sector meet its goal of $100 billion by 2030.

AUSVEG is looking forward to working with highly trained regional development officers to deliver a high-performing, consistent and efficient VegNET program that will meet vegetable growers' needs.

One member of the vegetable industry who is very familiar with regional development and extension activities is Greg Owens from NT Farmers.

After working for over two decades in the Northern Territory horticulture industry, Greg announced his retirement in November 2021. Greg's departure from horticulture will leave a void in the Top End's burgeoning industry; however, it is pleasing to see that he will still be around to impart his knowledge and wisdom to his younger counterparts.

I have known Greg a long time, and his dedication to Northern Territory horticulture is to be applauded. He was a very worthy winner of the DuPont Community Stewardship Award at the 2016 National Awards for Excellence Gala Dinner, where he was recognised for his biosecurity efforts.

Greg provided a vital link between the Northern Territory Department of Primary Industry and Fisheries and growers during the initial stages of the cucumber green mottle mosaic virus outbreak and continued to perform a crucial role in linking the CGMMV Management Program to industry. He has also been instrumental in working with and connecting CALD growers across the Top End with industry R&D activities and helping them to build thriving, successful businesses.

Greg will be missed by AUSVEG staff and the wider vegetable industry, and we wish him all the best in retirement.

Bill Bulmer
Chair
AUSVEG

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Agriculture Minister David Littleproud.

A message to vegetable growers from Agriculture Minister David Littleproud

The Australian vegetable industry is an economic powerhouse. In 2019-2020, the industry produced 3.7 million tonnes of vegetables, valued at over $4.8 billion. Our veggie farmers are a vital part of the Australian lifestyle.

Our consumers agree that our fresh veggies are the best in the world, with the average consumer chomping down almost 87 kilograms of vegetables a year. 99 per cent of the vegetables consumed in Australia are grown here.

Never has the role of Australian veggie producers and our farmers been more important or appreciated by the Australian public than during the last two years of a global pandemic.

Through the pandemic, the Australian Government has recognised the critical importance of the agriculture and horticulture sectors to our rural, regional, and national economies. We have worked hard to ensure that farmers can continue to provide agricultural product and keep our consumer both here and overseas supplied, even as other parts of the economy were placed on ice.

Through our national *Delivering Ag2030* plan, the Australian Government has committed to support the agriculture industry's goal of growing to $100 billion in farmgate production by 2030. Under the plan we are investing in actions across seven themes – Trade and Exports, Biosecurity, Stewardship, Supply Chains, Water and Infrastructure, Innovation and Research, and Human Capital – to support the agricultural industry to achieve its goal.

I'm pleased to see that we are on the way with a forecast record harvest in 2021-22, worth $73 billion. This is underpinned by the hard work and ingenuity of farmers, and the strong growing conditions and prices.

I am also pleased that in 2021 the Australian Government was able to deliver on the introduction of the Australian Agriculture Worker Visa – the Ag Visa. This is the biggest structural reform to agricultural work in this country's history.

While our farmers and industries have gone about their work keeping Australians and the world fed and clothed, they have done so under workforce constraints.

Not only will the Ag Visa give the agricultural industries the workers they have been so desperate for these past two years, but it will also give a permanent pathway to residency for those who come under this visa in the future.

It will provide a long-term, reliable workforce for our critical industries while solving one of regional Australia's greatest challenges in recent history. This is going to bring the next generation of migrants to Australia who will grow our regions and grow our agricultural sector.

Access to workers underpins the future success of the industry. In this regard, I would like to acknowledge the role workers from the Pacific have played in our horticulture and agriculture sector more broadly through the pandemic. Workers from the Pacific have played an invaluable role in making sure our markets and supermarkets have been stocked.

Since we restarted the Pacific Labour Mobility Scheme in September 2020, we have seen over 12,000 workers arrive in Australia and we have committed to a further 12,500 arriving by March next year. We know that together with workers arriving under the Agriculture Visa they will be critical to the ongoing prosperity of vegetable producers and the farming sector into the future.

It was great to be able to address delegates at Hort Connections in Brisbane earlier this year and meet so many vegetable producers at the Trade Show. The horticulture industry is at the forefront of technologies and innovations, and I look forward to meeting with you at future Hort Connections conferences and other industry events.

2020 and 2021 have been challenging years for vegetable producers. But they have also been a period in which all Australian have found comfort and solace in the important service they have provided. I am confident that the industry has a positive future going forward, and like you look forward to a more open and safe Australia in 2022.

Industry leaders look to 2022 *Twenty Twenty-Two*

From bushfires to a global pandemic, the last two years have resulted in significant disruptions to the vegetable industry. AUSVEG asked some of the horticulture industry's leading figures about trends, insights and developments to look out for in 2022.

Paul Luxton:
Managing Director and Country Head, Syngenta ANZ

Syngenta has witnessed many growers across the country this year again expertly balance risk and opportunity.

It is with some admiration we observe the industry continuously moving forward and at times adapting on-the-run to meet labour shortage challenges and enact in-house covid management strategies.

The global pandemic has led to many changes in our lives, and we will have to face challenges with global supply chains as freight services worldwide have become increasingly hard to source. Reliability of shipment dates has reduced, and production of crop protection active ingredients is being constrained in key countries.

While we continue to manufacture a significant amount of our crop protection volume locally, the influence of global disruptions on raw material and freight availability will lead to supply disruptions so I encourage you to work with your retailers to plan ahead. Despite these challenges, growers have and will continue to find a way forward and ensure households are fed healthy and nutritious vegetables each and every day across Australia.

With limited travel options available across the major growing regions, it has reminded us all just how critical local connections, initiatives and partnerships are. The ability to demonstrate, position and deliver new genetic technologies and crop protection innovations is something we are proud of within Syngenta, and we thank all growers for welcoming our local Syngenta team members into your businesses.

We value this engagement and the opportunity to understand your requirements better.

Industry leaders look to 2022

Ian Muir:
Chairman, E. E. Muir & Sons

As a result of the unprecedented times that we have all experienced over the last 18 months, there is now a focus on the continued secure supply of those inputs that we all require to continue to run our businesses and lives.

This focus is appearing across all industries and lifestyles, and ranges from necessities to the labour we all need to operate our businesses.

Border closures have certainly caused issues to many businesses, and this has been reflected globally, where the international demand for basic commodity inputs has escalated.

In addition to this increased demand, there has also been significant shortage in shipping container availability, leading to considerable increases in the cost of international freight. Shipping companies are now making selected decisions on what goods and containers they are accepting and prioritising for shipment.

The impact on our industry is yet to be fully felt, and it can be expected that product prices will reflect this increase in demand, and the increases in freight rates.

As an industry, we are very dependent on the importation of many of the seeds, crop protection and nutritional products that we use. Many Australian suppliers have made considerable plans to bring their products into the country earlier than normal.

Seasonal factors such as weather conditions and rainfall will naturally influence the use of these input products, and as such will determine their availability.

We would hope that nature is kind to us over the summer and autumn seasons, and that everyone can experience a very good business period as we all emerge from the lockdown period that has dominated our recent lives.

Stephen Titze:
President, Incitec Pivot Fertilisers

Sustainability has increasingly become a top priority for businesses across all sectors. This is especially true for agriculture as global demand for food and sustainable produce increases.

Looking into 2022 and beyond, growers will need access to a range of specialised agronomic products and services if they are to meet the profitability, productivity and sustainability challenges before us all.

Plant nutrition, similar to human nutrition, is essential to growing a quality crop and ensuring the health of the soil, which is many farmers' most important asset.

Data driven decision making based on solid science and precision farming technologies will be integral to improvements in plant nutrition, soil health, environmental outcomes and profitability.

Whether it's using soil health testing and tailored agronomic advice to better understand and improve overall soil health and productivity outcomes – or leveraging precision agriculture technologies and custom blending techniques to accurately meet the nutritional needs of crops – data and technology will be the key to success.

The role of research and development will continue to be critical in delivering new technologies that will help shape the future of our sector.

Our recent investment in the Australian Research Council Research Hub for Smart Fertilisers at the University of Melbourne brings together more than 20 researchers from plant and soil science, chemistry and chemical engineering. This is to improve our understanding of Australian soils and their microbiome with the aim of developing a new class of more sustainable 'smart fertilisers' and inhibitors to increase the efficiency of nitrogen use by up to 20 per cent, making a significant contribution to agriculture and the environment.

The challenge of profitably and sustainably producing increasing volumes of food in the Australian context is one we understand well.

Our aim is to deliver a range of market leading products and services that give growers more sustainable plant nutrition solutions, helping them manage input costs, increase crop yields and improve the health of their most valuable asset: their soil.



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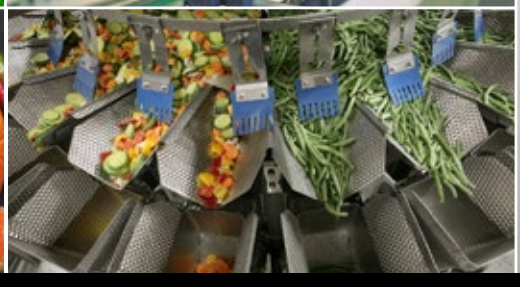


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Chloe Betts.

AUSVEG advocacy update: Monitoring ongoing industry issues

Over recent months, vegetable growers have faced evolving challenges that include labour shortages, border closures, rising farm inputs, and COVID-19 restrictions. These are complex issues that impact on how vegetable growers operate. The AUSVEG advocacy team has been actively working through these situations and voicing the needs of growers at state and federal level. AUSVEG Policy Officer Chloe Betts reports.

Farm inputs

Farm inputs have been increasing since the beginning of the pandemic. However, the unwavering increase is squeezing growers' margins and forcing many to rethink their options as prices look to continue to rise. AUSVEG has been working closely with growers to monitor the rise in farm input costs and will be providing further details via its advocacy update newsletter.

Overall, growers are seeing a 25-40 per cent overall increase in production costs including fertilisers, chemicals, and fuel. Complementing these increases are the skyrocketing freight costs. Containers coming out of China are recording an eight-fold increase in price. Struggling ports are inundated with containers, COVID cases, lockdowns and strikes, which are causing problems all the way down the supply chain.

Growers will continue to face pressure if farmgate prices don't increase. Many growers have been left with the difficult decision to either decrease production or bear the brunt of the losses. AUSVEG will continue to monitor this situation. We encourage growers to get in touch so we can continue to track the increases in cost of production.

Australian Agriculture Visa

AUSVEG has been working closely with the Federal Government to develop an Agricultural Visa fit for our industry. The visa has been moving along and should be fully operational by April 2022.

In what has been an extensive process between a number of Federal Departments and industry bodies, AUSVEG is confident the visa will meet much of the expectations from growers of being able to access an efficient and competent workforce.

However, it is important to recognise that the Agriculture Visa will not be a Backpacker Visa 2.0. It will be a visa that is designed for workers to come into the country to work in agriculture and horticulture. With that comes a level of responsibility from the employer, whether it be a grower or a labour hire business.

AUSVEG is advocating strongly that while there will be expectations on employers under the visa, growers are not overburdened with costs or slow processing times, and unreasonable responsibilities.

There will be a trial phase, which is currently underway through a selected number of Approved Employers. This trial will allow workers to come in and for government and industry to gather feedback and learnings before further rolling out the visa in full.

AUSVEG is also aware of a range of businesses offering workers under the Agriculture Visa already, and growers should treat any advances from businesses with caution, as the visa is not yet fully operational.

Growers who have any concerns, or would like further information about the visa, are advised to please contact the AUSVEG office.

Federal Election

Over the past few months, AUSVEG has been working through its Federal Election priorities, with a document to be released in the coming weeks. We have been working closely with our state members and constructing our asks around a survey that was released to all members

in September/October 2021.

The major themes of our priorities are:

- Driving increased consumption.
- Developing more efficient businesses.
- Becoming a more resilient industry.

Our focus is to develop strong long-term solutions for persistent issues such as labour, biosecurity, and low vegetable consumption; ultimately helping to promote the growth and health of our community and environment.

Further information on our Federal Election priorities will be released later in the year.

Market price transparency

Unlike many other agricultural commodities, there isn't any free, daily, accurate market data available to the vegetable and potato sectors.

Data can be used by growers and other stakeholders along the supply chain to identify consumer and market trends.

Access to free, timely, and accurate data can allow stakeholders to respond to changes and capitalise on opportunities. The current high farm input costs are another example where growers and industry struggle for a reference point to demonstrate accurately and freely what is happening in major markets across the country.

A strong potential area for development is around technology to track and record data. Improving technology could help to streamline and create an impartial system, which could standardise produce – a transition away from a paper-based system to further assist with timely data collection.

The Department of Agriculture, Water and Environment (DAWE) has begun a process to look at how better market price transparency could benefit various agricultural commodities.

Many industries such as grains and dairy already have a streamlined and automatic system in place. The meat and livestock industry has a real time data system such as The Eastern Young Cattle Indicator (EYCI), that compiles data nationally. The system utilises technology that promotes a level playing field, allowing all stakeholders to benefit.

While the above is an advanced model, it displays core priorities that could lead to a free, timely, accessible and accurate system available to all growers and stakeholders.

Fair Work Commission rules on piece work rates

In November, the Fair Work Commission (FWC) ruled that *'pieceworker provisions in the Horticulture Award were not fit for purpose.'*

AUSVEG – through the National Farmers' Federation (NFF) Horticulture Council – together with other horticulture industry bodies, had banded together to fight against the proposed changes to introduce a minimum floor by the Australia's Workers Union (AWU).

The decision is a draft variation determination and is a provisional view by the full bench of the FWC. An excerpt of the decision is below:

> *The Full Bench expressed the view that the existing pieceworker provisions in the Horticulture Award are not fit for purpose; they do not provide a fair and relevant minimum safety net as required by s.134 of the Act.*
>
> *The Full Bench was satisfied that the insertion of a minimum wage floor with consequential time recording provisions in the piecework clause is necessary to ensure that the Horticulture Award achieves the modern awards objective. The Full Bench expressed the provisional view that it is necessary to vary the Horticulture Award in the terms of the draft clause.*

It is the Horticulture Council's strong belief that a fair day's work should always receive a fair day's pay, and the piece work rate – when used appropriately – offers that.

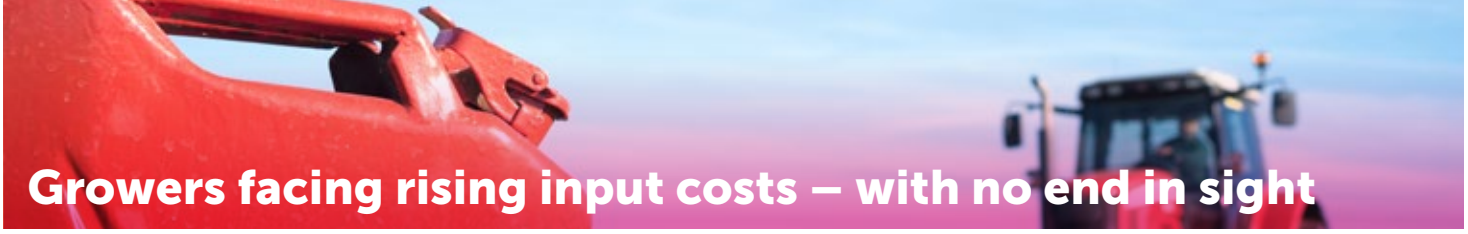
The NFF and its members have invested a significant amount of time, money and resources to put the best case forward on behalf of the horticulture industry to ensure a positive outcome for growers.

The Horticulture Council and its members are extremely disappointed with the decision and the impact this will have on growers throughout Australia, particularly at a time when the industry is already grappling with significant labour shortages.

At the time of writing, there has been no date yet set for when this will come into effect.

Find out more

Please contact AUSVEG National Public Affairs Manager Tyson Cattle on 03 9882 0277 or email tyson.cattle@ausveg.com.au. Further details can be found at ausveg.com.au/ausveg-advocacy.



Growers facing rising input costs – with no end in sight

While much of the focus of the pandemic has centred around labour shortages, input costs across the board are soaring, with growers forced to bear the brunt for the foreseeable future unless prices increase for fresh vegetables. AUSVEG National Manager – Communications Shaun Lindhe investigates.

Growers from all over Australia have spoken with AUSVEG and the message is clear – the cost of growing vegetables is going up and there is no end in sight to the current rises in production input costs.

This is not a problem that is unique to the Australian vegetable industry – global freight and shipping issues, labour shortages and rising fuel and energy prices are causing costs to skyrocket across the sector.

According to the Australian Bureau of Statistics, underlying inflation has risen sharply from 1.6 per cent to 2.1 per cent, making it the first time in five years that core inflation has been above two per cent.

Industry experts from a range of sectors are reporting that increased costs are expected to continue for 12-18 months due to global supply chain issues, and that retail prices must increase accordingly.

The consequence of increased farm input costs may not be felt by the average consumer yet, but the economic conditions are forcing growers to make difficult decisions within their business, including reducing production levels or deal with forecasted significant losses if farmgate prices for produce do not rise.

Impact on growers

Farm inputs have increased across key areas, including fertiliser, fuel, chemicals, freight, packaging and wood pallets.

"While all vegetable and potato businesses vary in terms of their production costs, vegetable growers' businesses are facing between 25-40 per cent increase to their cost base across the board," AUSVEG CEO Michael Coote said.

"Growers are typically unable to pass on these increasing costs, which is particularly concerning considering analysts can't tell us how high these cost increases will go or whether there is an end in sight.

"AUSVEG has highlighted the need for farmgate prices of all vegetables to increase by at least 10 per cent to ensure the financial viability of vegetable and potato producers.

"If growers can't cover the cost of production, the best-case scenario is that we see businesses accrue debt and limp through the nation's COVID recovery unable to innovate or expand. The worst-case scenario is that businesses will go under and people in regional and rural communities will lose their jobs and their livelihoods."

Using independent analysis from Thomas Elder Markets, we break down some of the context behind some of these cost rises.

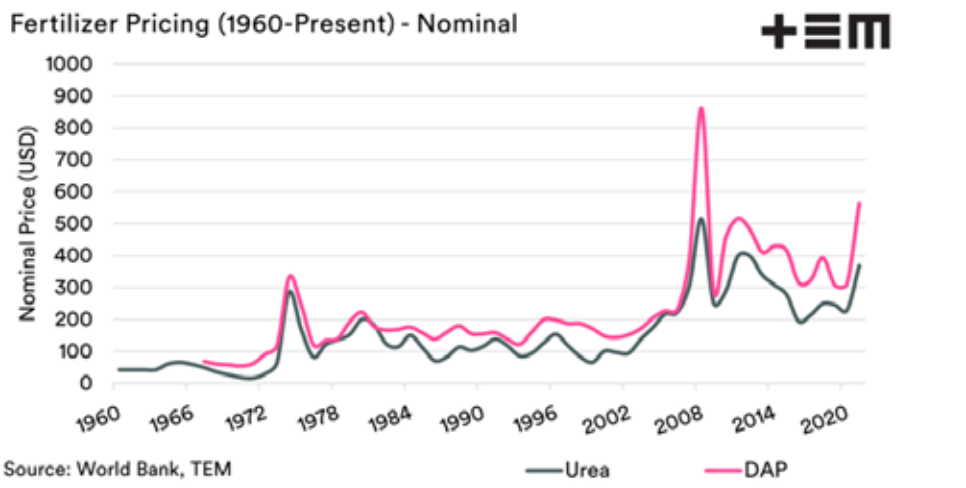
Fertiliser

The cost of DAP fertiliser and urea have rapidly increased to levels not seen since the high of 2008 (see Figure 1). Much of the world is struggling with energy cost and supply, which increases fertiliser production costs as it is highly energy intensive. In Australia, most urea comes from the Middle East and most DAP from China – and both are experiencing energy issues.

On top of this, fertiliser plants are closing in regions that are suppliers of Australian fertilisers. Governments in Europe, China and Russia are also discouraging exports or capping their exports, creating global scarcity of these products, which could increase prices further and reduce supply.

As demonstrated in Figure 1, fertiliser prices have been rising since the start of the year but have skyrocketed since August. The result of these price increases is that growers may be forced to use less fertiliser because which brings the potential for lower yields.

Figure 1 Nominal price of fertiliser from the 1960s to the present.



Fuel

High energy costs are the driving force behind the rise in fertiliser. So, it's not surprising to also see higher diesel prices since the crash during 2020, given crude oil is the feedstock for diesel.

Figure 2 shows that there is a strong correlation between both Australian diesel pricing and crude oil.

While energy prices are notoriously difficult to predict, the consensus is that energy prices will remain high for the coming months as the northern hemisphere demand ramps up. Also, expectations of a particularly cold European winter are worsening the world's energy crisis and causing countries to stock up on their gas and oil supplies.

Wood pallets

Timber prices in Australia, and in many areas around the world, are increasing due to heightened demand. As a result, there are fewer wooden pallets being made or repaired, which is leading to a shortage – dubbed 'Pallet-gate' by some of Australia's retailers – and prompted the supermarket industry to create a →

taskforce to address the shortage. This shortage is compounded by the disruptions in supply chain and freight movement.

Without pallets, goods cannot be shipped into warehouses, leading to forced production stoppages and fewer goods for sale. There are reports that some businesses throughout the global supply chain are hanging on to pallets rather than recycling them.

Freight

The impact of the pandemic on both sea and air freight has affected many exporting growers – particularly those who export high volumes of carrots, onions and potatoes whose margins are tight, given the competitive global market for these commodities.

Many growers from around the country have raised with AUSVEG the shipping disruptions, port congestion and delays, shortage of containers and the rising costs to export vegetables. This situation is not unique to Australia, as markets all over the world are adapting to the changed global trading environment brought on from the pandemic, particularly the shortage of refrigerated containers for exporting produce.

The high cost of containers around the world is increasing the cost of export goods such as meat, wool, pulses and horticultural products, as well as increasing the cost of importing parts and chemicals.

Disruption to ports across Australia due to industrial actions in Melbourne, Sydney, Brisbane and Fremantle have also caused cost increases and delays.

Figure 3 shows how the price of containers out of China has diverged massively from normally expected levels, moving from the around US$2k to averaging more than US$16K, whereas containers into China are moving at not far off normal levels.

Chemicals

High energy costs are also the driving force behind the rise in chemical prices, including glyphosate. Most of Australia's glyphosate comes from China, which is experiencing energy issues.

Glyphosate pricing has increased dramatically. Typically, 95 per cent glyphosate has traded around the A$4 to A$5 per kilogram. As at the end of August 2021, glyphosate has increased to A$11 per kilogram.

Expectations are that glyphosate costs will likely increase further due to the higher energy costs during September, with coal prices up 42 per cent since the end of August.

Figure 2

Cost per litre of crude oil and diesel.

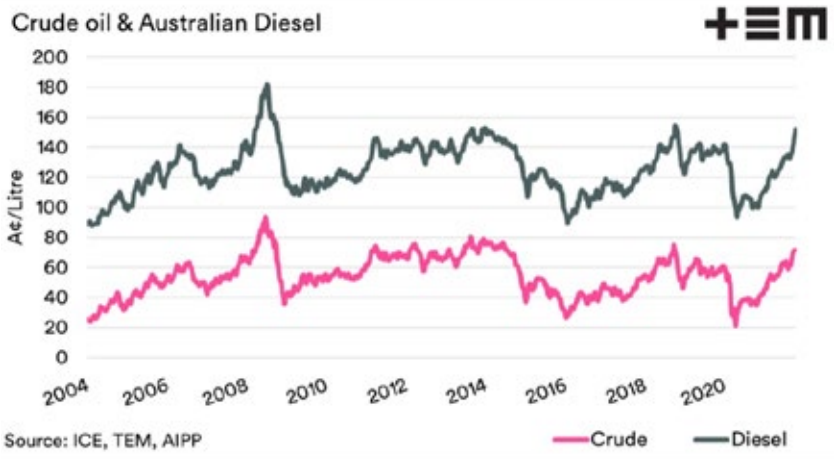


Figure 3

Container rate in and out of China.

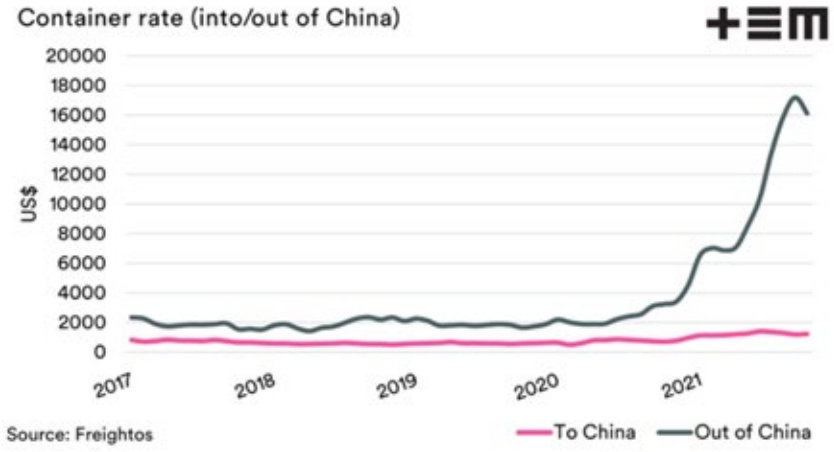
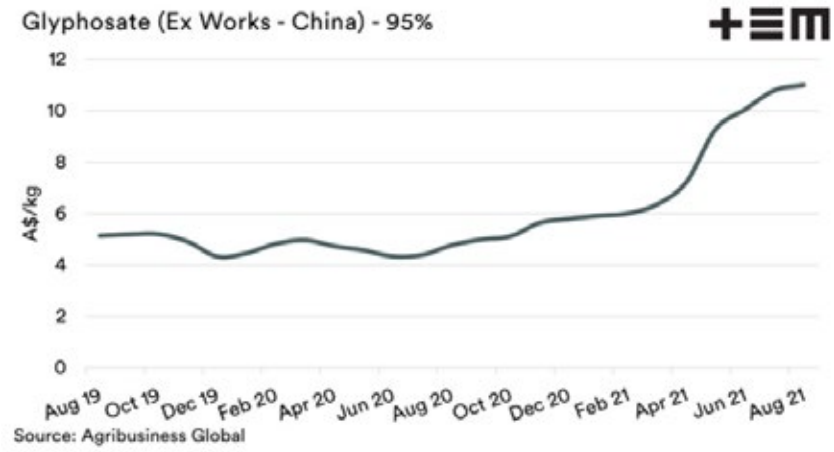


Figure 4

Glyphosate prices.



Find out more

The information presented in these charts is accurate as of 29 October 2021.

Please contact Andrew Whitelaw from Thomas Elder Markets at andrew.whitelaw@thomaseldermarkets.com.au for more details.

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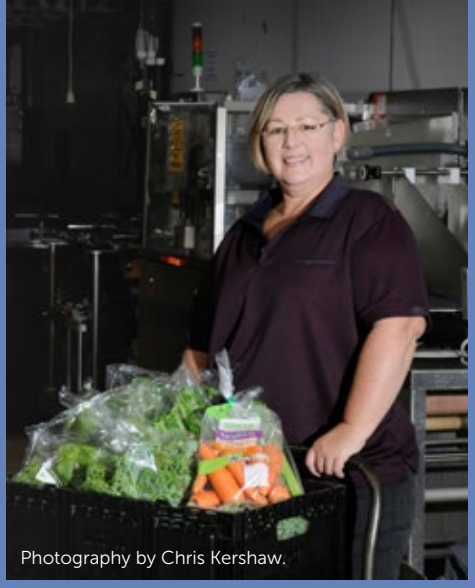
Gingin Organics: An ever-evolving growing operation

Lynda Harding and her husband, Noel, have been growing fresh produce in Western Australia since 2003. Since then, the pair have reinvented their business – they started as a stone fruit growing operation to becoming an organic vegetable farm that produces lines for Woolworths' Macro brand. Michelle De'Lisle reports.



Photography by Chris Kershaw.

Gingin Organics is a Certified Organic vegetable farm located in Neergabby, just over 80 kilometres north of Perth.

It grows a range of vegetables throughout the year and on a seasonal basis. Vegetables such as carrots, celery, kale, broccoli and lettuce are grown all year; others such as cauliflower, cabbages and zucchini can be grown seasonally and when they fit into the rotation. Gingin Organics grows, harvests, and prepacks all its vegetables for Woolworths' Supermarkets under its Macro brand.

Lynda Harding is the General Manager of the operation, which encompasses a range of jobs from running the farm and supervising employees to human resources and overseeing the business' finances. There is never a dull moment, as Lynda describes a typical day.

"My day usually starts with a quick check for order changes that may have occurred overnight that may affect the picking program that day. Orders are usually stable but the day you don't check is the day there is a change!" she says.

"Then I check for any personnel messages that may impact on the days' work. I make any changes to the pick sheets and packing plan that may have been affected, including putting myself on the picking team if short of crew.

"I do a quick check on the first crop to be picked for the day, just to be sure nothing is wrong. As I said, things can change overnight – particularly if there has been inclement weather or hot conditions.

"I meet and greet with the Field Leading Hand for a start-up meeting and check in with the Packhouse Manager, and we address any issues. I perform crop assessments and scouting for supply continuity – identifying any gaps or gluts – followed by program planning for seedling deliveries and specials, review of trials, and forward planning."

Lynda reviews completed documents that have been submitted by the packhouse and picking crew and makes sure picking and packing is on-time.

All the while, she juggles this with the school run for her teenage children Grace, 16, and Luke, 14, along with family duties and office work.

Story behind the business

Lynda and her husband Noel began the business in October 2003 as a conventional low-chill stone fruit orchard producing peaches and nectarines.

"I learnt very quickly that the way we were growing fruit was not sustainable in terms of our personal health, environmentally or economically," Lynda says.

"We commenced growing stone fruit organically and achieved Organic Certification in 2010; however, we found that we just had too much fruit for a limited market. As the fruit was low-chill stone fruit varieties, we were unable to 'export' them to Australia's east coast due to quarantine requirements, as they did not retain the required shelf-life.

"In 2012, I started looking for other options. At this point – even though we were Certified Organic – the farm was not paying for itself, and Noel was having to work away to supplement it. After speaking with the local market agents, I determined there was a gap in supply of lettuce and kale and started growing them."

Growing vegetables was a steep learning curve, says Lynda.

"Vegetables need more regular management than trees. With trees, it's like prune, feed, thin, feed, harvest – take six months off – and start again. Whereas vegetables are like plant, feed, weed, feed, weed, feed, harvest, plant – and maybe take Christmas off.

"However, the advantage of vegetables is that if something goes wrong such as pest or disease incursion, it can be mowed in and planted again."

Gingin Organics started supplying vegetables to the general marketplace in early 2012 but a year later, it was realised that the marketplace for organics was too erratic to be sustainable.

"I contacted all the major supermarkets to see if there was interest in Gingin growing for them and only one supermarket took us seriously," Lynda says.

"In mid-2013, we were in touch with an organic produce expeditor who helped organise the supply of our stone fruit to Woolworths for the 2013 season, so we were finally able to move the bulk of our fruit into the supermarket.

"Unfortunately, it was still not enough economically and with the demand for organics growing, we were able to work with Woolworths to create a plan to grow and supply kale."

Facing challenges

Lynda says pests and weeds are the among the biggest challenges for any organic vegetable grower. This is along with maintaining supply continuity of a good quality product.

"We manage these issues by keeping our soil healthy, which is important for disease control. Integrated Pest Management is an important component of pest management, and crop scouting is another critical task that helps with the prevention of outbreaks," Lynda says.

Hard work is key to disease resistance and ongoing sustainability on the farm.

"We use biologicals to create a healthy soil so that we can grow healthy plants. Gingin maintains a good balance and level of beneficial (good) bacteria, fungi, protozoa, and nematodes. We also stopped disturbing our soil by hoeing and usually only disturb the top three centimetres of the soil," Lynda explains.

When it comes to R&D, Lynda believes investigating and developing affordable robotic and mechanical harvesting for the industry is important, particularly for small- to medium-sized businesses.

"Not many businesses can afford million dollar harvesting equipment, and I think even the bigger growers would struggle for a return on such large capital investments. Making this equipment available at an affordable price would help to address the current labour shortages," she adds.

An organic passion

Although Lynda works tirelessly and the days can be long, she enjoys the challenge of seeing the produce through from seedling to store as well as working to improve Gingin Organics' process lines.

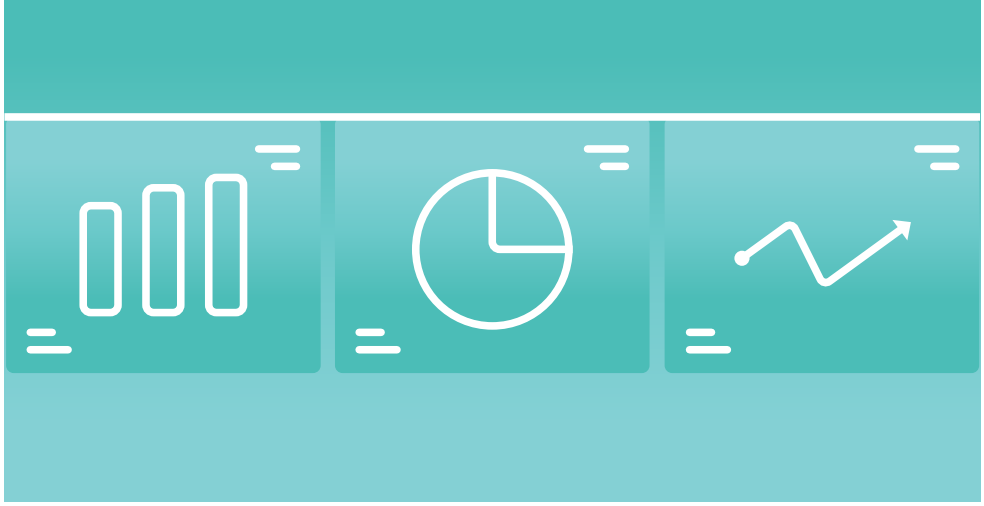
The operation is focused on increasing productivity so it can reduce the economic cost of organic produce. This includes introducing machinery to streamline the cutting and trimming process of vegetables such as celery and broccoli, and it is hoped that these will be in place by Christmas.

Becoming a Certified Organic grower also has its challenges – and achieving Certified status in 2010 was a proud moment for Lynda and Noel. This followed three years of implementing organic practices and on-farm management.

"Because your way of growing changes, you're dealing with pest and disease incursions. We managed to get to the end of the three years without having to go backwards – like having an incursion where you must use chemicals that put you back to being a conventional grower," Lynda says.

"It was really hard to do, but we put in the work and got it done."

Catherine Velisha.



Helping industry to navigate the horticultural business world

VEG Education was born from a need to think differently about horticulture workforce development, safety and business security. In this article, founder Catherine Velisha speaks about why she established VEG and what it can offer Australia's vegetable industry members.

Third-generation horticultural business owner, Catherine Velisha, has learnt the hard way that keeping your team educated drives not only compliance, but also productivity, loyalty, and satisfaction.

"There was always something missing in our ability to develop the people in our business. We often take the best worker and make them a team leader or manager with little or no training and then wonder why they fail," Catherine says.

"When I purchased the Velisha Farms business off Dad, I quickly realised that things needed to change. Safety, education and investing in our people became a priority."

Developing a people-first approach and investing in education to improve the skills of her workforce, Catherine has been able to change the culture of her family-run business.

Farming and the horticulture sector are seen by the broader community in very simple terms; however, the truth is so much more complex.

In 2020, Catherine joined forces with employment and work, health and safety lawyer, Neil Salvador, to establish VEG Education as a vehicle to assist other horticulture businesses to take the leap into real, value-adding, industry specific education.

"Taking back the narrative from people outside of the industry has been so important for me," Catherine explains.

"I am so sick and tired of people who have no skin in the game, no understanding of the pressures of our industry coming in and telling us what we need. That is why I have dedicated significant time, resources and my own money into VEG Education – to create something *by* us, *for* us."

VEG Education is now a Registered Training Organisation and is also approved by WorkSafe to deliver the Health and Safety Representative Initial Occupational Health & Safety Training Course.

Catherine's passion for improving the industry is clear.

"Training and developing your team is so vital to tackle the challenges facing business over the next 10 years," she says.

"We can provide induction programs, safety training, compliance, management and leadership skills that are specific to horticulture and remove the stress of workplace training."

Building an education support network

VEG Education programs are designed to support farming businesses from the ground up, and inspire a new generation of smarter, safer workers both in horticulture and the wider food and fibre sector industries.

By providing real-life examples and case studies, VEG ensures its comprehensive programs demonstrate how to run a thriving business and assist in navigating the ever-changing legal and compliance landscape within horticulture.

"We are about providing solutions, tangible examples that can help horticulture businesses," Catherine explains.

"It's about giving farmers and owners the tools that will meet their needs – and not simply telling people they have to do better."

A recent article in *The Guardian* entitled 'Farmers manage more than half of Australia. We all have a stake in them getting it right' highlights the increasing challenges faced by the industry.

Farmers need real support and real solutions that can help their business to survive and compete in this increasingly difficult environment.

Catherine sums this up perfectly.

"Yes, there are more fatalities on farms as a percentage of the workforce in agriculture. Yes, there are workforce labour shortages and yes, the industry is expected to adapt to change with little support," she says.

"But I believe this is not the time to release a new review or government strategy paper. This is the time to take real action. The industry is ready to make the changes needed, and VEG Education is here to support that."

Find out more

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VegNET 3.0: Vital extension work to continue for Australia's vegetable growers

After five years and two iterations, VegNET returned in October 2021. This time, AUSVEG is partnering with nine key regional industry groups to lead the five year, multi-million-dollar project. Building on the work that has already been completed, AUSVEG – as the national peak industry body for vegetable growers – is perfectly positioned to deliver world-leading extension services that are led by growers, for growers. AUSVEG National Coordinator – VegNET Sam Turner reports.

The nationally-coordinated, regionally-delivered project *VegNET 3.0* is a strategic levy investment under the Hort Innovation Fund.

The project builds on previous work to improve Australian vegetable growers' knowledge and skills to implement best practice management on-farm through a variety of delivery mechanisms.

It acts as a knowledge broker to link growers with the best science and tools to meet their individual business development goals, as well as linking the rest of industry with growers to help focus R&D efforts.

Developing networks of industry stakeholders is a key focus of the project and exemplifies a shift in extension strategy away from traditional top-down, push extension, towards a more inclusive and collaborative research, development and extension (R, D&E) ecosystem.

This systems approach to extension will be led on the ground by highly skilled and trained extension experts whose focus will be on delivering results for growers. These Regional Development Officers (RDOs) will also form a key link in providing information and feedback into the levy investment system to ensure that R&D priorities are delivering on key grower issues.

National collaboration

A key strength of the project is the partnerships with regional organisations to deliver outcomes and programs relevant for their regions.

All major growing regions in the country have been targeted with 10 regionally-based extension experts to ensure that all growers – no matter what their business is – benefit from the best resources and support to improve their operation.

Organisations involved include:

- AUSVEG
- AUSVEG SA
- vegetablesWA
- The Northern Territory Farmers Association (NT Farmers)
- Bowen Gumlu Growers Association
- Bundaberg Fruit and Vegetable Growers
- Lockyer Valley Growers Inc.
- Greater Sydney Local Land Services
- Food and Fibre Gippsland
- RM Consulting Group (RMCG)

In additional to the regional bodies, AUSVEG has partnered with RMCG to deliver independent monitoring and evaluation of the project. This will ensure that all activities have a measurable impact for growers and will drive continual improvement from the program.

Planning ahead

In VegNET 2.0, each region developed a five-year extension action plan to help focus and guide extension strategy. This action plan is reviewed yearly and will help to ensure that key challenges for growers are being addressed, and extension is efficient and effective at achieving on the ground practice change.

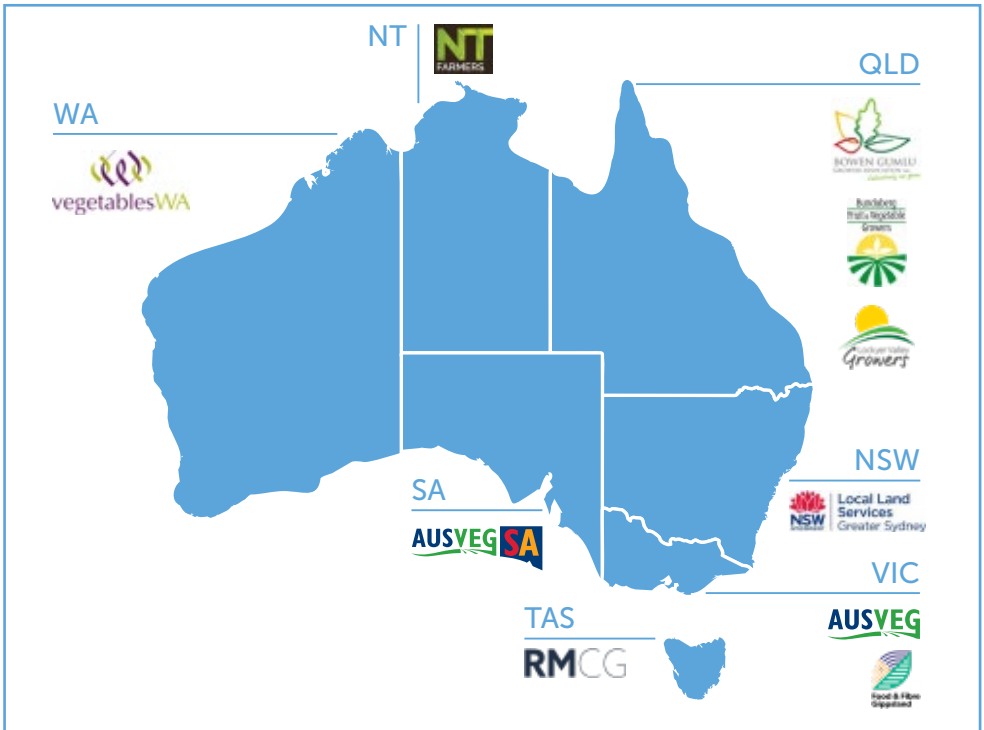
The five-year plans identified a series of similar challenges for growers right across the country.

Priorities for 2022

Since beginning in late 2021, the project has hit the ground running with all regions developing their annual plans for 2022.

These plans help to target regional issues affecting growers in a prioritised, efficient manner. They are being developed collaboratively with the other regions and identifies multiple, innovative extension methods to allow better engagement with growers – no matter their level of development or industry engagement.

This multi-faceted, multi-tiered approach ensures that growers receive the support they need to develop their businesses and solve their specific challenges.



The 2022 national extension priorities have been developed by collating the key issues from the regions and fall into four major pillars:

1. **Business costs, capability, and labour.** In addition to production challenges, all regional extension officers will focus on supporting business outcomes in 2022. Rising input costs, labour challenges and a difficult trading environment have resulted in an increased focus on business capability. Extension efforts will be focused on supporting vegetable business to increase commercial resilience and labour use efficiency as well as business development outcomes and cost savings.

2. **Resource and water use efficacy.** Irrigation and resource management is critical to the success and sustainability of vegetable production businesses. Coordination of extension is a key priority for all regions and will provide growers with consistent, focused, and efficient information to support their irrigation and production.

3. **Pest and disease management.** Pest and disease management is a major concern for growers of all regions. Increased understanding of pests and diseases, Integrated Pest Management and emerging biosecurity threats is a key priority for extension activities and will directly support grower production outcomes.

4. **Soil health.** Soil health is an area of increased focus for growers. VegNET will prioritise extending information and tools to help growers understand and manage their regional and local soil profiles to support production outcomes.

Getting involved

VegNET RDOs are located in all the major growing regions of the country.
To become involved and develop your business, please reach out to your local officer.

Region	RDO (name and organisation)	Contact
New South Wales	Sylvia Jelinek, Local Land Services New South Wales	sylvia.jelinek@lls.nsw.gov.au 0427 086 724
Northern Territory	Amélie Corriveau, NT Farmers	ido@ntfarmers.org.au 0410 067 422
Queensland – North QLD	Ry Collins, Bowen Gumlu Growers Association	rycollins@bowengumlugrowers.com.au 0427 701 225
Queensland – Wide Bay-Burnett	Andrew Halpin, Bundaberg Fruit and Vegetable Growers	vegnet@bfvg.com.au
Queensland – Southern QLD	Zara Hall, Lockyer Valley Growers	ido@lockyervalleygrowers.com.au 0456 956 340
South Australia	Yanyu Liang, AUSVEG SA	yanyu.liang@ausveg.com.au 0432 742 896
Tasmania	Ossie Lang, RM Consulting Group	ossiel@rmcg.com.au 0430 380 414
Victoria – Gippsland	Bonnie Dawson, Food and Fibre Gippsland	bonnie.dawson@foodandfibregippsland.com.au 0407 683 938
Victoria – North, West and South-East and Regions	Danielle Park, AUSVEG	danielle.park@ausveg.com.au 0432 324 822
Western Australia	Michael Bartholomew, vegetablesWA	michael.bartholomew@vegetableswa.com.au

Find out more R&D

For more information, please contact AUSVEG National Coordinator – VegNET Sam Turner on 03 9882 0277 or email sam.turner@ausveg.com.au.

This project has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.

Project Number: VG21000

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Ex-NT Farmers' Chief Executive Officer, Greg Owens.

Recognising Greg Owens: A farmer's friend

In this edition, Simone Cameron pays tribute to her former colleague and ex-NT Farmers' Chief Executive Officer, Greg Owens. Greg officially announced his retirement in November 2021, and his departure leaves a big hole in the Top End horticulture industry. However, Greg will continue to remain actively involved as a consultant with NT Farmers, ensuring that his wealth of knowledge can be passed on to the next generation.

Greg Owens is a well-respected horticulture industry member. He has immense knowledge of the industry and growing conditions in the Northern Territory, having worked in the Top End for 35 years as an agricultural educator, extension officer, grower, researcher, and industry development officer.

Greg's extensive industry knowledge, experience and networks helps growers with their technical, regulatory, development and biosecurity issues. His loyal, reliable, valiant efforts and dedication to the north have been instrumental for the exciting growth the industry has seen.

Greg is a mentor, a role model, an advocate, a stalwart who continually nominates himself to support and assist in whatever capacity is asked of him from R&D through to extension and adoption.

His network spans far and wide and even writing this article, it is hard to capture all what Greg has done and does for the industry. Conversations with Greg are always insightful, thought-provoking and extremely enlightening. You always leave the conversation knowing so much more than when you began the conversation; in hindsight, recording them would have been valuable. How one person can retain so much is beyond admirable.

Northern Australia Food Futures Conference Committee Lead Ian Baker echoed these sentiments.

"Greg always gives good advice and he's a good sounding board for ideas," Ian said.

"He has been a good contributor to many projects and is always polite, respectful and well-meaning."

Greg's passion for industry is undeniable and he imparts this always effortlessly to others. He has worked tirelessly with growers – particularly our non-English speaking Vietnamese and Cambodian growers – to ensure that any R&D works in practice, often tailoring individual solutions as required.

In addition, Greg has held a position on Hort Innovation's Vegetable Consumer Alignment Strategic Investment Advisory Panel. In 2016, Greg was recognised for his tireless efforts to protect and maintain Northern Territory's biosecurity – along with his community spirit and engagement with the Northern Territory growing community – when he took home the DuPont Community Stewardship Award at the 2016 National Awards for Excellence Gala Dinner.

The early years

Greg and his young family moved to the Northern Territory in 1984, where he began teaching at Darwin High School as a senior chemistry teacher. Past students – some of whom Greg remains in constant contact with – recall his passion for science, along with his enthusiasm and dedication.

In 1999, Greg took on the role of Horticulture Extension Officer with the Department of Primary Industry and Fisheries. For the next nine years, there were a lot of meetings with different grower groups, including the establishment of a Vietnamese grower group. It respects Greg's commitment to them over the years.

"On behalf of the Vietnamese Horticultural Association, I would like to thank Greg for the ongoing support and assistance that he has provided us over the years," Marrakai grower Chris Pham said.

"He has made a tremendous impact on us through imparting his wealth of knowledge, which in turn has allowed us

to grow in the field of horticulture. He will be greatly missed, and we hope he gets the break that he truly deserves."

Greg was instrumental in the development of a National Extension Policy as a member of National Management Committee, which is the Australian and Pacific Extension Network (APEN).

In 2008, he returned to teaching at a rural regional school – Taminmin College – where he assisted with the management of the school farm and initiated many improvement projects; many of these outcomes are still valuable today.

Greg also joined the NT Agriculture Association as a project officer, where he focused on irrigation and land management practices to help support the growing industry. He juggled both his teaching and support roles for a few years and used his networking opportunities to immerse his students in highly engaging extension activities.

Dedication to NT Farmers

In 2013, Greg left his secondary teaching role to commence a full-time role as Vegetable Grower Extension Officer with the newly named NT Farmers. NT Farmers was a significant merging of the NT Ag Association and NT Horticultural Association.

During his time at NT Farmers, Greg used his natural abilities and experience to tailor his dedication to his work by putting it into practice.

He put a significant amount of effort into fostering awareness on the benefits of using Integrated Pest Management (IPM) along with understanding tropical soils and developing adequate biosecurity plans through numerous extension opportunities.

"Greg's a farmer's friend, and an exemplary extension officer with a passionate focus on promoting, delivering and supporting R, D&E and its adoption," NT Farmers President Simon Smith said.

"One of his great strengths is he knows how to put work into practice, tailoring solutions to individual farmers' needs as required."

The banana freckle outbreak followed by the cucumber green mottle mosaic virus incursion – which affected the melon crops – kept Greg extremely busy and cemented the valuable relationships he has with growers and his ability to serve as a conduit between them and the wider industry.

Through his straight-up conversations with industry, Greg ensured that growers impacted by these incursions were operational as soon as possible with minimal damage. He ultimately became the rock necessary to keep industry moving and developing.

Northern Territory's Chief Plant Health Officer, Dr Anne Walters, praised Greg's commitment to biosecurity across the Top End.

"Greg's knowledge, expertise and skills have made him a fantastic partner for the NT plant biosecurity team over many years. Through Greg, we have been able to forge exceptional outcomes for industry in terms of eradication, trade and market access, and research and development," Dr Walters said.

"Greg's commitment to the horticultural industry of the Northern Territory is inspirational. He will be truly missed."

In 2016, Greg's title changed to Industry Development Manager (IDM) and he was asked to step into the role as NT Farmers' CEO the following year.

Greg handed the CEO position over in 2019 and returned to his IDM role. Greg's ability to be involved in numerous key industry drivers is insurmountable and he is to be credited for this. A highlight was the organisation and leading a group of Top End farmers on a 10-day tour of Punjab, India.

Greg is passionate about helping and supporting our growers obtain the best possible outcomes. The entire NT industry and beyond applauds his commitment to value-adding to the north. Greg has become a Territory legend for the vegetable industry, which was all but non-existent when he first arrived in town. He has fostered, encouraged and supported a handful of equally keen and passionate farmers who believed in him, believed in the north and its potential future.

"Greg has been the strength behind the success of NT Farmers," Simon said.

"Through his tireless efforts he has ultimately improved the level of confidence in our growers by forging trusting relationships with them, doing so without bias."

"He has single-handedly been instrumental in the development and implementation of our northern Australia biosecurity regulations and has provided important stability for industry."

Today this industry is worth over $61 million – this is a remarkable achievement driven through the passion and dedication of industry experts such as Greg.

Greg Owens pictured at work helping growers across the Northern Territory.

Greg (left) helped to conduct Northern Australia Quarantine Strategy (NAQS) surveys in September 2021.

Greg speaking at a NT Farmers' event.

Find out more R&D

Please contact Simone Cameron at drp@ntfarmers.org.au.

VegNET 3.0 is a strategic levy investment under the Hort Innovation Vegetable Fund.

This project has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.

Project Number: VG21000

Hort Innovation Strategic levy investment | VEGETABLE FUND

A view of the fertile Strzelecki hills from Bordonaro Produce in Koorooman.

South Gippsland in the spotlight: Meet the region's growers

If you have eaten a snow or sugar snap pea in recent months, there's a high probability that it was grown in the fertile soils of South Gippsland. With its reliable rainfall, South Gippsland is home to a number of snow and sugar snap pea growers, who – over the six warmer months of the year – supply almost all of Australia's markets. VegNET – Gippsland Regional Development Officer Bonnie Dawson reports.

Select Produce

VegNET – Gippsland Regional Extension Advisory Group member, Frank Nobile is the Managing Director of Select Produce, which is the largest of the South Gippsland growers. Select Produce has 17 properties covering 3,000 acres between the Strzelecki hills and the Bass Coast. In 1996, 14 of the region's original pea growers came together to form a new processing and marketing company – Select Produce – with Frank at the helm.

Select Produce Managing Director Frank Nobile.

In the cooler months, Select Produce grows its produce up in Bundaberg, Queensland, where there is access to irrigation. However, all products are processed and packed at their modern South Gippsland facility in Korumburra.

Frank and his brother grew up picking peas for his uncle and grandfather in the Korumburra area. The industry at the time was primarily growing garden peas, but since the 1980s when frozen peas took over much of this market, South Gippsland's industry has shifted to a focus on hand-picked sugar snaps and snow peas. When asked what Frank loves about the industry, his response is simple: "It's in my blood, and what I know."

A productive area

While Select Produce brought together many of the industry's original families, others continue on independently. Just down the road, between Korumburra and Leongatha, 91-year-old Frank Condoluci is still at the helm of Condoluci Produce. His two sons – Loui and Frank – ably support the business in production and freight respectively.

On the other side of Leongatha, Paul Bordonaro represents the next generation. Paul manages most of the farm's operations, while these days his father Sam spends much of his time on the road and trading at the Melbourne Market. The father-son team may be now considered a smaller operation, but they produce a number of lines – garden peas, sugar snaps and snow peas, borlotti and broad beans – adding resilience to their operation.

Passionate family farmers Rob and Tamara Prentice relocated to the region from Victoria's Mallee region in 2000. Having previously cropped broadacre lentils, they were drawn to South Gippsland by its high rainfall as well as its closer proximity to Melbourne. They are passionate about producing snow peas, sugar snaps and green peas of the highest quality, while also implementing practices such as cover cropping to regenerate the land that they farm.

Challenges and opportunities

There is a perception among some locals that snow peas are taking over the local landscape, with some unfortunately seeing this as a threat to the dairy industry, rather than an opportunity for employment.

According to Frank Nobile – who recently shared this philosophy with

Biosecurity signage at the entrance of Condoluci Produce in Leongatha.

Biosecurity update

Following on from a webinar delivered by VegNET – Gippsland and AUSVEG's biosecurity team in August, support will be provided to interested growers to develop and implement comprehensive on-farm biosecurity plans.

If you would like to discuss your needs or to request biosecurity signage, please contact VegNET – Gippsland Regional Development Officer Bonnie Dawson.

primary school students – if you want a job in farming, you're only ever limited by your imagination.

Through VegNET, Select Produce has become involved with the Raising Aspirations in Careers and Education – Gippsland (RACE – Gippsland) program. RACE Gippsland is creating opportunities for schools and teachers to connect with local producers. As well as this school-industry partnership, Select Produce will also play host to a group of teachers participating in RACE Gippsland's professional development program. This includes a learning module on the traceability of Gippsland produce, for which Select Produce's packhouse is a perfect exemplar.

Forward-thinking operation

Frank prides himself on his research skills and hunger for information, which has enabled Select Produce to innovate, invest in technology and implement systems to ensure products are produced safely, ethically and consistently. However, every snow and sugar snap pea is still hand-picked – this means Select Produce and the rest of the region remain heavily reliant on seasonal labour each summer.

As well as this obvious workforce challenge, Frank would like to see more research and development investment in improved chemistry for the pea industry. Being a relatively small industry, development of new chemistry is often lagging far behind other vegetable lines. Prevention of pest incursions and chemical resistance is therefore a high priority across the region, especially as the risk of a number of leafminers increases.

Find out more R&D

Please contact VegNET – Gippsland Regional Development Officer Bonnie Dawson from Food and Fibre Gippsland on 0407 683 938 or email bonnie.dawson@foodandfibregippsland.com.au.

VegNET 3.0 is a strategic levy investment under the Hort Innovation Vegetable Fund.

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Study tour highlights: Technology, export and multi-modal freight opportunities

The Toowoomba Wellcamp Trade Distribution Centre. Image courtesy of Gary Wilkinson.

A recent study tour organised for Southern Queensland vegetable growers provided an opportunity to view the technology in use at Boomaroo Nurseries' Southbrook facility and the progress and future capacity of the Toowoomba Wellcamp Trade Distribution Centre. VegNET – Southern Queensland Regional Development Officer Zara Hall reports on the tour highlights.

Growers and other vegetable industry members joined representatives from Growcom, Queensland Farmers' Federation and the State Government on a wide-ranging study tour of two major horticultural facilities in southern Queensland.

First, attendees enjoyed breakfast in the park at Gatton's railway station before taking the second range crossing to Southbrook's Boomaroo Nurseries site, west of Toowoomba.

Tour participants were given a full tour of the Boomaroo Nurseries facility. This included the production shed and germination rooms, seed storage, computer/technology control centre, protected growing structures, sun-hardening outdoor growing area and the dispatch, nutrient-dosing and wash-down areas.

State-of-the-art technology

The facility is designed around a system of rolling benches to transport seedlings around the nursery and is managed by software that can either be controlled from the central technology centre or through workers' smart phones and iPads. This automated system keeps the manual handling of product to an absolute minimum, prevents 'shadowing', and is used to schedule orders for dispatch to clients.

Tour participants learnt the site of the nursery – which is set on approximately 300 acres 50 kilometres west of the Lockyer Valley – was chosen for its climate, proximity to large vegetable production areas (the Lockyer, Fassifern and Granite Belt growing regions) as well as the quality and quantity of available water.

Attendees were interested to learn how Boomaroo Nurseries was able to minimise COVID-19 impacts on its business operation. This included careful forward-planning to ensure customer orders are delivered uninterrupted, maintaining healthy stockpiles of materials where freight delays were predicted, and the careful management of trucked freight between state boundaries.

Sustainability was a major theme throughout the tour. For example, participants heard about Boomaroo's recent investment in a new reverse osmosis, micro-filtration water treatment plant. This is currently under construction, and will maximise the operation's water recycling capabilities and the use of beneficial insectaries set up throughout the nursery as part of its pest management program.

Ingenuity was another feature of the visit. For example, shallot trimming – a technique widely used to stimulate stronger, healthier growth in shallots – is conducted using a simple machine designed in-house, which eliminates any manual handling.

Freight focus

The second stop on the tour was the recently completed Toowoomba Wellcamp Trade Distribution Centre. The international airport was built by the local Wagner family, who is known for cement operations – and now an airport that includes international cargo flights. Most recently, the Wagner family's airport has been in the spotlight for the company's plans to build a 1,000-bed COVID-19 quarantine facility for international passenger arrivals.

After rapidly outgrowing the original freight export building, the recently completed distribution centre has a range of features that make it potentially desirable for vegetable producers for Queensland and interstate.

The facility is designed to complement road and rail transport as part of the countries' multimodal freight network. The site includes a plan for four kilometres of railway siding as part of the in-land rail project that is currently under construction, as well as direct access to the Toowoomba second range crossing which connects Queensland to the southern states. Flights currently out of Wellcamp include cargo flights to Hong Kong and Singapore, with more flights planned as COVID-19 restrictions ease.

Other features of the site included on-site freight forwarders and the ability to re-pack to cargo freight specifications (e.g., repacking of standard Australian pallets/CHEP pallets to PMC or AKE), as well as cold-chain management for perishable goods; for example, extensive cold rooms in close proximity to the tarmac.

The tour of the airport provided 'food-for-thought' for participants about the possibilities that export might provide in what is an oversupplied domestic market.

Acknowledgements

VegNET – Southern Queensland would like to thank Boomaroo Nurseries and Toowoomba Wellcamp Trade Distribution Centre staff for their contribution to this study tour. Also, thank you to the sponsors who contributed gifts for the event: Boomaroo Nurseries, Ag Requirements, Corteva, TriCal and Visy.

Find out more R&D

Please contact VegNET – Southern Queensland Regional Development Officer Zara Hall on 0456 956 340 or email ido@lockyervalleygrowers.com.au.

VegNET 3.0 is a strategic levy investment under the Hort Innovation Vegetable Fund.

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Jason Agosta with native vegetation insectaries planted on a dam bank at AAA Farms in Werribee South, Victoria. Image courtesy of Stephen Moore.

Delivering maximum benefit to Victorian veg growers

It has been a busy time for VegNET – Victoria (North, West and South-East regions). AUSVEG's Danielle Park has taken on the role as VegNET – Victoria Regional Development Officer, and this article looks at recent project activities and how the next phase will continue to collaborate with vegetable growers across Victoria's north, west and south-east.

The new VegNET Regional Development Officer (RDO) for the Northern, Western and South-Eastern regions of Victoria is Danielle Park.

As coordinator of the current EnviroVeg Program – facilitated by AUSVEG – Danielle has worked closely alongside outgoing RDO Dimi Kyriakou and formed close connections with many growers in the region.

Danielle has a Bachelor of Agricultural Science with Honours from the University of Melbourne and a Master of Business Administration from Charles Sturt University. She has over 20 years' experience in the agriculture industry. Her previous roles include on-farm operations, state government agricultural extension and market research.

RM Consulting Group (RMCG) has delivered VegNET – Victoria since 2016. RMCG and AUSVEG have worked collaboratively over recent months to ensure a seamless transition of the project that continues to support Victoria's vegetable growers and connect them to levy-funded R&D that fosters innovation and best practice on-farm. From a grower's perspective, it has been very much 'business as usual' for VegNET in Victoria.

Supporting vegetable producers

RMCG has successfully delivered VegNET in the Northern, Western and South-Eastern regions of Victoria for the past six years, which has helped growers improve their growing practices and profitability.

Given its previous success with VegNET – and its extensive experience in agricultural extension and program monitoring and evaluation (M&E) – RMCG is working with AUSVEG as an independent M&E Manager for the national VegNET program, while continuing to deliver VegNET in Tasmania.

With RMCG's expanded program role, it was mutually agreed to transition the VegNET – Victoria position from RMCG to AUSVEG. This will ensure that future extension for the regions will build on the strong foundation set by Dimi and RMCG, and growers will benefit from AUSVEG's

Some of the VegNET – Victoria resources that are available.

industry networks and close ties with local growers.

Dimi will continue working at RMCG to benefit the horticulture sector, including the vegetable industry's Soil Wealth Integrated Crop Protection project, and looks forward to continuing to engage with growers and industry. She has enjoyed delivering VegNET in Victoria in 2021 and working on exciting initiatives to help growers benefit from levy R&D investments and improve their farming practices.

Getting soil moisture monitoring right

Soil moisture monitoring can provide a real-time and predictive decision-making support tool for growers to improve their irrigation scheduling and water use efficiency. It allows growers to make informed decisions on when and how much to irrigate by providing data on soil moisture content from varying depths within the soil profile.

VegNET – Victoria has developed a poster to explain why, how, and when soil moisture monitoring could be appropriate for vegetable growers, and the key issues and questions to consider. The link to the poster can be found here: ausvegvic.com.au/wp-content/uploads/2021/09/SMM-poster-FINAL.pdf.

Beneficial bugs boosted

In Werribee South, vegetable growers are trialling native vegetation insectaries on their farms to boost beneficial insect activity and better manage pests, prevent weeds, and reduce soil erosion.

AAA Farms and Mason Fresh Produce have worked closely with local agronomist Stephen Moore from E.E. Muir & Sons and Karen Thomas from the Port Phillip and Westernport Catchment Management Authority to design the trial sites, source plants, and organise the plantings.

VegNET – Victoria helped to facilitate discussions to kick off the trial back in 2019 and has since been instrumental in communicating progress and results back to industry.

A recently published case study outlines the trial development, along with some early results and next steps. It also provides some practical tips for vegetable growers to set up an insectary on their farm. The case study can be found here: ausvegvic.com.au/wp-content/uploads/2021/09/NVI-case-study-FINAL.pdf.

Tune in to a webinar recording from VegNET – Victoria to learn more about on-farm insectaries and how to get started, including the benefits of planting native vegetation. You can also access the presentation slides as well as other useful resources.

The webinar can be viewed here: https://ausveg.com.au/articles/webinar-recording-field-and-landscape-management-for-beneficial-arthropods/

The webinar is also available as a shorter 30-minute podcast that can be accessed here: soundcloud.com/user-1137739/vegnet-victoria-podcast-field-and-landscape-management-for-beneficial-insects.

Celebrating R&D adoption

The VegNET projects in Victoria introduced the R&D Adoption and Industry Impact Award at the annual AUSVEG VIC Awards for Excellence in 2017 to highlight how the state's growers are benefiting from R&D outcomes on-farm – whether it's pre-harvest, post-harvest or sharing key findings with the wider industry.

A case study has been developed to capture the achievements of the winners of this award since 2017, when the inaugural winner was Andrew Fragapane from Fragapane Farms. Additional past winners included Schreurs & Sons as well as Mark and Darren Schreurs.

The East Gippsland Vegetable Innovation Days (EGVID 2020) received the R&D Adoption and Industry Impact Award at the 2021 AUSVEG VIC Awards for Excellence.

Read more about the winners and their R&D innovations here: ausvegvic.com.au/wp-content/uploads/2021/09/RD-award-case-study-FINAL.pdf.

Find out more R&D

Please contact Danielle Park on 0432 324 822 or email danielle.park@ausveg.com.au.

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Connecting vegetable growers to industry R&D

In this column, VegNET – South Australia Regional Development Officer Yanyu Liang provides an update on recent SA vegetable industry activities. These have ranged from topics such as on-farm biosecurity and managing the risk of on-farm pests and diseases to business health check assessments for growing operations.

Dr Cathryn Todd from PIRSA-SARDI speaks to attendees.

Extension events

VegNET SA assisted AUSVEG representatives to deliver the second biosecurity and pest and disease R&D workshops. These were held at the SA Produce Market on 9 September.

At the workshop, Dr Cathryn Todd from The South Australian Research and Development Institute – a branch of Primary Industries and Regions SA (PIRSA-SARDI) – introduced the horticultural diagnostic service from SARDI.

If you missed out on attending, you still have a chance to access the free pest and disease diagnostics service by January 2022. Please contact Dr Todd on 08 8429 2249 for further information. You can also contact VegNET – SA Regional Development Officer Yanyu Liang to request a sample submission form.

Greenhouse toolkit now available

To ensure good on-farm biosecurity practices on the Northern Adelaide Plains, AUSVEG SA has a longstanding partnership with Biosecurity SA to deliver the 'Clean Your Farm' project.

The Clean Your Farm initiative aims to raise awareness of key sources of risk for vegetable pests and diseases, as well as help growers to better protect their products and income.

The latest version of the Greenhouse Biosecurity Toolkit is available to access through the AUSVEG SA website. This is translated in English and Vietnamese.

This toolkit has been developed by Biosecurity SA and AUSVEG SA and aims to assist vegetable growers to identify biosecurity threats, implement biosecurity planning and management practices and protect their business against external threats.

The resource includes step-by-step checklists and guidance on practical measures that growers can take to protect their properties against pest and disease threats.

If you would like to know more information about the project or would like a hard copy of the toolkit, please contact VegNET SA RDO Yanyu Liang on 0432 742 896 or PIRSA Biosecurity SA on 08 8207 7820.

Business health check assessment

In September, AUSVEG SA engaged experienced not-for-profit rural financial advisory service Rural Business Support to provide a series of business health checks for SA vegetable producers.

The goal of this program is to attain an assessment of current skills and capabilities in the industry, but also provide the opportunity for growers to assess their current skills and activities as a means of promoting improvement in their businesses and encouraging access to available financial support.

The process included delivery of an induction workshop for program participants, completion of 10 site business health checks with SA vegetable growing businesses using a specialised checklist questionnaire developed for this project and the development of individual business reports for each business summarising key findings and opportunities for future improvement.

Some insights from the assessments were addressed through this program. One of the main issues identified across the assessments is that most owners see themselves as 'growers' and that is where their skills set lays and their passion. They see managing the business as important, but also as a secondary task.

The business health check assessments have been beneficial in taking stock of some of the issues within vegetable businesses in SA and identifying key issues for growers to work on. AUSVEG SA and the VegNET SA project will continue to engage with these growers to provide ongoing support for those who are motivated to keep making improvements to their business.

Find out more R&D

Please contact VegNET SA RDO Yanyu Liang on 0432 742 896 or email yanyu.liang@ausveg.com.au, or AUSVEG SA CEO Jordan Brooke-Barnett on 0404 772 308 or email jordan.brooke-barnett@ausveg.com.au.

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Introducing Salvatore Sacca

Salvatore Sacca is the general manager/owner of Da'Salvatore, which specialises in the production of unique high-quality lines such as cherry tomatoes, mini cucumbers and heirlooms. VegNET – South Australia Regional Development Officer Yanyu Liang speaks to Salvatore about his family-run operation and participation in the business health check assessments that have been facilitated by AUSVEG SA.

Salvatore Sacca from Da'Salvatore.

Can you please tell us about your operation?

I currently run the farm with my family, and my role is the general business manager and horticulture specialist. I grow quality lines that are not in the everyday market. The varieties I exclusively grow are breeds from across the world, such as Europe, America and the Middle East. These varieties exhibit different tastes, flavours and colours, which allow me to be unique in the market. My main focus is to bring high quality and good service to all my customers, which is the key to running a successful business.

How long have you been involved in the horticulture industry?

I'm very new to the industry – I have only been involved in horticulture for 10 months. Despite the short timeframe in which I've been involved, I've made many connections and friends within the industry. I'm here to assist anyone that needs my support as I want to see the industry move in a positive direction.

What have been some of the biggest challenges you've faced in the short time you've been involved in vegetable production?

As a grower, I can label a million types of challenges I deal with daily that either relate to growing or the business. That's the life of farming; however, I enjoy the thrill as there is always something different to do every day.

Regarding the biggest challenges, I have thousands of ideas that I want to execute by tomorrow. However, the crops that I specialise in growing to take more than nine months to finish!

Trying to maintain a healthy balanced crop during that timeframe can be very stressful, but extremely rewarding once complete. Random factors such as harsh weather or drought can also be a huge hurdle to overcome as you're never fully prepared for what the world is going to throw at you.

However, I see all these challenges as a growing aspect for myself and the business. Every challenge that I face and complete builds my character and business for the better.

Are there any tips or advice you'd give to other young growers who face stressful situations in their day-to-day farming operations?

What I recommend is to try your best to relax and calmly assess the situation. Figure out what's the best plan of action to take on the problem.

Patience is key in this industry – don't make rash/risky decisions based on the dollars you hear or see. Note that operating a farm is operating a business, there are days where you will be successful and there are days where you won't be.

Focus on doing the most important tasks to improve the quality of your crop, and don't worry about the dollar signs. You will make mistakes and it will be stressful/emotional, but you can learn from them! Make it construct who you are and know that you will do better next time with hard work and dedication.

How do you maintain your disease resistance and ongoing sustainability of the farm?

The business has a dedicated spray program overseen by our agronomist, and we implement rotational farming between the sugarcane and ground crops.

Recently, you were involved in a Hort Innovation-funded project through AUSVEG SA that required undertaking a business health check program. What were your thoughts and impressions as a result of being involved in the project?

Currently my business is in a very healthy state. However, I still have so many ideas I want to implement in order to grow and expand. All these ideas were contained in my head and never properly consulted with an expert. Getting all my ideas on paper and discussing them with a professional allowed me to have a clearer understanding of those goals I need to achieve in the future.

The business health check program outlines all the strengths and weaknesses within the business. I see that a lot of growers around me need the aspect of running a successful business in order to survive in the industry. The AUSVEG SA business health check program is a great solution for helping farmers with their businesses.

I'd like to also thank VegNET SA, AUSVEG SA and Hort Innovation for giving me the opportunity for a business health check and a Q&A on my opinion for the future of the industry.

Many thanks to Yanyu Liang (VegNET SA), Jordan Brooke-Barnett (AUSVEG SA), and Jay Cummins (Hort Innovation).

Assisting growers with digital soil moisture monitoring

VegNET – WA RDO Truyen Vo helps to install the soil moisture monitoring device at a grower's farm.

In this Western Australian extension update, VegNET Regional Development Officer Truyen Vo discusses the results from digital soil moisture monitoring that was conducted in tomato and chilli crops, plus the challenges that vegetable growers can face when setting up their system.

The VegNET – Western Australia Regional Development Officers (RDOs) have worked closely with growers and related stakeholders to create value by setting up a field demonstration of digital soil moisture monitoring on tomato and chilli crops in April 2021. These were a translation of innovation into adoptable field practices.

Technically, the digital soil moisture monitoring requires a few practices that most growers haven't used before. These included:

- Soil moisture monitoring probes installed at various depths to monitor the soil moisture profile over time.
- Digging to expose the root zone to acquire knowledge on the root zone concept and soil characteristics.
- Downloading an app to their smartphones to read the soil moisture monitoring results.
- Accessing and understanding the data outputs presented in graph form on digital devices such as smart phone or computer.

Recorded soil moisture showing as a graph chart on a grower's smartphone.

- Including the soil moisture monitoring results in decision making of irrigation program.

As a result of these demonstrations, growers who were involved experienced better crop performance as well as reduced water and fertiliser loss.

There was some concern from the growers involved that the technical skills required to set up the system and to gain confidence to adopt this innovation may be too difficult.

To manage these concerns and barriers, the project was carefully designed to provide grower participants the one-on-one assistance needed to bring them up to the competency level required to operate the system themselves.

Developing a strong task force

The careful implementation of the stakeholder engagement plan has brought in expert collaborators who committed to contributing resources and knowledge to create value by translating the innovation into easily adopted field practices for growers.

This taskforce includes experts and scientists of Department of Primary Industry and Regional Development, Perth Natural Resources Management, Irrigation Australia, Wildeye Soil Moisture Monitoring and the VegNET WA RDOs.

Since January 2021, the taskforce has been working together to design field trials and demonstrations and setting them up on two growers' properties in Wanneroo.

Effective grower learning design

The project team has foreseen that some growers may have difficulty setting up an account on smartphone to download the app.

They may also find it difficult to access and understand the data outputs presented in a graph form on digital devices such as a smartphone or computer. It can also be complicated for growers to include the soil moisture monitoring results into their irrigation program. These difficulties can be even more significant for Vietnamese-Australian growers because of the added language barrier.

Therefore, the five stages of the extension process have been carefully employed in the project. This will enhance growers' journey toward decision-making and innovation adoption. This extension process includes:

- Knowledge (Introduce the innovation to growers and help them understand the benefits).
- Persuasion (Development of growers' favourable attitude to the introduced innovation).
- Decision (Growers' commitment to adopt the innovation).
- Implementation (Growers putting innovation into use via trial-and-error process).
- Confirmation (Reinforcement the adoption decision based on positive outcomes from it).

This article has been provided by vegetablesWA, and first appeared in the spring 2021 edition of *WA Grower* magazine.

Find out more R&D

For more information, please contact VegNET – Western Australia Regional Development Officer Truyen Vo at truyen.vo@vegetableswa.com.au.

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Facing workforce challenges in a COVID-19 world

Luke Jurgens pictured remote piloting an RPV to distribute mites on vegetable farms.

In this column, VegNET – North Queensland provides an update on its activities, which include helping growers in the region with their labour requirements and workforce planning. The project also catches up with Luke and Gillian Jurgens, who have built a successful business that is built around providing tech-driven Integrated Pest Management and crop imaging solutions.

As anticipated, seasonal worker shortages during the winter growing season in north Queensland have been reported across all sectors. Growers have spoken of issues with worker retention, lower levels of productivity and motivation compared to previous years.

Fortunately, growers who were in a position to employ Pacific Islander workers directly or via Approved Employer Labour Hire have given positive feedback on higher levels of productivity and consistency, which has enabled the businesses to sustain their focus on farm production – the benefits of which are reported to far outweigh the current additional costs of quarantine.

The Queensland Government's #pickqld bonus scheme and the Australian Government's AgMove initiatives have assisted horticultural business to attract and retain workers for longer periods. The workers may not otherwise have taken up harvest work. These incentives are still available, and businesses are encouraged to inform job seekers about the potential cash payments up to $6,000 when advertising positions.

Workforce planning has never been more important. The COVID-19 pandemic has fast-tracked the need for the horticulture industry to become less reliant on an overseas workforce and develop strategies that promote agriculture careers to attract new workers into the industry. The Queensland Farmers' Federation (QFF) and Jobs Queensland are presently developing the Queensland Agriculture Workforce Plan to help shape future industry-led workforce strategies and projects. Industry consultation conducted by QFF is underway, with the plan to be released by the end of 2021 – culminating in an Agriculture Workforce Summit to be held in Toowoomba in February 2022.

Looking to next year, it is imperative to plan as early as possible for your workforce requirements and reach out to the Queensland Agriculture Workforce Network (QAWN) – North Queensland Agriculture Workforce Officer, Julia Wheway at workforce@bowengumlugrowers.com.au or on 0427 009 929 if you would like guidance on workforce planning.

Tech-driven solutions for integrated pest management

Luke and Gillian Jurgens have pioneered beneficial insect distribution in the north Queensland vegetable industry with their business, NQ Aerovation. Luke's family has a long history of vegetable farming in Bowen; but instead of farming, the couple grew a photography and film business.

"We originally used a Remotely Piloted Aircraft (RPA) to do videography for weddings but being from a farming background, I quickly saw the potential in using the technology on-farm," Luke says.

The family farm adopted GPS controlled tractors early and since then, they have been hungry for technology, particularly in improving pest control. Beneficial insect releases are a large component of integrated pest management (IPM), and Luke and Gillian saw that the RPA could be a cost-effective solution to a labour-intensive practice.

Every year, vegetable farms spend hundreds of thousands of dollars on releasing beneficial insects that either predate or parasitise pests such as silverleaf whitefly, spider mites and aphids.

Normally agronomists release beneficial insects on-foot, which means distribution is not always effective. Luke and Gillian conducted their own research and development to devise a method and a customised hopper for their RPV to remotely distribute beneficials more efficiently across an entire field.

"We are committed to working on more innovative solutions to improve cost-effective solutions for IPM, and in the process give agronomists and customers more time to concentrate on growing crops," Luke says.

Luke and Gillian have seen grower adoption of RPAs increase substantially over the years but say that many growers are not sure what they can do with their images – often shelving the devices shortly after purchase due to the lack of after-sale service. Ground truthing is the most important part of remote sensing crops and often growers don't know where to start.

NQ Aerovation is working very closely with beneficial insect breeders, agronomists, growers, and researchers to create more services to add to their suite of tech-driven IPM and crop imaging solutions to support growers in improving their sustainability.

Find out more R&D

For further information about VegNET – North Queensland activities, please email admin@bowengumlugrowers.com.au.

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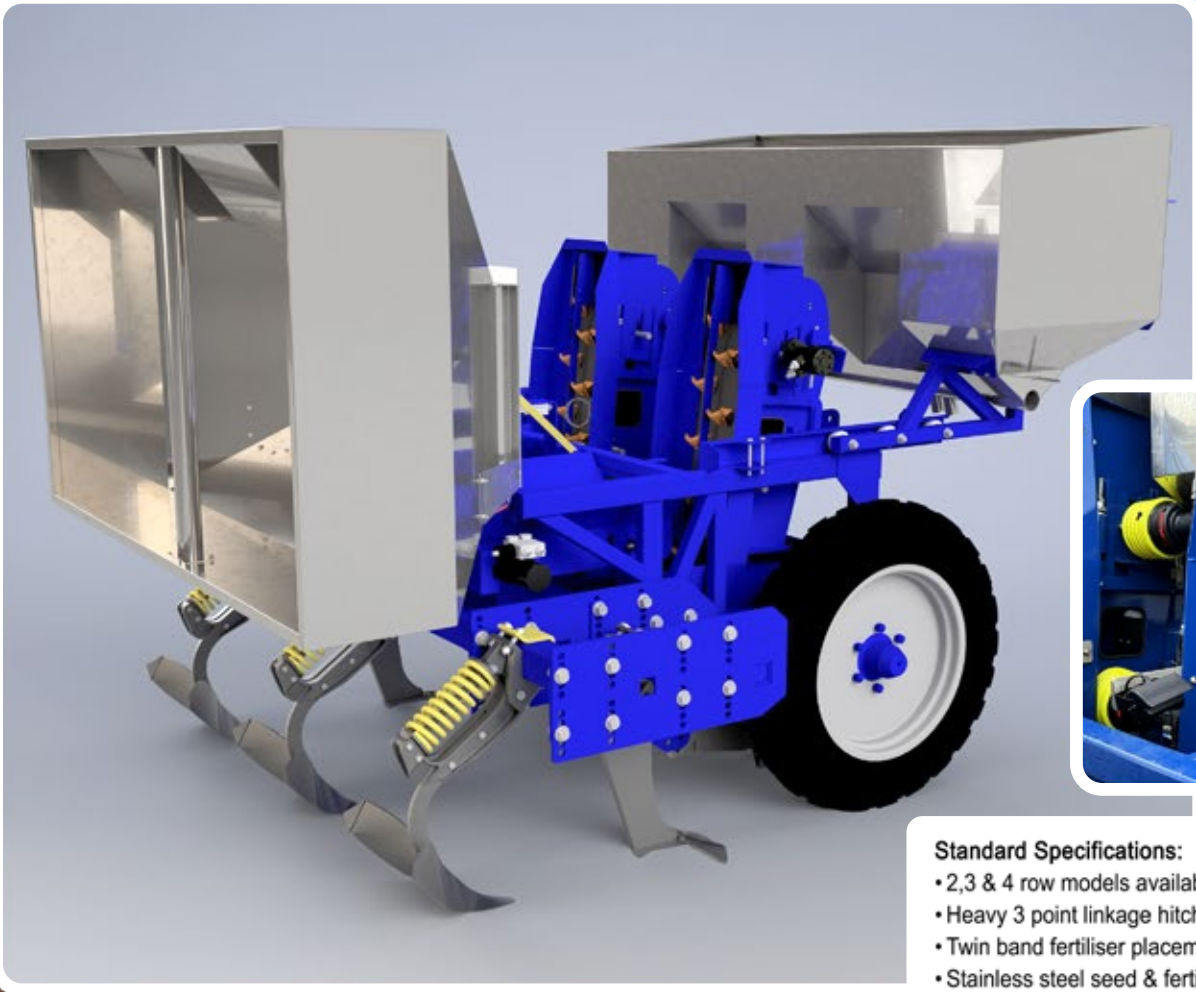

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Update from the Wide Bay-Burnett region

Karli Groves (CQUniversity), Dr Fiona Kerslake (Bitwise Agronomy), Aran Elkington (Bitwise Agronomy), cucumber producer Tom Redfern and Peter Hockings from Bundaberg Fruit & Vegetable Growers.

The VegNET – Wide Bay-Burnett project is delivered by Bundaberg Fruit & Vegetable Growers (BFVG) to keep vegetable growers informed about current R&D activities, results and resources. BFVG Managing Director Bree Grima provides an update on issues affecting the Wide-Bay Burnett region and project activities, which include working towards the next phase of the VegNET investment.

The Wide Bay-Burnett remains drought declared, which presents ongoing challenges for all horticultural producers.

Traditionally, the region has enjoyed good water security but groundwater irrigators are now receiving between 25 and 85 per cent allocation. Additionally, ongoing issues with one of our main dams has resulted in low water allocations of 22 per cent for medium priority customers in the Burnett sub-scheme.

On the other side of town, there are more sustainable water allocations of 98 per cent for medium priority customers on the Kolan River Sub-scheme, so there is a large difference of water availability for producers in the region. As a result, the temporary transfer market for water is very strong.

Coupled with continued labour supply pressures, there is a degree of uncertainty for some producers in the region – particularly those that require forward planning to order seedlings and stock.

Resilience and innovation factors

Despite the challenges, producers in the region remain positive and resilient and the volume of produce leaving the region destined for both domestic and international markets is encouraging. There are more producers looking to do things differently within their business, and agricultural technologies are playing a part in helping them reach greater efficiencies.

Whether it's through accessing farm management software or utilising drone technology, producers are open to trying new technologies and are assisting tech companies modify their products to suit specific horticultural growing operations. CQUniversity – through the Hinkler AgTech Initiative – continues to deliver a wide range of ag-tech on farms and has several trials in place within the region.

Tom Redfern from Eden Farms is a producer who is open to trying new technology and has had his fair share of labour challenges.

A recent trial he has undertaken includes technology to investigate yield monitoring forecasting in protected cucumber production. Simple methods for yield forecasting have been utilised by producers for a very long time and support producers in managing delivery estimates, planning their labour requirements, harvest, and cash-flow budgeting.

Utilising technology to deliver on this is generally more accurate and timely. The device being trialled in the region captures imagery through cameras and plots this on a map to create a virtual field allowing the producer to make crop/row comparisons, and assist with future decision making regarding irrigation, pesticide applications and crop harvest.

Project update

The VegNET project assists as a conduit of information and connects producers with on-farm R&D to work towards more productive, profitable and sustainable operations.

Bundaberg Fruit & Vegetable Growers (BFVG) is pleased to continue to deliver the VegNET – Wide Bay Burnett project and host the Regional Development Officer position.

BFVG has been involved with the VegNET project since its inception in 2016, and looks forward to delivering the five-year strategic plan developed during phase two of the program.

Now in its third phase, we will deliver on that program with five focus areas: biosecurity, organic waste management, inorganic waste management, ag-tech and input efficiencies.

The BFVG Cooperative recently celebrated its 73rd birthday, and we'd like to thank the thousands of farming families that have supported and contributed to the Cooperative since its inception.

We also thank the committees that help the Cooperative deliver on their programs and ensure programs are reflective of grower needs. The Regional Extension Advisory Committee was developed to support the VegNET program, and we thank them for their contribution to delivery of the program.

The mix of grower and researcher input has ensured the five-year extension plan will target topics of relevance and commercial applicability to regional producers in the Wide Bay-Burnett.

Finally, we would like to thank AUSVEG for its support in its role as national coordinator and Hort Innovation for project funding, and for sharing our vision and belief in the importance of regionally delivered extension programs.

Find out more R&D

Please contact Bree Grima at bree.grima@bfvg.com.au or email vegnet@bfvg.com.au, or phone the BFVG office on 07 4153 3007.

VegNET 3.0 is a strategic levy investment under the Hort Innovation Vegetable Fund.

This project has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.

Project Number: VG21000

Hort Innovation Strategic levy investment | VEGETABLE FUND

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Greater Sydney Demonstration Farm: An asset to New South Wales horticulture

University students pictured enjoying a day at the Greater Sydney Demonstration Farm.

In this column, VegNET – New South Wales Regional Development Officer Sylvia Jelinek introduces readers to the Greater Sydney Demonstration Farm, located on the Richmond Lowlands. Since its expansion in 2019, the farm has become a valuable learning site for growers and NSW vegetable industry members as well as hosting a number of Hort Innovation-funded investments.

In 2019, Greater Sydney Local Land Services launched its newly expanded demonstration farm, located at the site of Western Sydney University's historic River Farm on the Richmond Lowlands.

Part of the original Hawkesbury Agricultural College and more than twice the size of the previous site, the farm demonstrates best practice in land management, agricultural production and biosecurity.

The Greater Sydney Demonstration Farm now has several industry and university funded trial sites and has been VegNET – New South Wales' secret weapon of success and an instrumental tool for Hort Innovation. It sits along the Hawkesbury River, among family run vegetable farms and other horticultural enterprises.

After two years of successful trials, projects and events, the farm is recognised by vegetable growers as an ideal meeting place for workshops and showcasing research trials.

Additionally, it brings together the latest university and industry research in agriculture, natural resource management and biosecurity. Designed to support cross-sector collaboration and innovation, the farm can cater for growers, producers, educational institutes and landholders.

Having hosted up to more than 100 events with thousands of landholders since its official opening, the Greater Sydney Demonstration Farm is a success story.

Most recently, the farm hosted a recovery workshop for vegetable growers after many were affected by the March 2021 floods.

Delivering wide-ranging benefits

The Greater Sydney Demonstration Farm is a great asset to VegNET – NSW, bringing growers together for high value, collaborative learning experiences.

It is seen as 'neutral territory', and ideal for hosting field days and workshops for vegetable growers as well as supporting industry by presenting research outcomes and industry innovations. It means growers can view trials outside of their own farm – avoiding unwanted costs, crops failures or technological failures.

The farm emulates a typical farm set up in the Sydney Basin to encourage best practice in sustainable and profitable land management. The trials demonstrate new techniques, opportunities and the latest research available to vegetable growers and industry.

An EnviroVeg self-assessment has been carried out at the Greater Sydney Demonstration Farm to establish a baseline under the programs guidelines and improvement targets to achieve. A strategic levy investment under the Hort Innovation Vegetable Fund, the EnviroVeg Program (VG16063) assists growers in self-assessing and improving their on-farm practices.

Greater Sydney Local Land Services has showcased the latest innovation in precision agriculture in robotics and irrigation, as well as best practice biosecurity and other on-farm issues incorporating weed control and soil improvement techniques.

Projects demonstrated and extended to stakeholders at the farm include:

- Growave weed chemical-free treatment.
- Agerris Digital farmhand from *Evaluation of automation and robotics innovations: Developing next generation vegetable production systems* (VG15003).
- *Soil Wealth and Integrated Crop Protection – Phase 2* (VG16078).
- *Optimising cover cropping for the Australian vegetable industry* (VG16068).
- *A multi-faceted approach to soil-borne disease management* (VG15010).
- *A strategic approach to weed management for the Australian vegetable industry* (VG15070).
- *Internal fruit rot of capsicum* (VG17012).
- *Area wide management of vegetable disease: virus and bacteria* (VG16086).
- *Stingless bees as effective managed pollinators for Australian horticulture* (PH16000).

The vegetables grown at the Greater Sydney Demonstration Farm are donated to Foodbank Australia, helping Australians who are experiencing food insecurity. To date, in excess of 40 tonnes have been donated.

"We pride ourselves on freshness. We usually pick the produce on the morning of pick-up," Farm Manager Peter Conasch said.

Find out more R&D

Please contact VegNET – NSW Regional Development Officer Sylvia Jelinek from Greater Sydney Local Land Services on 0427 086 724 or sylvia.jelinek@lls.nsw.gov.au

VegNET 3.0 is a strategic levy investment under the Hort Innovation Vegetable Fund.

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Soil health practices land Tasmanian farmer national award

Acting Landcare Tasmania CEO Peter Stronach (left) and Board Chair Jonathan Lord (right) present Michael Nichols with the state's 2019 Innovation in Agriculture Award. Image courtesy of Amy Brown and Landcare Tasmania.

Each year, the National Landcare Awards acknowledge and celebrate local Landcare achievements at state and territory level as well as nationally. In 2021, Tasmanian farmer Michael Nichols from Redbank Farm took home the Australian Government Innovation in Agriculture Land Management Award. VegNET – Tasmania Regional Development Officer Ossie Lang speaks to Michael about the operation's innovations and his recent achievements.

Michael Nichols runs a 165-hectare farming operation at Sisters Creek in north-western Tasmania. Redbank Farm has a five to six year cropping rotation with onions, potatoes, peas, poppies, wheat and corn. Michael also fattens beef steers and has some pine plantations. This type of mixed farming is typical for many vegetable producing businesses in Tasmania.

Additionally, he owns a grain dryer and silos on-site where he takes in grain from local growers – as well as his own – and markets it to local dairy operations.

The corn has been a relatively recent addition to the rotation, and Michael is still trialling varieties to determine what suits his growing conditions. The corn, when blended with the wheat, is a useful lead feed alternative for his dairy clients. Corn is a good rotational crop with other vegetables.

Michael also regularly uses cover crops, not only to avoid erosion and suppress weeds, but also as a biofumigant. Alongside this, Michael's father runs an extensive chicken hatchery operation on the property.

Celebrating innovation

On 5 August 2021, Michael took home the Australian Government Innovation in Agriculture Award at a function held in Hobart. This followed the state award that he received in 2019 at the Landcare Tasmania awards.

While Michael is innovative in a number of ways, the national award was for the work he undertook in adopting precision ag approaches, reducing his yield variation through soil mapping and variable rate applications of fertiliser and other inputs.

Michael had his land sampled and soil tested with two tests per hectare. The analyses included soil pH and nutrients potassium (K), calcium (Ca), magnesium (Mg) and phosphorous (P). Michael then used this information to create variable rate maps for his various inputs, lime to adjust pH and single super to adjust P variability issues.

Michael has also combined this variable rate approach with in-season monitoring to vary his Nitrogen (N) applications to match crop needs. He has done this using NDVI imagery – either by satellite or drone –through the growing period to check for variation between areas of lighter and darker green foliage in the crop.

Positive outcomes

The success of this variable rate management has been confirmed in those crops where Michael is able to monitor the yield across the paddock.

"Before commencing this program, we would see a (within field) yield variation of around 40 per cent. We've been able to reduce this down to around 20 per cent using variable rate technologies," Michael explains.

The variable rate approaches have also paid off in reduced fertiliser costs.

"In one instance, I was able to scale back the rate to around a quarter of the recommended rate in certain areas. This reduced fertiliser cost was achieved while getting a yield increase from the crop," Michael says.

Several other benefits, which are a result of a more consistent crop across the paddock, aren't as easy to pin a dollar figure on. A more even crop makes spray application, nutrition, and other crop management decisions much easier to get right, as there is less variation in the plant growth stage and vigour.

Michael has also seen reductions in disease incidence as the areas with high nutrient loads, lush growth and other favourable conditions for diseases have decreased.

So, what next for Redbank Farm?

"At the moment, irrigation decisions are being made for a paddock based of a single probe or data point. I'd like to apply a similar area sampling type method to moisture monitoring and irrigation to better inform irrigation decisions," Michael says, adding he is also interested to see how sap testing across a paddock could back up the variable rate nutrition decisions.

Find out more R&D

For further details about how to use variable rate approaches, please contact Ossie Lang via email at ossiel@rmcg.com.au or on 0430 380 414.

Follow us on social media: Facebook: @VegNET. Tas and Twitter: @VegNET_Tas.

VegNET 3.0 is a strategic levy investment under the Hort Innovation Vegetable Fund.

This project has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.

Project Number: VG21000

Hort Innovation Strategic levy investment | VEGETABLE FUND

Mustard cover crop at Michael Nichols' property. Image courtesy of Ossie Lang.

New nematicide offering significant advantages for Australian vegetable growers

Corteva Agriscience Salibro Product Manager, Dan Cornally, pictured showing the nematode control in carrots. The treated product is on the right.

The fight against root-knot nematode has received a huge boost with Australian growers becoming the first in the world to have access to a new nematicide that has received approval for use in root and tuber, cucurbit and fruiting vegetable crops.

Corteva Agriscience Australia is pleased to announce the first global registration of Salibro® Reklemel® active nematicide.

Corteva Agriscience Australia Regulatory and Policy Manager, Greg Mitchell said that the Australian Pesticides and Veterinary Medicines Authority (APVMA) did a great job in meeting the regulatory timelines.

It was not the first regulator to start the risk assessment; however, it was the world's first to issue a registration. There were some adjustments in timelines along the way, which were done jointly, openly, fairly and amicably.

Australia is fortunate to have a risk-based, rigorous and robust regulatory system based on science that protects the safety of people, animals, and the environment.

Australian growers will be the first in the world to access and use Salibro to protect their crops.

Salibro is now approved for the control of root-knot nematode (Meloidogyne spp.) in root and tuber, cucurbit and fruiting vegetable crops. It offers growers significant advantages over existing options.

Making a difference

Corteva Agriscience Salibro Product Manager, Dan Cornally, said nematode control options in the past have typically been quite disruptive to beneficial fauna contained in the soil.

"Nematode control can be very challenging. Many of the current options available to growers are not IPM-friendly, which results in significant disruption to soil beneficial organisms. Current nematicides are also generally considered higher risk to growers and the environment.

"Salibro is quite different. It has a much lower risk to applicators and the environment and is an effective nematicide that controls root-knot nematode, as well as having negligible impact on the beneficial species that help suppress pests and diseases for healthier soils."

Mr Cornally said this product has a unique mode of action and can be used at relatively low rates.

"It affects the co-ordination of the nematode, meaning within hours of treatment they are unable to move, feed and infect plant roots. Death will occur in a couple of days as nematodes cannot move or feed effectively," he added.

How it works

In treated soils, parasitic nematodes are exposed to Salibro as they move in films of water within the soil in search of a host root. Once eggs hatch, and newly emerged juveniles become mobile they will also be controlled.

Soil temperature does not have any impact on the product's performance and effective control is observed both at low and high soil temperatures, e.g., 4 to > 35 °C.

"It will typically provide root protection from 20 to 50 days, so is an excellent option for growers needing effective robust control of root-knot nematodes," Mr Cornally said.

The approved use patterns are:

1. At crop establishment through drip from three days before planting up to three days after transplanting depending on the crop.
2. As a bed or furrow spray incorporated mechanically or with irrigation up to three days before planting.
3. Split application through drip – applied at establishment and again 14-28 days after transplanting depending on the crop.
4. Post plant drip as a top up treatment following another registered nematicide treatment.

Trials and testing

This new nematicide has been extensively tested across Australia, targeting important horticultural areas on a range of soil types since 2013.

One of the trials sites was in Bundaberg, Queensland, and included a planned trial of the new product in sweetpotatoes, carrots and capsicums.

There were very high rates of nematodes in the soil, and Salibro was compared to untreated plots and those treated with current industry nematicides. In the carrot trial, the untreated section produced very small and deformed vegetables, whereas the treated plot had large quality carrots.

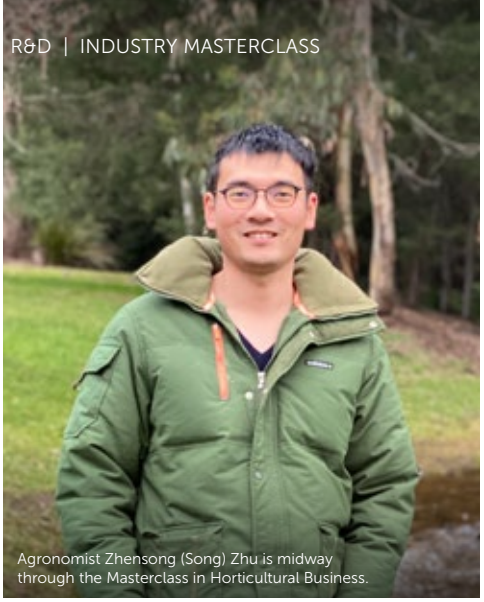
"It demonstrated the product's excellent crop safety and ability to control nematodes to produce high yields of quality vegetables," Mr Cornally said.

Mr Cornally said the new product would be welcomed by growers in the coming season.

"It has application flexibility and will help growers produce consistent, quality vegetables while looking after their soil," he said.

Find out more

Please visit corteva.com.au or phone Corteva Agriscience toll free on 1800 700 096.



Agronomist Zhensong (Song) Zhu is midway through the Masterclass in Horticultural Business.

Coolibah Herbs, where Song previous worked, prides itself on growing high-quality produce.

Helping hort industry members reach their full potential

The Masterclass in Horticultural Business was launched in 2017 by The University of Tasmania, in partnership with some of the world's leading names in horticulture. It provides current and future horticultural managers around the country the knowledge and skills to maximise farm performance and lead successful teams. In this column, we meet current student and agronomist, Zhensong (Song) Zhu, who outlines what he has learnt so far and the course benefits.

Agronomist Zhensong (Song) Zhu is only midway through his studies for the Masterclass in Horticultural Business – but can already see the benefits it will provide him and his employer.

The University of Tasmania's Graduate Diploma in Agribusiness: Masterclass in Horticultural Business offers participants immersive study that will ultimately make them a better businessperson.

Offered through the Tasmanian Institute of Agriculture (TIA) and developed in partnership with some of the world's leading names in horticulture – including New Zealand's Lincoln University, the Wageningen Research Academy in the Netherlands and Hort Innovation – the course is delivered online, with face-to-face learning and networking opportunities.

Song has recently joined Impact Fertiliser and is based in the company's Melbourne office. Previously, he worked for Coolibah Herbs.

"Before I joined Impact Fertiliser, I was regularly traveling across farms in Victoria, checking the crop quality and giving recommendations to farmers on soil health, fertiliser application and chemical use," Song said.

"Coolibah Herbs is a leader in the vegetable industry, and it is focused on the organic market and minimising using chemicals in conventional crops.

"As a member of the leadership team at Coolibah, I led the agronomy team for three years and ensured Coolibah products retained their position as a quality item in the market.

"The Masterclass will give me a better idea of the industry and I can read things from a different angle."

Networking benefits

Song studied a bachelor's degree in Agricultural Science in China from 2011-2015. After moving to Australia, he furthered his studies with a Master of Agriculture Economics at the University of Western Australia (2017-2019) and saw the Masterclass in Horticultural Business as an opportunity to further his studies and increase his network.

"As I have been away from school for a couple of years, I wanted to go back to university to refresh my knowledge and look at what is new in the industry," Song said.

"Although we are struggling in the COVID situation, it is still lovely to meet people around the country and talk about their stories among the industry."

Song is keen to translate theory into practice and apply the learnings from the Masterclass that will benefit him, his employer, and the industry.

"As a starter in the industry, I gained practical experience and applied the knowledge from university into the field," Song said.

"From my point of view, an agronomist helps people get access to high quality and safe crops. I can then develop a better understanding of what is the right way to approach farming."

Masterclass opportunities

The Masterclass in Horticultural Business will provide current and future horticultural managers around the country the knowledge and skills to maximise farm performance and lead successful teams.

The units are typically delivered over an 18-month period with individual flexible study plans allowing participants to study during periods of seasonal workload and around personal circumstances.

Find out more R&D

Please visit utas.edu.au/tia/study/masterclass-in-horticultural-business.

Masterclass in Horticultural Business is funded by the Hort Frontiers Leadership Fund, part of the Hort Frontiers strategic partnership initiative developed by Hort Innovation, with co-investment from the University of Tasmania and contributions from the Australian Government.

Project Number: LP15001

hort frontiers | LEADERSHIP FUND

Potassium nitrate benefits on top dressing application in carrots

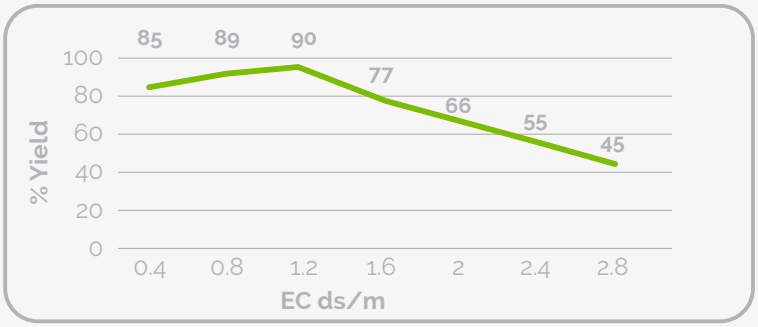
Prilled potassium nitrate (12% N - 38.2% K) is a potassium source with 2-4 mm prill size, that provides rapidly absorbed nitrate-nitrogen, plant's preferred nitrogen source.

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

Carrot yield is negatively affected by salinity, potassium nitrate is the N & K source with lowest salinity contribution.

Potassium nitrate is an N & K source which is virtually chloride & sulphate free as compared to other K Sources that contribute to build up salinity in soils.

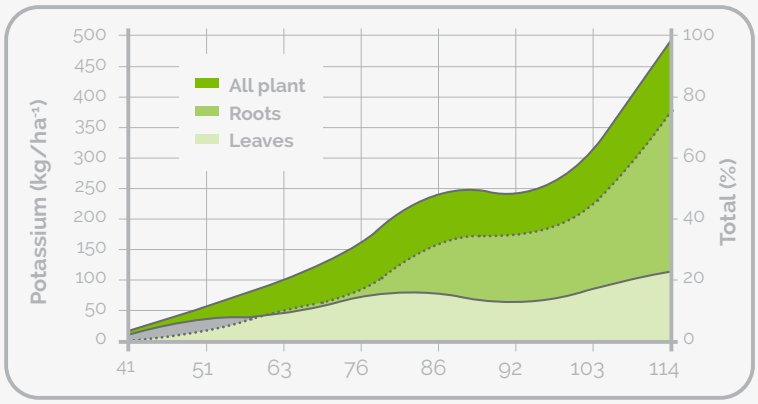
Effect of salinity in carrot yield potential



Adapted from: Arega Mulu January 2012, researchgate.net/publication/312159981_Cumulative_effect_of_saline_water_on_carrot_production

Potassium nitrate is the ideal N & K source during root bulking stage

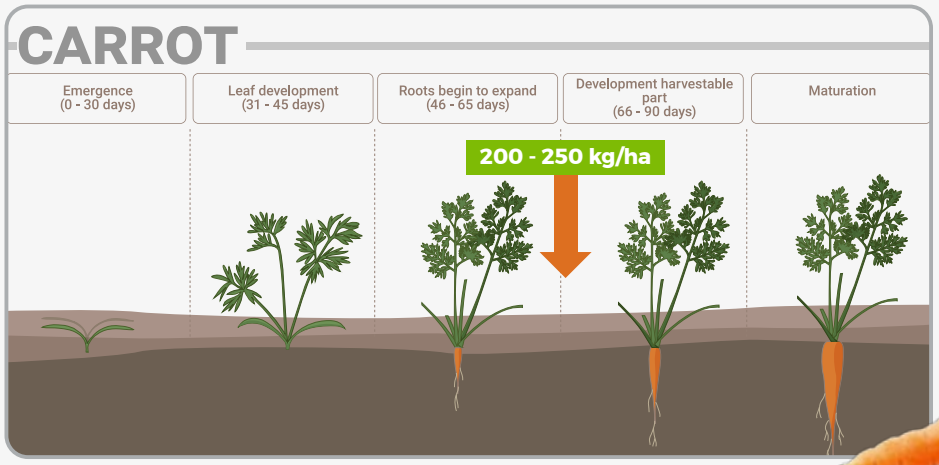
Carrot's potassium requirement is high during root bulking stage.
The combination of potassium with nitrate nitrogen is the most efficient way to supply these nutrients during this stage.



Source: IPACER, Nutrient accumulation curve in carrot, Bermuda and Natuna varieties – Season 2017/2018.

Recommendation of use:

Apply prilled potassium nitrate at **200-250 kg / ha**, as **top dressing**, at the beginning of root bulking stage:



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.
- Due it is synergistic effect, promotes the uptake of cations as potassium (K), calcium (Ca), magnesium (Mg), copper (Cu), iron (Fe), manganese (Mn) and zinc (Zn).

Prilled potassium nitrate is virtually chloride free.

- Yield and quality are negatively affected by chloride. The presence of nitrate nitrogen in potassium nitrate (NO3-), acts antagonistically to chloride (Cl-) uptake if present in soil or water.

Proven benefits of prilled potassium nitrate in carrots:

- Increases yield, weight and size.
- Increases dry matter & carbohydrates content.
- Decreases weight loss during storage and increases shelf life.
- Improves drought tolerance (less chance to crack from water imbalances)
- Avoid root bifurcation due to ammonium excess.

SuniTAFE SMART Farm Project Manager Warren Lloyd said John Deere technology has helped the training facility embark on its precision agriculture journey.

Technology empowering horticulture's rising stars

Precision agriculture is a subject offered to horticulture students at SuniTAFE's Mildura campus in north-west Victoria. The campus has embraced the Sustainable, Manageable, Accessible, Rural Technologies (SMART) approach to farming, and provides a practical, hands-on experience for students and teachers alike.

Australian horticulture's future leaders are honing their precision agriculture skills using a fleet of John Deere equipment at SuniTAFE Mildura.

The agricultural campus has 150 students and is situated in Victoria's Mallee district, where it grows 10 crops across 30 hectares in accordance with a Sustainable, Manageable, Accessible, Rural Technologies (SMART) approach to farming.

Given the way the agricultural landscape has and continues to evolve – and the growing importance of data-driven farming – SuniTAFE SMART Farm Manager Warren Lloyd said it was essential the training facility matched the needs of the industry.

"We are embracing technology and want to make sure we're at the forefront of any advancements in horticulture," Warren said.

"We are trialling the latest technologies here and then teaching it to our students, so they are the forerunners when they head into careers in the industry."

A pathway to precision

Working with its local John Deere dealership, Haeusler's Mildura, SuniTAFE took the first step of its precision agriculture journey through enhancing a John Deere 5085GF Tractor with JDLink™ and Generation 4 CommandCenter™ technology.

John Deere Operations Center™, a system that automatically records and collates real-time field data, was also adopted to ensure information across the farm's grapes, citrus, avocados, almonds, olives, dates, vegetables, and hemp crops, is collected.

As a fourth-generation dried grape grower himself, Warren knows first-hand the collation of up-to-date farm records is vital, but at the same time can prove challenging for farmers without the right technology.

"Keeping records can be a real bugbear," Warren said.

"If you leave it even a day and try and remember yourself, it can quickly become a nightmare. The fact our John Deere tractor does that autonomously and immediately is incredible."

The on-board weather station, fitted to the top of the 5085GF, has also been hugely effective.

"I had been relying on weather data from the internet, but it needs to be much more localised," Warren said.

"In that respect, I don't think you can be more localised than having a weather station that's attached to the roof of your tractor."

Now the SuniTAFE property has been fully mapped, spraying has also been simplified. The tractor's attached herbicide unit operates automatically – saving time, money and providing better environmental outcomes.

"You just drive into the row. It turns on when you enter, and it turns off when you leave," Warren said.

"Real-time data is also helping set some parameters. You can see the wind is blowing 19 kilometres per hour from the north-west and the temperature is above 30 degrees, so you know it's no good for spraying.

"When there's a breach of the parameters, you are alerted while in the cabin and you can make the decision to stop spraying."

Next generation

Warren said the most rewarding aspect of his work was watching students go on to have thriving agricultural careers.

"In horticulture, there is a need to find people who have specialised skills. Because of that, as an industry, we have to try to retain some of the best and brightest kids in our sector," he said.

"Nowadays, you do not have to be born on a farm to become a farmer – you just have to have enthusiasm and a love of growing things."

Find out more

Please visit JohnDeere.com.au and sunitafe.edu.au.

Focus on food industry and vegetable-based product development

CSIRO, Flinders University and Nutrition Australia are working together to deliver VegKIT, an integrated five-year project designed to deliver tools and interventions for increasing children's vegetable intake, with the ultimate aim of increasing veg intake by more than half a serve a day. The project's latest activities include the development of new vegetable-based product concepts for Australian children. *Vegetables Australia* reports.

Researchers at CSIRO have been undertaking studies on a new scientific framework based on sensory science that can be used to develop new vegetable-based products for children. A range of new vegetable-containing concepts – both fresh and processed vegetables – have been designed using this framework, known as CSIRO Children's Acceptance Model for Product development Of Vegetables (CAMPOV).

These activities are being conducted as part of a wider project entitled *Tools and interventions for increasing children's vegetable knowledge – VegKIT* (VG16064), a strategic levy investment under the Hort Innovation Vegetable Fund.

Sensory focus

The CAMPOV model is set to guide food manufacturers in developing vegetable-based products for children, as CSIRO sensory and consumer scientist and project leader Dr Astrid Poelman explained.

"It's based on key factors of food choice that are relevant for the development of vegetable-based food products for children. There is a lot of literature on how to increase children's acceptance for vegetables, but not every part of that knowledge is modifiable in terms of creating insights that are relevant for the food industry and product development," Dr Poelman said.

"It considers factors that are relevant to the child and the product. For the child, you have to think of biological and psychological factors; for example, children's taste buds are still in development, and they taste foods differently to adults. They live in different sensory worlds, and this explains why children like sweet foods more and dislike bitter foods more than adults."

When looking at the product, researchers took into consideration intrinsic properties such as appearance, taste and texture, as well as extrinsic properties like branding and packaging.

"We've undertaken literature reviews to gather the scientific knowledge about how these factors can be used to increase children's acceptance of vegetables. We then developed the model with modifiable attributes based on this knowledge," Dr Poelman said.

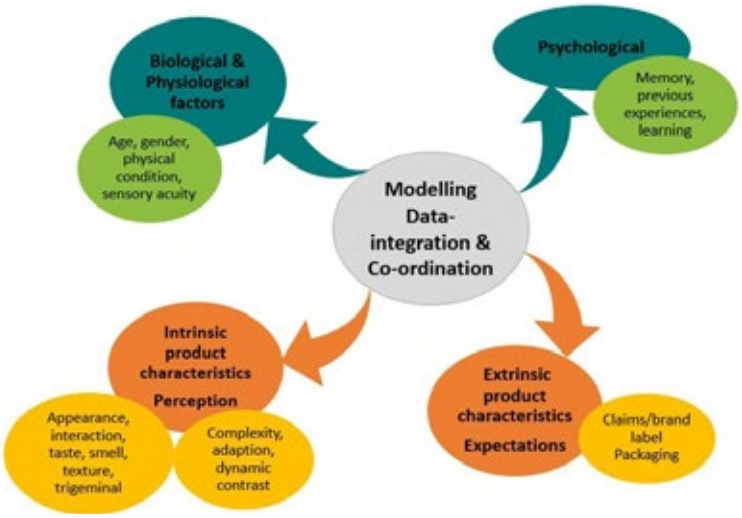
Testing the model

The team came up with 14 concepts that were then evaluated through qualitative research involving 36 children aged between 5-8 years old during eight focus group sessions.

Overall, children had a high interest in six of the concepts: Rainbow dippers – vegetables and vegetable-based dips; ice cream and ice blocks with veg in them; →

Figure 1

Key determinants of relevance to developing new vegetable-based products for children. Adapted from Mojet's (2001) Model of essential factors that influence eating and drinking behaviour and food choice.



fairy dust – a vegetable-based powder; Rainbow squeeze-mate – a vegetable-based sauce that can be squeezed on sandwiches; the Crunch & Sip KIT and a Children's Cooking KIT.

Factors from the CAMPOV model that positively influenced children's interest in the concepts were bright colours, fun shapes, bite-sized pieces, good taste, fun eating experience, imaginative language, familiarity and role modelling.

"There are a few of those concepts that are fun eating experiences, and that's what the children really liked. Their parents agreed, and said it would be really appealing to children," Dr Poelman said.

There were concepts that received a mixed response or low interest. Among these were a pizza base that contained vegetables; veggie sticks, which were vegetables on sticks similar to a kebab; vegetable nori-type sheets; and yoghurt with vegetables.

There were results that surprised researchers, particularly the mixed reactions to the pizza base with vegetables. However, there may be a reason behind this – as Dr Janne Beelen, who was also involved in the research, pointed out.

"Because pizza is a familiar and popular dish with children and parents, you can't mess around too much with it. This was the same for wraps and bread rolls with vegetables in the dough," Dr Beelen said.

"Therefore, if you were to develop these concepts, you need to make sure that it looks and tastes much like their familiar counterparts. It shouldn't go too far away from what they're used to, and what they like."

The results from this study can be used to further develop and evaluate prototypes into products containing vegetables for children for commercialisation, and the CAMPOV Model can also be used by food manufacturers to develop further concept ideas.

Further investigation

Based on the work that has been undertaken so far, the CSIRO sensory team went a step further and developed specific prototypes.

"We gathered all the data and specifically developed some prototypes. For example, with ice blocks we looked at how far you can go with increasing vegetable content and if there was a trade-off between taste and vegetable content that you need to consider. And there was, so that will provide further tangible outcomes for industry," Dr Poelman said.

One of the prototypes will be tested in a real-life setting: the school canteen.

"That will be produced by a commercial manufacturer for our study. It's a snack pack with vegetables – the dippers and vegetable dips –we have looked in the earlier research at what the combination of the pack should have for optimal appeal. We'll be selling those in primary school canteens and measure the sales. These are exciting new steps," Dr Poelman said.

Figure 2

CSIRO Children's Acceptance Model for Product development Of Vegetables (CAMPOV).

Factor	Properties to promote children's vegetable acceptance
Intrinsic properties	
Appearance	Bright colours, atypical colours of veg, colour/shape contrast, fun shapes, small sizes/bite sized
Taste/flavour	Sweet taste, taste contrast (sweet/sour), suppression/absence of bitterness, flavoursome, pairing with like tastes/flavours
New sensations	Novel sensations, fun sensations
Extrinsic properties	
Claims/branding	Sensory claims, imaginative language, fun characters on pack, absense of health claims
Fun	Fun eating experience
Psychological factors	
Asociative learning	Pairing with liked attributes
Previous experience	Encourage repeated trying, familiarity to existing
Role modelling	Mimicking parents

Key recommendations

The CAMPOV model identified various factors that can be considered for the development of new sensory-based concepts containing vegetables:

- Enhancing visual appeal/appearance – related to good visual appeal, novelty and fun –but also packaging (labelling, characters and claims that promote sensory appeal).
- Enhancing the sweet taste of vegetable-containing products by using sweet tasting vegetables or fruits.
- Enhancing the flavour intensity, by using condiments or other ingredients.
- Reducing bitter taste – for example, by adding a small quantity of salty ingredients or condiments.
- Creating concepts with crunchiness.
- Creating concepts with novelty value or with a high 'fun' factor either through visual appeal or interactive engagement 'play factor'.
- Creating concepts that build onto existing, familiar products that are liked by children.

The concepts evaluated in the research focused on the intrinsic properties and 'fun' and not so much on other extrinsic factors. Concepts covered all eating occasions for children (main meals, snacks, at school) and considered the Australian climate, environment and culture. The list of concepts also included ideas that draw on current food trends, such as meal kits and subscription models.

Overall interest in concepts as evaluated in focus groups with children aged 5 to 8 years.

Industry benefit

Dr Poelman explained that the idea behind this research is that if more successful vegetable-based products for children are being introduced to the market, this will increase vegetable consumption among children – and thereby drive vegetable demand.

"This will directly benefit Australian growers," she said.

Additionally, there are concepts that use vegetables as an ingredient in a processed form.

"This provides an opportunity to reduce vegetable waste for vegetable products that might not be able to be sold in their whole form as they don't meet the retail quality standards," Dr Poelman added.

"There are also several concepts that use fresh vegetables, so it might provide some opportunities for growers who have an interest in starting to produce value-added products.

"Lastly, children who eat vegetables ultimately become adults and parents that eat vegetables, so it provides a lot of opportunities to increase longer term demand for vegetables."

Industry resources available online

The VegKIT team has compiled tools and resources to support industry and grower efforts to increase children's vegetable intake.

These include an interactive webinar aimed at the food industry entitled *New opportunities for developing vegetable products for children. We've done the science for you.* There is also a report with a similar title that details the topics covered in this article.

To check these out and more, please visit vegkit.com.au/industry-growers/industry-growers-tools-resources.

Find out more R&D

The VegKIT website now contains a suite of practical, evidence-based resources for food industry, health professionals, schools and day care centres. These can be found at vegkit.com.au.

This project has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.

Project Number: VG16064

Hort Innovation Strategic levy investment | VEGETABLE FUND

Trays of alyssum ready for delivery to growers.

Beneficial planter boxes at Boomaroo's Southbrook nursery in Queensland – its own little breeding farm for beneficial insects.

A growing commitment to sustainability in veg production

Operating for over 30 years, Boomaroo Nurseries is a wholesale supplier of vegetable seedlings to the fresh produce industry and potted greenlife products to the nursery and garden industry. It has recently expanded its range to include Certified Organic seedlings as well as beneficial host plants that complement Integrated Pest Management programs. *Vegetables Australia* reports.

Boomaroo Nurseries has long been invested in optimising plant health – both in-nursery and for its growers on-farm – as well as pursuing the highest possible standards in sustainability.

It has been now over 12 months since the operation launched Boomaroo Organics out of its Lara and Southbrook nurseries, supplying Certified Organic seedlings across all crop categories to growers along the eastern seaboard.

From humble beginnings, Boomaroo now supplies to organic producers in the Lockyer and Granite Belt regions, Mornington Peninsula, Gippsland, Mildura, Swan Hill and the Murraylands, to name a few, and continues to receive positive feedback and strong grower interest.

Initially focusing on its core crops – celery, leafy veg, brassicas, alliums and tomatoes – the operation has responded to grower requests with an expanded organics range including additional fruiting crops such as watermelon, capsicum and pumpkin as well as Asian vegetable varieties.

Focus on plant health

However, it isn't only organic product lines that have proven popular with growers. Boomaroo is seeing increased interest in a more holistic approach to primary production, reducing reliance on the heavy use of chemicals and promoting natural processes to support plant health.

As such, the operation has remained focused on solutions that provide ongoing benefits to on-farm crop management through its plant health programs. One such initiative, providing value to organic and conventional growers, is its beneficial host plant program.

The benefits to pest control and chemical input reduction through the introduction of beneficial predatory insects – also known as Integrated Pest Management (IPM) – have long been known. Beneficial host plantings alongside crops further support IPM by providing a natural farm environment that attracts and sustains a wider range of beneficial predators, who in-turn feast on unwanted and harmful pests.

Traditionally planted at row ends on farm, the host plantings also act like yellow sticky trap pest indicators – with damaging aphids and thrips attracted to host planting flowers and the beneficial predators they house – before attacking valuable vegetable crops nearby.

Boomaroo's beneficial host plant offering includes marigolds and alyssum, as well as a range of flowering herbs, which are all grown organically.

This program is further supported by its adoption of softer chemistry applications in lieu of commercial insecticides in-nursery, even on conventional crops – resulting in a clean, healthy plant and encouraging beneficials such as lady beetles, parasitic wasps, lacewings, damsel bugs, black-headed mirid and big-eyed bugs to take up residence.

Although the operation has already seen a strong uptake from organic and conventional growers, the benefits couldn't be clearer than at its own nurseries. Planters of marigolds and alyssum have been stationed with great effect, complementing the use of sticky traps and pheromones also deployed throughout the nurseries.

Through Boomaroo, growers can now meet their seedling and host beneficial plant needs in one convenient delivery.

For more information about its organics offering, plant health programs such as beneficial host plantings or sustainable chemistry applications, please contact your local Boomaroo Territory Manager or email sales@boomaroo.com.

Find out more

Please visit boomaroo.com.

Multi-species cover crop – oats, tillage radish, field peas & red clover before a potato crop in Manjimup, Western Australia. Image courtesy of Andrew Falcinella.

Single or mixed cover crops – what's the best fit for vegetable production?

You've nailed single species cover crops use on your farm and are now considering the next step. If you jump on the web, mixed-species mixed cover crops are the buzz. Three-, eight- or even 30-species mixes are often promoted as the silver bullet for improving soil health and productivity. In this column, Kelvin Montagu from Applied Horticultural Research discusses when to stick with single species cover crops and when to jump into mixed species cover crops.

Are mixed species cover crops a good fit for vegetable production?

To answer the question, you need to be clear about your main aim and how long you have for the cover crop.

In the table, I have summarised the relative benefits of single versus mixed cover crops in vegetable production. This is based on my experience and research reviews (see further reading).

As you can see, I like to keep it simple with single species cover crops. If a single species cover crop delivers, stick with it. They are cheaper, easier to manage and often deliver more specific benefits.

If you are new to cover cropping, then definitely start with single species cover crops.

Relative benefits of single versus mixed species cover crops in vegetable production.

Cover Crop Benefits	Biomass production	Biomass reliability	Legume nitrogen	Short growing time	Prevent erosion	Rooting structure	Soilborne disease	Biofumigant efficacy	Weed suppression	Cost	Agronomy	Multiple benefits	Soil biology
Single species	✓		✓	✓	✓		✓	✓	✓	✓	✓		?
Mixed species	✓	✓			✓	✓						✓	?

Single species cover crop trial – millet oats, ryegrass and tillage radish before a baby leaf crop in southern Tasmania. Image courtesy of Kelvin Montagu.

Multi-species cover crop – tillage radish & ryegrass cover crop before a processing tomato crop in Shepparton, Victoria. Image courtesy of Kelvin Montagu.

When single species cover crops are the winners

When managing soilborne disease pressure, carefully chosen single species cover crops are a clear winner.

Non-hosting cover crops, or break crops, are an important way of reducing soilborne disease pressure. Typically, cereals (e.g., oats, cereal rye, sorghum, millet) are used in the vegetable rotation as a break crop.

Moving to a mixed species cover crop greatly increases the likelihood that one of the additional species will be an alternate host to the soilborne disease. This complicates your rotation and can increase losses caused by soilborne disease in the following vegetable crop. Choose wisely.

The amount of biomass produced by cover crops is important for biofumigation efficacy, nitrogen fixation by legumes and suppressing weeds. Carefully chosen (right season and sowing rates), single species cover crops will usually produce more biomass than mixed species cover crops. For both nitrogen fixation and weed suppression, biomass is king.

Maximum biomass is particularly important for biofumigants that rely on high biomass and rapid incorporation into the soil for their efficacy. Adding in other species will reduce the biomass of the biofumigant and hence the biofumigation efficacy. See the biofumigation breakout box on the next page.

For guidance on single species cover crops, check out the *Cover Crops for Australian Vegetable Grower Poster* on the Soil Wealth website.

If single species cover crops are your choice but you want to introduce more diversity, consider changing your cover crop species occasionally to provide more diversity.

Where do mixed species cover crops fit?

If you have long cover crop growing time and no soilborne disease issues, then mixed species cover crops can be a good option. The mixes can provide a greater variety of rooting structures to help build soil structure (e.g., including some ryegrass with cereal and adding in a deeper rooting brassica), or a wider range of flowering plants to help maintain beneficial insects. There is also evidence that nutrient cycling is more efficient in mixed-species system.

A longer growing time and different management practices (e.g., grazing or mowing) will be required to allow different species to contribute to mixed species cover crops. In general, the most successful mixed species cover crops have been in grazing systems – and then I would call them pastures!

There is also a lot of talk about mix species cover crops being better for soil biology – greater diversity in the cover crop creates greater diversity in soil biology is the logic. However, the research is not clear cut on mixed being better than single species cover crops. But what is clear, is that any cover crop is way better than a bare fallow.

If you want to try mixed species cover crops, then start building with one or two additional species and make sure the benefits you want are being delivered, and that you are not compromising or complicating your money-making vegetable crop.

Single species cover crop – oat cover crop before corn in Richmond, New South Wales. Image courtesy of Kelvin Montagu.

Biofumigation: Keep it simple for maximum soilborne disease management

Recently, a grower rang me following a crop loss from Sclerotinia in lettuce. He had successfully used caliente biofumigant to reduce the Sclerotinia pressure prior to growing the lettuce.

With this working well, he thought a mix species cover crop might bring more benefits so added in a cereal and legume. However, he lost sight of the main aim of managing Sclerotinia levels.

By adding in more species, the effectiveness of the biofumigation cover crop was probably reduced. Firstly, the cereal and legume would have 'diluted' the biofumigant action by reducing the amount of biofumigant biomass produced. Maximum biomass incorporated at the right time is required for a biofumigant to be most effective. Secondly, legumes are a known host of Sclerotinia – potentially hosting the Sclerotinia during the growth of the cover crop.

The reduction in biofumigant biomass, together with the legume hosting Sclerotinia, resulted in the lettuce crop suffering serious losses under ideal conditions for the disease. A better option would have been to keep with the straight biofumigant and perhaps rotate through a straight cereal in alternative years to add some diversity to the rotation.

Find out more R&D

Please visit soilwealth.com.au and look for the cover crop section.

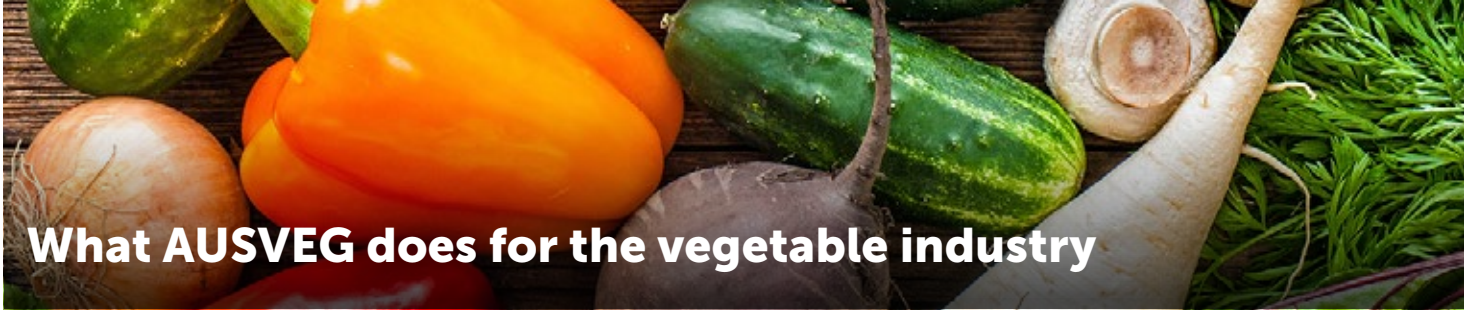
For further information, please contact Dr Kelvin Montagu from Applied Horticultural Research at kelvin.montagu@gmail.com.

Soil wealth and integrated crop protection – phase 2 is a strategic levy investment under the Hort Innovation Vegetable, Potato – Processing and Potato – Fresh Funds.

This project has been funded by Hort Innovation using the vegetable and potato research and development levies and contributions from the Australian Government.

Project Number: VG16078

Hort Innovation



What AUSVEG does for the vegetable industry

AUSVEG is the peak industry body for Australia's vegetable growers. Since COVID-19 emerged in 2020, just as growers have laboured to ensure Australian families are fed and healthy during the pandemic, AUSVEG has worked tirelessly behind the scenes to advocate to all levels of government and deliver services to benefit vegetable growers around Australia. AUSVEG National Manager – Communications Shaun Lindhe details the work that AUSVEG does for vegetable growers and what this has delivered during the pandemic.

Grower advocacy: Government relations, public affairs and industry representation

Speaking up for growers and the wider industry

AUSVEG has strong ties to Federal Government ministers and advisors and relevant department officials in Foreign Affairs, Agriculture, Trade, Immigration, Jobs and Employment, as well as labour hire providers and key industry stakeholders.

The most important of these issues currently is the cost and availability of labour, which AUSVEG's dedicated public affairs team is addressing in three ways:

1. *Increasing labour supply:* AUSVEG works with the Federal Government to modify visa settings to improve access to international labour, and portraying a positive image of the work and career opportunities that exist in horticulture.

2. *Ensuring ethical employment practices:* AUSVEG promotes programs such as Fair Farms to ensure employees have positive, safe, fulfilling experiences working in horticulture.

3. *Ensuring the supply chain applies appropriate ethical sourcing standards:* so that the growers who do the right thing are not undercut buy those that do not.

Recent outcomes for vegetable growers

- Held direct meetings with numerous politicians to advocate for vegetable growers, including Deputy Prime Minister Barnaby Joyce MP, Agriculture Minister David Littleproud MP, Michael McCormack MP, Darren Chester MP, Scott Buchholz MP, Nola Marino MP, Senator Michaelia Cash, Alan Tudge MP, Damian Drum MP, Anne Webster MP, Senator Raff Ciccone, Senator Susan McDonald.
- Strongly advocated for the Agriculture Visa and the Horticulture Industry Labour Agreement to ensure businesses have access to skilled, semi-skilled and unskilled workers.
- Ensured vegetable growers' interests are considered by the National Farmers' Federation through its Horticulture Council, which is managed by AUSVEG National Manager – Public Affairs Tyson Cattle.
- Liaising with state farming associations and vegetable industry members on upcoming Federal Election policy platforms to ensure vegetable growers' issues are included.

Making growers' voices heard and ensuring their levies are invested well

AUSVEG provides policy advice and oversight of levies expenditure via representation in key decision-making forums.

Recent outcomes for vegetable growers

Over the last 18 months, AUSVEG has been involved in recent meetings of the following:

- Hort Innovation Vegetable Strategic Investment Advisory Panels, which direct the investment of levies based on industry priorities.
- EPPRD's National Management Group and Consultative Committees, which oversee and manage the country's response to new pest and disease incursions.
- The Standards Development Advisory Group of Food Safety Australia and New Zealand (FSANZ).
- Federal Government forums and committees, including the Healthy Food Partnership.
- Forums for government regulators, including the Australian Competition and Consumer Commission.
- Industry and government Trade Advisory Panels.
- Industry reference groups for key industry projects and investments.

Connecting with growers: Extension, Hort Connections & industry communications

VegNET: Working with growers to improve productivity and profitability

AUSVEG has extensive experience in delivering practical, informative and contemporary activities to build knowledge and awareness of relevant and productive business practices, production methods and research to help improve business productivity and profitability.

AUSVEG is leading the Hort Innovation-funded VegNET extension project, which is a nationally-coordinated, regionally-delivered project to improve Australian vegetable growers' knowledge and skills to implement best practice management on-farm through a variety of delivery mechanisms.

All major growing regions in the country have been targeted with 10 regionally-based extension experts to ensure that all growers – no matter what their business is – benefit from the best resources and support to improve their operation (see page 22).

Recent outcomes for vegetable growers

- Launch of the five-year VegNET program, which will ensure growers from all major growing regions will have dedicated, tailored support from regional development officers who will support vegetable businesses in their regions to improve their productivity, profitability and competitiveness.
- Delivered webinars on topics of importance to vegetable growers, including serpentine leafminer, the international trade landscape and fall armyworm.
- Assisted growers through the delivery of on-the-ground biosecurity preparedness for vegetable growers.
- Delivered agriculture industry-wide extension for the pest surveillance project iMapPESTS, which is working with vegetable growers to develop smart surveillance and cutting-edge diagnostic technologies.

Delivering Hort Connections, the national industry event

AUSVEG is the co-host (with PMA A-NZ) of Hort Connections, the largest horticulture industry event in Australia, which brings together growers, suppliers, marketers, buyers, researchers and government to network and address key industry opportunities.

Recent outcomes for vegetable growers

- Hosted Hort Connections 2021, which attracted 2,200 delegates in-person, despite then-Victorian lockdowns.
- Delivers the Annual Vegetable Industry Seminar, which brought together the industry's most innovative researchers and thought-leaders to speak with growers about the latest research and technologies.

Speaking to growers and the community

AUSVEG has a long history of providing successful and effective communications, publishing magazines, directly engaging with journalists and sending industry-focused newsletters to update growers on the issues that are important to them.

Recent outcomes for vegetable growers

- AUSVEG delivers the Hort Innovation National Vegetable Industry Communications program, which includes funding to communicate research in the *Vegetables Australia* magazine, the AUSVEG Weekly Update e-newsletter as well as across AUSVEG's social media and online channels.
- Through this program, AUSVEG is working closely with the VegNET project to deliver regionally-tailored podcasts and videos for each major growing region based on the issues and priority areas that are affecting growers in these regions.
- Media coverage across all major national and regional print publications, as well as radio and TV coverage on all major networks, on issues that are important to growers.
- AUSVEG is a key industry partner for The Fruit & Vegetable Consortium, which brings together key organisations to collectively advocate for comprehensive joint action to improve fruit and vegetable consumption in Australia (see page 62).
- Since March 2020, AUSVEG has distributed over 120 newsletter and advocacy updates directly to growers and industry.

→

International trade: Export development & trade advice

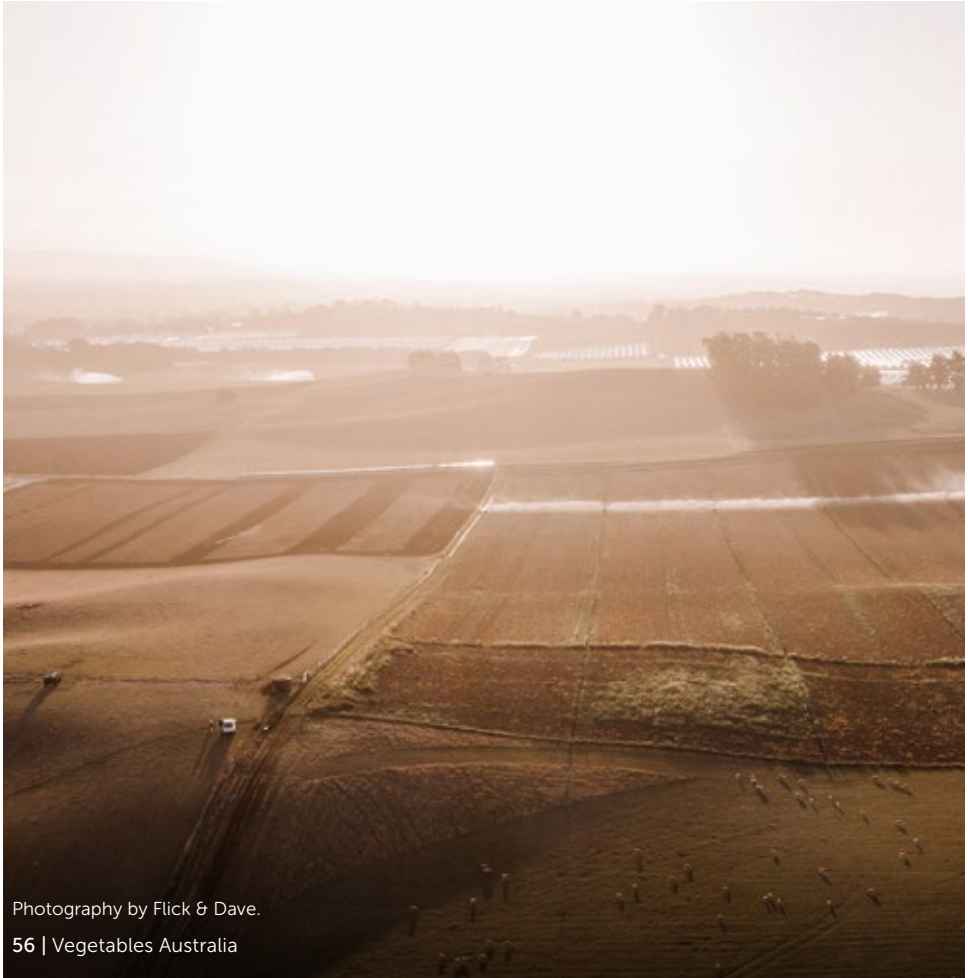
Building export capability and developing international markets

AUSVEG employs a team of international trade experts who provide tailored resources, practical advice on the exporting process for fresh produce and market development strategies. The team works with exporting growers in Australia and in-market customers to provide businesses with the skills, know-how and networks to supply international markets with high-quality fresh produce. AUSVEG's exporting expertise includes, but is not limited to:

- Export readiness training and capability development.
- Industry and business export development assistance.
- Market entry strategies and advice.
- Showcasing at international trade events.
- Designing and delivering in-market knowledge sharing and networking tours for exporting businesses.
- International buyer engagement and supplier linkages.
- Trade barrier and technical market access advice.
- Market insights, data and analysis.
- Government engagement and industry representation.

Recent outcomes for vegetable growers

- Advocated for vegetable growers in recent trade negotiations, including IA-CEPA.
- Advocated growers' concerns directly to Federal Trade Minister Dan Tehan, Austrade and the Department of Foreign Affairs and Trade on issues including sea- and air-freight costs, input costs and the impacts of COVID on international trade.
- Undertaken a leadership role to liaise directly with the International Freight Assistance Mechanism (IFAM) team to provide assistance for vegetable growers since the beginning of the COVID-19 pandemic.



Photography by Flick & Dave.

Biosecurity & Technical expertise

Protecting vegetable growing businesses from pests and diseases

Biosecurity planning

AUSVEG has a dedicated team of industry-leading biosecurity experts who develop and help implement biosecurity plans for vegetable growing businesses to help protect their farms from the spread of damaging pests and diseases. AUSVEG is involved in many biosecurity projects that focus on increasing growers' capacity to adopt biosecurity best-practice on-farm.

Grower representation

AUSVEG represents the interests of growers on biosecurity matter as a signatory to the Emergency Plant Pest Response Deed (EPPRD). This is the agreement between governments and industry that defines how new pest incursions are managed and how the costs of treating such incursions will be shared. Without this agreement, the full impact of the arrival of new pests and diseases would land squarely on growers.

Recent outcomes for vegetable growers

- Held 25 virtual and hybrid-model workshops on pests of importance to vegetable growers, including serpentine leafminer, fall armyworm and American serpentine leafminer.
- Represented growers' interests on the Consultative Committee for Emergency Plant Pests on incursions of significant concern, including tomato-potato psyllid, serpentine leafminer, fall armyworm, and American serpentine leafminer.
- Promoted biosecurity best-practice to growers at workshops, via webinars and through one-on-one consultations.
- Liaised with Plant Health Australia and Hort Innovation to advise on biosecurity-related investments to protect Australia's vegetable growers from harmful pests and diseases.

Helping vegetable growers protect the environment

AUSVEG employs experts in environmental stewardship and best-practice to provide vegetable growers with information about how they can improve their environmental management and increase the sustainability of their production businesses.

AUSVEG manages EnviroVeg, which is an industry-led environmental best-practice management program for vegetable production businesses that provides resources for sustainable growing techniques and represents vegetable businesses as responsible stewards of land, water and biodiversity.

Recent outcome for vegetable growers

- Over 320 vegetables growers have been involved in EnviroVeg in the last 18 months, delivered by AUSVEG and funded using the Hort Innovation Vegetable Fund.

Keeping produce free from pests and diseases

AUSVEG has a detailed understanding of the pests and diseases that impact the vegetable industry, as well as the chemical and integrated pest management options to control any outbreaks. AUSVEG works with growing businesses to develop and implement plans to prevent the spread of pests and diseases, as well as research organisations, agronomists, chemical companies and others in the supply chain to increase the capacity of the vegetable industry to manage pests and diseases.

AUSVEG is involved in government and industry forums that ensure decisions around pest, disease and management options are informed with the 'on-the-ground' experiences of growers and that government and industry investment is directed in the most relevant areas.

Recent outcomes for vegetable growers

- AUSVEG has been involved in recent EPPRD forums and committees on behalf of vegetable growers.
- AUSVEG has worked with industry organisations and commercial companies over the last 18 months to ensure that vegetable growers' concerns are addressed through the latest innovations, products and technologies.
- Provides ongoing feedback to government departments on matters relating to pest management and border protection, including recent pest incursions.

Images courtesy of Sophie Burge.

Generation next: Jennifer's rapid rise into protected cropping

Jennifer Hulme is Assistant Grower at Family Fresh Farms, an intensive glasshouse operation located on the New South Wales Central Coast. Despite being in her early twenties with no farming background, Jennifer is kicking goals in the vegetable industry. In this column, *Vegetables Australia* speaks to Jennifer about her current role, her passion for the industry and journey so far.

Tucked away in Peats Ridge is Family Fresh Farms, which consists of two 2.5-hectare high tech glasshouses. The operation grows mini snacking cucumbers, known as 'Qukes', using a highwire, climate-controlled system and its produce is distributed to major supermarkets around Australia.

At just 22 years old, Jennifer Hulme is the Family Fresh Farms' Assistant Grower. She supports the Head Grower in ensuring all operations on the farm are as efficient and effective as possible. This involves everything from managing a team of 70-plus seasonal workers, to monitoring and controlling the climate in the glasshouses.

"The Qukes grow incredibly fast and are a very labour-intensive crop, but it always keeps us busy, all 365 days a year," Jennifer says.

"Climate control is a huge part of my role. Everything can be adjusted, including temperature, humidity, irrigation, CO^2 and ventilation.

"There is also scouting the crop and implementing suitable integrated pest management (IPM) practices where necessary, fertiliser regimes, and boiler operation."

"This comes with huge responsibility. On some days when you're the only grower on duty, it is down to you to make the correct decisions and essentially keep the crop alive. It keeps you on your toes, but I absolutely love the challenge."

Journey into horticulture

Jennifer became interested in agriculture in high school when she chose it as an elective for her final two years.

"I absolutely loved it. From there, it made sense to continue this interest into university where I studied a Bachelor of Agriculture majoring in plant production at the University of New England," she explains.

"Living on the coast meant horticulture was the main farming enterprise near me so for my university work experience, I found Family Fresh through a recommendation from a previous vegetable farm I worked at.

"It was nothing like I could have imagined, and I adored my work experience there. I was lucky enough that they offered me a job after that, and a career in horticulture was pretty much a done deal from there!"

Gaining knowledge

Although most of Jennifer's general ag background information stems from higher education, she has learned more specific horticultural knowledge from working in the industry.

"The degree was brilliant at teaching me the basics and the systems involved in cropping, but nothing beats the understanding you gain from experience. It is daunting starting in a role like this with such limited past knowledge and

experience, but you amaze yourself with how fast you learn," Jennifer says.

She is also learning from an innovative, forward-thinking business.

"One of the things that Family Fresh does best is keeping up-to-date with new technology," Jennifer says.

"For example, this year we have started using iPads in the glasshouses and packing shed to see live updates on progress, yield and quality. It syncs automatically to a Google Drive that we can all access and these completion status updates have dramatically improved our decision-making abilities regarding labour.

"We are also always looking at the newest climate sensors, machinery, and equipment. There is the mentality here that anything that can improve the farm that little bit is worth looking into, and I think that's great. It keeps us in front and producing to the best of our ability."

However, Jennifer believes there should be more focus on the sustainability and environmental side of horticulture production.

"The sheer volume of single-use plastics I see many farms go through is crazy, and I just know there must be a better way – whether it's introducing more cardboard packaging for produce instead of plastic punnets, finding a second use for growing slabs, or just finding a way to reduce overall on-farm waste," she says.

"Understandably, the solution also has to be economically viable for the farm so more research and trials into what could work and what won't, is so important. The earlier we can begin developing and integrating more sustainable processes, the better."

Shedding the stigma

Jennifer thinks the reason why a lot of women don't investigate farming as a career path is because of the stigma surrounding it, and that it is viewed as 'a man's job.'

"While it is true that this kind of role is still male dominated, there are plenty of opportunities for interested women too!" Jennifer points out.

"Horticulture – and protected cropping in particular – has such a diverse range of jobs available, from labour managers to crop specialists to technology whizzes. So much of the industry is becoming modernised and automated, and filling roles with young, technologically minded people is crucial. I promise you there's so much more to this industry than even I realised."

Industry passion

Jennifer says there are many facets of the vegetable industry that she loves, including its diversity.

"Think about how much produce you see in the supermarkets and how all that food has to be grown somewhere. Each crop is so unique and requires so many different processes, so it's fun finding the one most suited to you," she says.

"There's also so much variety in the individual roles on each farm, which brings together an amazing range of skilled people. The labour force is a huge reason I love this industry so much.

"I can honestly say I've never met such motivated, hard-working people in all my life, and it inspires me every day to do better. There's also so many opportunities to travel and learn and experience new things, which is amazing."

Jennifer adds that there is never a dull day at work.

"Maintaining enthusiasm can be tough sometimes because the hours are long, and it definitely becomes more of a lifestyle than a job. But stepping back and reminding yourself of how far you've come always helps.

"The Vanuatu seasonal workers employed here also make a huge difference. They come to work with a huge smile on their faces and give it their all every single day – it's incredible and lifts the mood instantly."

The final word

Jennifer is proud to reach the Assistant Grower position in one of the most intensive and fast-paced glasshouse farms in Australia.

"To be 22 with no background in agriculture and land a role like this fresh out of university is still something I pinch myself over," she admits.

"As well as this though, the growth I have seen in myself over the last year is something I couldn't have dreamed of. I was a shy person when I first started and now I give speeches in front of the entire workforce with ease.

"I'm so much more confident in my decision-making and feel like this job has matured me so much. It's been incredibly fulfilling working in this industry, so here's to many more years!"

Championing sustainable environmental practices

Graeme Pitchford.

South Australian vegetable grower Graeme Pitchford has been a long-serving member of the EnviroVeg Program's Steering Committee. In this column, AUSVEG's Danielle Park speaks with Graeme about his involvement with EnviroVeg, and the importance of environmentally sustainable practices in 2021.

A strong advocate for sustainable vegetable production in South Australia, Graeme Pitchford is continuing to investigate innovative practices to improve his vegetable growing operation.

Graeme's business, Pitchford Produce, is located near Currency Creek on the Fleurieu Peninsula, south of Adelaide. Crops grown include baby cos, iceberg lettuce and broccolini, with a few additional lettuce lines included.

It all starts with the soil

Soil is a strong focus for Graeme and Pitchford Produce, with most of the property consisting of sandy loam over clay.

"Managing the soil is important. The aim is to look after the soil the best we can," Graeme says.

Cover cropping through the cooler months of winter is an important part of managing the soil. Different cover crop types have been used at Pitchford Produce.

To control broadleaf weeds, a cereal cover crop option has been a more recent choice. Graeme is very interested in continuing to investigate a wider range of cover crops, including options that might allow nitrogen fixation while not providing a host for club root.

"We are always trying to work out the best scenarios, looking after the microbes in the soil using crop rotation and adding organic matter back in through compost," Graeme explains.

Graeme is also interested in incorporating biofumigant cover crops to maintain and build a healthy soil biology without using fumigation. Better quality produce is also a sought-after benefit.

Preventative measures

When it comes to managing pests and diseases, Graeme is a strong advocate for Integrated Pest Management (IPM). However, he is aware that it can be difficult to get the balance right all the time.

"It is challenging. You can do your very best at times – you keep monitoring and find a bug or two. You can still get caught out," Graeme says.

"We're trying to be the best we can, but preventative measures are needed sometimes."

Overall, Graeme is keen to continue to improve his IPM practices.

"I like the thought process. I like the idea of only when necessary and targeting specific insects at specific times," he says.

When it comes to disease management, the issue of white blister on brassica crops has created a new challenge for Graeme over recent years. As with any new disease or pest, there is a need to learn and apply different methods of management or control.

The use of drip irrigation to keep the leaf dry and allow for efficient application of irrigation water has been the option chosen to best manage both the disease risk, and to reduce the loss of water and nutrients when fertigating.

Raising awareness

One area that the EnviroVeg Program has highlighted for Graeme is the potential risk posed with his current level of preparation for any on-farm biosecurity challenges.

The EnviroVeg biosecurity section highlights the benefit of on-farm biosecurity signage, procedures to prevent pests and diseases from entering and travelling across a property as well as monitoring and recording unknown pests and diseases, among other practices.

However, the topic of on-farm biosecurity had not been included in earlier versions of the EnviroVeg program. Therefore, when Graeme completed the online EnviroVeg self-assessment for Pitchford Produce, several new areas to improve were highlighted for the business.

He admits that biosecurity wasn't something the business had focused on beforehand.

"It has made me think about who is coming on-farm. We take part in a local program that includes school visits and have re-sellers visiting the site too," Graeme says.

"On-farm biosecurity is now something to keep at the forefront of our minds."

Through EnviroVeg, Graeme is also looking at the potential sources of on-farm waste.

As with most vegetable production systems, there is a certain level of organic waste created and crop residue can be a sizeable waste stream. However, this is

Pitchford Produce grows a range of green leafy vegetables, along with broccolini.

dependent on the type of crops grown.

As a grower who is already using compost within the production system – and with approximately 50 tonnes per hectare of green waste generated from an average brassica crop – Graeme is looking at opportunities to better utilise crop residue and investigating options for improvement in reusing organic waste.

Environmental stewardship in-focus

EnviroVeg is an industry-led program that aims to support and promote environmental best management practice techniques among vegetable producers in Australia.

The involvement of vegetable producers and industry representatives is an important element to the longevity of the EnviroVeg program.

"Many years ago, I was approached to be a part of the EnviroVeg Steering Committee. I had the opportunity to jump on board. I've always thought it was a good idea to be kept up-to-date and to express an opinion," Graeme says.

There have been several changes to the program in recent years. It has sought to move the program online, developing a nationally consistent program while investigating options to allow for the challenges and practices in across different vegetable growing regions in Australia to be addressed.

The importance of looking after the environment and telling the story of vegetable growing businesses as being responsible stewards of the land, water and biodiversity is as important as it has ever been.

"I'd like to see all the great work that AUSVEG has done in the area of environmental sustainability continue, with recognition," Graeme says.

Graeme will continue to be a strong supporter of the EnviroVeg Program, as well as actively seek out opportunities to improve the environmental benefits available for a commercial vegetable farming business.

"I'm very aware that we're left to look after a piece of ground and to do our best with that piece of ground. By doing this, it benefits everything in the long run," he concludes.

Find out more R&D

For further details, please contact Danielle Park on 0432 324 822 or email danielle.park@ausveg.com.au.

This project has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.

Project Number: VG16063

Hort Innovation Strategic levy investment | VEGETABLE FUND

Crops growing at Pitchford Produce in South Australia.

A fresh approach to boosting vegetable consumption

The Fruit & Vegetable Consortium (FVC) exists to provide the strategic direction and collaborative action required to achieve a significant and sustained increase of Australian consumers' fruit and vegetable intake. In this column, Fruit & Vegetable Consortium Managing Director Justine Coates answers some questions about the organisation and outlines its plans to boost vegetable consumption.

Over the last few years, the Fruit & Vegetable Consortium (FVC) has made notable progress as a collective of 12 organisations united by purpose and committed to collectively raising the alarmingly low levels of fruit and vegetable consumption in Australia.

What is the FVC?

The membership of the FVC is unique and powerful in that it starts at the paddock with Aussie farmers and collectively has the expertise and capability to collectively influence what's on the plate.

Led by Nutrition Australia and AUSVEG, the FVC comprises 12 key partners, including VicHealth, Heart Foundation, CSIRO, Health and Wellbeing QLD, Wellbeing SA, Cancer Council Victoria, Deakin University, Stephanie Alexander's Kitchen Garden and The Good Foundation.

The motivators for the FVC are anchored in human health and wellbeing (preventative and primary care including physical, social, and mental health), with benefits flowing across sectors to agriculture and the supply chain, food service and operators, climate change and the environment, regional communities, and the economy.

What has the FVC achieved to date?

Since March 2019, the FVC has produced a Position Statement, developed a dedicated website, acquired over 250 supporter organisations, and gathered considerable media and institutional interest in its activities.

Importantly, it has also produced in a compelling business case with six propositions that have been researched, validated, and ratified by member organisations. The business case outlines the compelling case for investment and material support for a behavioural change strategy to increase vegetable consumption nationally.

These propositions are:

1. The vast majority of Australians are not eating the recommended serves of vegetables.
2. Low vegetable consumption is causing poor public health outcomes and escalating the health cost burden.
3. Attempts to lift vegetable consumption in Australia have not improved the national position.
4. The economic, social and environmental payback from investing to lift vegetable consumption is compelling.
5. Pooled resources would more effectively deliver the scale of shift that is now required.
6. There is much goodwill among stakeholders to collaborate on addressing this national crisis.

The business case was launched in March 2021 and with it there has been a shift in gears, with FY22 set for collective action. To read the business case, please visit the FVC website: thefvc.org.au.

What is a behaviour change strategy?

Behaviour change programs are essentially social marketing that 'stiches together' and coordinates the collective efforts of multiple interested parties around a common framework.

In this case, the various interventions will be linked by a common umbrella brand (e.g. an active brand such as the Slip Slop Slap or Quit brands), supported by an advertising campaign.

It is intended that the interventions would be able to embrace many of the current activities of the program partners.

The behavioural change model proposed is evidence based and has been successfully employed in an Australian context for such diverse programs such as safety at work and women's fitness.

Why is this behaviour change strategy recommended?

The recommendation for a behaviour change strategy – rather than a marketing program alone – is that there are a range of factors constraining vegetable consumption, which vary across different cohorts and meal occasions. Therefore, a wide range of targeted and nuanced interventions is required beyond advertising alone.

Although advertising can be targeted to some degree, it is essentially 'broad brush', focusing on just one touch point with a 'one size fits all' messaging.

A behavioural issue such as vegetable consumption needs to be far more nuanced in its approach, with distinctly different interventions for each consumer segment that infiltrate their various meal occasions.

Furthermore, the strategy needs to evolve over the years to reflect the changing dynamic as behaviours begin to shift.

Looking to 2022

As the economy starts to resurge in early 2022, it is the intent of the FVC to match state/federal investment by way of commercial fund-raising plus in-kind member contributions (where appropriate).

AUSVEG is working with the FVC

$100 million p.a.
reduction in the health burden
(Deloitte, 2016)

$634 million p.a.
in increased economic value
(McKINNA et al, 2018)

$1 billion
in economic value over 11 years
(Deloitte Access Economics, 2018)

Every dollar and job created in the industry creates another in the regions
(Deloitte Access Economics, 2018)

ahead of the pending Federal Election to prioritise funding for this behaviour change strategy, given the health benefits to the public and the returns to industry from increased sales.

There is a compelling case for public investment in demand driving activity to support vegetable growers noting the significant rises in cost base due to COVID-19 (labour, freight, global volatility) and climatic change (fires, floods, drought).

There is also an urgent need for government and invested organisations to increase investment and collective efforts in effective funding of broad and narrow cast communications that 'meet consumers where they are' (physically, mentally, and socially in a post-COVID world) to achieve the same increased intake goal.

Find out more

Please contact Fruit & Vegetable Consortium Managing Director Justine Coates on jcoates@nutritionaustralia.org. Further details can be found at thefvc.org.au.

Climate positive practices: Aussie veg producers acknowledged on the world stage

Australian Climate Positive Leaders Program award winner, Jake Ryan.

In September 2021, two members of the AUSVEG-led EnviroVeg Program were acknowledged for their implementation of climate positive practices and the ecosystem benefits on-farm. Western Australian mixed cropping/livestock producer Jake Ryan and Sharni & Shane Radford from north-west Tasmania were among those honoured, with nominees named from right across the globe.

Corteva Agriscience's 2021 Climate Positive Leaders Program is a nomination-based farmer and rancher recognition program designed to uplift the voices of early adopter producers around the world who are implementing, scaling and sharing climate positive practices.

Launched in March 2021, the program will amplify their successful experiences with the intention of accelerating the broad adoption of those practices where applicable.

Farmers who met the program criteria were nominated by regional third-party groups including grower groups, nonprofits, universities or other technology assistance partners.

A panel of industry-leading judges completed an anonymous review of the farmer applications and confirmed the winner and runner up producers.

The program focused on growers in the U.S.A., Canada (except Quebec Province), Brazil, Argentina, Germany, France, Australia, and Kenya.

Australians recognised

Jake Ryan, winner

Jake Ryan received the Australian Climate Positive Leaders Program award. Alongside his parents Gary and Tracey, Jake runs The Three Ryans – a mixed cropping/livestock operation in Manjimup, Western Australia. The operation uses holistic grazing, minimal tillage, cover cropping, and mineral nutrition to produce a wide variety of winter vegetables; cereal and oilseed commodity crops; ewes for wool and lamb production; first cross Angus Friesian heifers; and pasture-raised laying hens.

Jake has implemented a strip-tilling and cover crop process for his vegetable crops, ensuring there is a living root feeding carbon into the soil and stimulating soil microbes. Acres are rotated with one year of vegetable production, followed by four years of pasture production for livestock and soil regeneration. Cover crops are planted on the entire operation to improve soil, then are grazed or cut for silage.

Further practices

In addition to traditional cover crops, Jake has recently begun intercropping with flowering cover crops to increase the population of beneficial insects and reduce the number of predatory insects that are damaging to crops and livestock. With the adoption of holistic grazing and a focus on mineral nutrition and tracking minerals proportions, he has been able to dramatically reduce the need for nitrogen base fertilisers from the pasture/cover/vegetable crops as well as reducing the phosphorous requirements. Profits have increased consistently five to 10 per cent annually.

Jake says the Climate Positive Leaders Program will help him to communicate to other farmers that climate positive practices are for the betterment of agriculture and the environment.

"Farmers learn best from other farmers, especially when they can see the results in-person. Through this program, I will help demonstrate to other farmers that regenerative practices not only will improve their land but increase productivity and lead to potential financial gains," he says.

Shane Radford and his daughter Caitlin. Shane and wife Sharni were named runner-up in the Australian Climate Positive Leaders Program award.

Sharni and Shane Radford, runner-up

Sharni and Shane Radford from Moriarty is Tasmania's north-west were named as a runner-up in the Australian awards. The pair – along with their daughter Caitlin – produces potatoes, onions, carrots, green beans, broccoli, wheat, grass seed, hay, prime lambs, and beef cattle, and apply numerous practices to retain water and prevent run-off in hilly terrain.

As soon as crops are harvested, natural grasses and other cover crops are planted for the 90-day period between cropping to improve soil structure, build organic matter, improve microbial activity, and reduce compaction. Wheat straw is also used in run-off vulnerable locations to reduce soil erosion.

These practices have increased crop yield as well as improved on-farm biodiversity and support for coastal water quality preservation. The Radfords have made a long-term commitment to the conservation of area birds, specifically the ground nesting Swamp Harriers that offer natural pest management. Water quality is monitored to protect the frog and eel populations. Leveraging livestock manure to increase dung beetle populations has also increased soil fertility and moisture retention.

"Climate positive is about thinking differently, focusing on managing the farm so that it can be productive for future generations. The Climate Positive Leaders Program will help us to continue improving the health of our soils with new methods and technologies as they emerge," Sharni says.

Having a voice

Winners – including Jake Ryan – will receive a global platform to share their experience and advocate for climate positive practices. They will also engage with a strong network of other early adopters and leaders in agriculture.

Other opportunities include:

- An expenses-paid international trip, lifetime membership and other benefits with the Global Farmer Network.
- Access to other early adopters and agriculture leaders through engagement with Global Farmer Network and its broad platform.
- Leadership and communications training to support farmers as they share their experience.
- Soil sampling and soil health guidance, including carbon sequestration measurements and an estimation of carbon from Dr Rattan Lal and his team from the Carbon Management and Sequestration Center, based at Ohio State University. Producers will also receive a personalised report with recommendations along with a lecture and interactive discussion with Dr Lal and the program winners.

Find out more

For further details about the Corteva Climate Positive Leaders Program and the 2021 winners, please visit corteva.com/sustainability/climatepositive/leaders-program.html.

Sustainability key to family's on-farm success

Sharni and Shane Radford made the decision to participate in the online pilot EnviroVeg Program in 2019. Through their participation, they provided valuable feedback ahead of the program's rollout from 2020.

The Radfords are involved in training the next generation who might be working in the farming sector. They are very proactive in being involved in industry programs, including the Australian vegetable industry's environmental sustainability program EnviroVeg, and regularly share what they have learned with others for the betterment of their industry and growing community.

The EnviroVeg program allowed the Radfords to benchmark their practices against other vegetable producers, and guided changes and improvements on-farm.

The decision to participate in the revised EnviroVeg program led to the business successfully undertaking its first Freshcare Code of Practice Environmental audit in March 2021.

The *EnviroVeg Program 2017-2022* (VG16063) is a strategic levy investment under the Hort Innovation Vegetable Fund.

Veg growers' fight against whitefly intensifies

Whitefly control in vegetable crops is at the centre of a new pesticide available to Australian growers. It can be used alone for quick knockdown or tank mixed with other pesticides as a part of an Integrated Pest Management program, as *Vegetables Australia* explains.

Adult whitefly on leaf of cucurbit. Image courtesy of Alton N. Sparks, Jr., University of Georgia, Bugwood.org.

There is a new product on the Australian market registered for whitefly control in cucurbits and tomatoes.

Released by Oro Agri and available exclusively through E.E. Muir & Sons, PREV-AM has a quick knockdown effect that makes it a versatile stand-alone treatment or tank mix partner with other pesticides or liquid fertilisers. It can stop whitefly within minutes and its level of control is accomplished within 1-2 hours.

The quick knockdown action makes this product a great addition to an Integrated Pest Management program. An application can be timed to control insects and diseases only when they reach the economic threshold. Because it is a contact pesticide and has no residual activity, PREV-AM applications can be scheduled to avoid impacting bees or other beneficial insects.

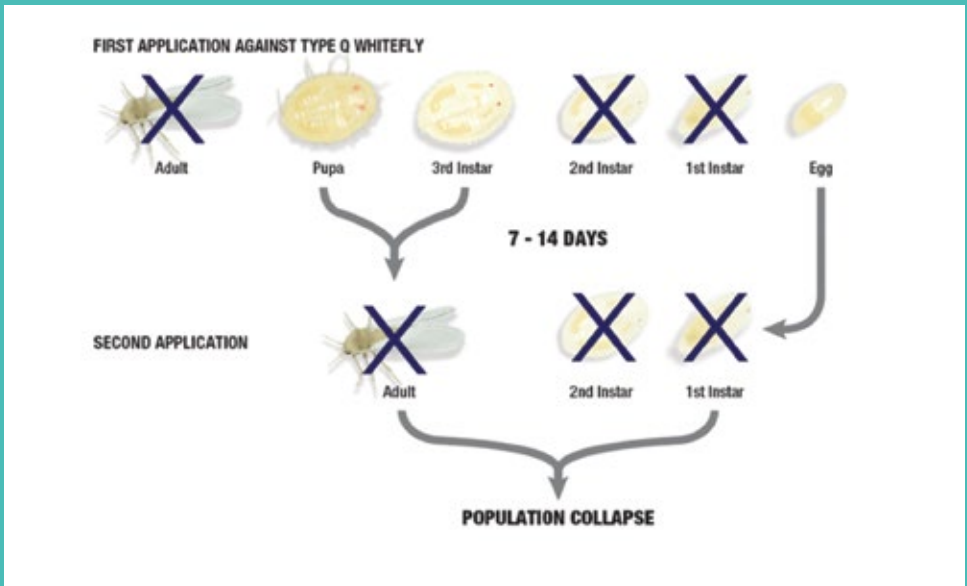
To achieve best results in controlling whitefly, it is recommended in consecutive spray applications seven days apart (see figure below). This strategy will provide the best opportunity to achieve population collapse of whitefly within your crop.

How it works

The OROWET® technology contained in PREV-AM provides outstanding spreading on the leaf surface. In a tank mix with other pesticides, the product distributes the spray solution evenly on the plant surface to help prevent phytotoxicity and to improve control – making adding an additional adjuvant unnecessary.

The unique action of the leaf 'rewetting' surfaces after the PRE-VAM spray solution has dried. It will be rewetted due to rainfall, irrigation or a heavy dew event, and moisture is dispersed evenly across the leaf surface – resulting in redistributing chemistry and faster drying times. This ensures even distribution of protective chemistry and lessons the opportunity of disease infection.

Additionally, with a low re-entry interval and no withholding period, PREV-AM will not disrupt harvest schedules or staff ability to continue working in the field or glasshouse.



Family-owned business looking to the future

E.E. Muir Pty Ltd is a privately-owned Australian company, wholly owned by the Muir family.

The business is focused on providing superior services and products to a wide range of rural enterprises that concentrate on high-value production agriculture.

The company operates from several locations right across Australia. This unique footprint offers both international and local manufacturers of farm inputs (fertiliser, crop protection and seed) with a specialised route to the farmgate. Its significant investment in people with agronomic qualifications provides farming customers and input manufacturers with a professional approach to maximising farm production.

Established in 1927 and approaching 100 years in business, E.E. Muir & Sons is committed to providing its farming customers with every opportunity to meet and profit from the present and future requirements in feeding the ever-increasing demand.

The fourth generation Muir family employees – Andrew, Stuart, James and Cameron – have begun to lead the business into the future, knowing that it is becoming increasingly important to maximise every technical advantage and input at farmers' disposal.

Find out more

Please contact your local E.E Muir & Sons store for more information and product availability.

Labour hire: The risks, and how to manage them

Using a labour hire provider (LHP) does not mean that labour laws don't apply to your business – far from it. If the LHP you use does the wrong thing by its workers, then your business could be liable. The main areas of risk relate to workplace health and safety (WHS), employee wages and conditions, and Right to Work and you should have a system to manage that risk. Fair Farms Program Compliance Officer Adam Carter reports.

Step 1: Due diligence

Your business should apply a process of due diligence before engaging a LHP.

> **Queensland, Victoria, and South Australia have laws that now require the licensing of LHPs. It's unlawful to use an unlicensed LHP in those states.**

To verify that a LHP is licensed, check the relevant online register:

- Queensland: ols.oir.qld.gov.au/licence-register/
- Victoria: register.labourhireauthority.vic.gov.au/LhSearch/
- South Australia: secure.cbs.sa.gov.au/OccLicPubReg/index.php

Labour Hire Provider or contractor?

The business you are considering engaging may claim that they do not need to be licensed because they are a contractor and not a LHP. It is unlawful to enter into an arrangement that is designed to avoid licensing obligations. Whether or not a business meets the definition of an LHP under state laws depends on a range of factors.

Making sure a LHP has a current license is just the first step.

Refer to the checklist of red flags and good practices to consider when preparing to engage with a LHP.

Step 2: Get it in writing

The cost of labour is likely to be one of the most significant expenses for your business. With so much at stake, it's good business practice to have a written and legally enforceable agreement.

If your LHP does do the wrong thing by their employees – and regulators are asking you some hard questions – a written agreement will help in establishing that your business should not bear any liability. A good agreement will require the LHP to provide your business with evidence that it is meeting its legal obligations and should ensure that there is no sub-contracting without consent.

Step 3: Ongoing monitoring

Effectively managing the risk to your business involves implementing a system to regularly check that the LHP is doing the right thing. Check time and wages records on a regular basis and spend some time talking to the employees of the LHP working on your farm. Make sure you investigate any complaints or issues that arise. Applying this process may take a little time and effort but it could prevent a lot of expense and heartache.

Further resources

To view free training videos, please visit growcom.com.au/projects/managing-labour-hire-risks.

Find out more R&D

Please visit the Fair Farms website at fairfarms.com.au.

Visit fairwork.gov.au and growcom.com.au for more information regarding your obligations as an employer.

Fair Farms is developed and delivered by Growcom with support from the Federal Department of Agriculture, Water and the Environment and AUSVEG.

FAIR FARMS
FOSTERING FAIR EMPLOYMENT PRACTICES IN THE AUSTRALIAN HORTICULTURE INDUSTRY

The LHP can't provide a certificate of currency for insurances such as workers compensation and public liability.	✗
The LHP has WHS policies and procedures, and a process for induction and supervision of employees.	✓
The LHP has been prosecuted for breaches of WHS, Fair Work or Migration laws.	✗
The LHP has a system for checking that employees have the right to work in Australia (e.g. VEVO).	✓
The LHP can't identify the correct industrial instrument (Award) and pay rates.	✗
The LHP maintains good time and wage records, and pay slips are provided to employees.	✓
The LHP has written employment agreements and does not use ABNs.	✓
The LHP won't rule out subcontracting to another LHP without consent.	✗
The LHP is currently registered (ABN or ASIC) and has been in business a while.	✓
The LHP has quoted rates that may not enable obligations to employees to be met.	✗
The LHP is a StaffSure certified provider (see staffsure.org).	✓

Soil health testing yields simple solutions

Australian growers manage approximately 60 per cent of this country's landscape, and witness first-hand the role soil health plays in driving the productivity and sustainability of agricultural businesses. *Vegetables Australia* investigates a new soil health test that can help growers with their short- and long-term input decision making or correcting any issues in a cost-effective way, sustainable way.

With an increasing national focus on the importance of soil health, the question that's front of mind for many Australian vegetable growers is how to achieve and maintain healthy soils within a productive and profitable farming system.

For senior agronomist with Incitec Pivot Fertilisers (IPF) Jim Laycock, the ability to measure and monitor the soil's key biological, chemical and physical characteristics is essential to understanding and improving soil health.

Jim has been instrumental in the development of a new soil health test package from the Nutrient Advantage Laboratory, designed to help growers better measure and manage their soil health.

"The package comprises four tests and looks at the total carbon and total nitrogen, and C:N ratio of soils, as well as aggregate slaking and dispersion, active carbon and microbial respiration," Jim says.

"When taken together, these four quite simple tests can yield very useful insights that can be addressed in the short-term and over time, longer term."

With soil health being linked to total nitrogen, total carbon and active carbon levels, these tests can alert growers to shortcomings in their overall soil health – prompting practice changes to fix any problem areas.

Trial results

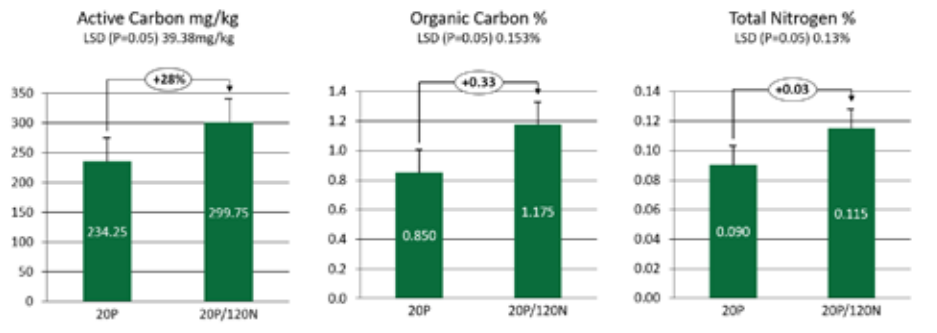
Recent results from IPF's trial site near Grenfell in New South Wales show how inputs and management can impact soil health over time.

Selected treatments were sampled and compared active carbon, organic carbon and total nitrogen in soil with just phosphorous applied versus with both phosphorous and nitrogen applied.

The results show both organic carbon and active carbon levels increased by 28 per cent with the addition of nitrogen, and an increase in total nitrogen from 0.09 per cent to 0.115 per cent.

"The higher the total nitrogen levels in the soil profile, the more potential there is for mineral nitrogen cycling," Jim says.

"The more you can grow, the higher your yields will be – but you're also then able to achieve greater levels of biomass, which retains and builds carbon and nitrogen levels in your soil. It's a simple equation, but higher nitrogen and carbon levels lead to higher rates of microbial activity – and ultimately healthier soils."



Supporting decision making

While increasing data on overall soil health is the first step to improvement, Jim believes the recommendations and guidance that come with it is critical.

"The real value for growers is in having support around their decision making," Jim says.

"The Nutrient Advantage soil health package delivers tailored recommendations alongside its laboratory data test results.

"The decision support system is invaluable for growers as they go about both identifying and then correcting any issues or barriers to soil health."

For over 50 years, Nutrient Advantage has been Australia's leading provider of nutrient analysis and expertise as well as helping growers manage their input requirements in a cost-effectively way.

The soil health package has been developed to help growers better measure and manage their soil health, boosting their productivity today while safeguarding the sustainability of their businesses into the future.

It is recommended the tests be repeated every two to three years at the same time of year. Using the Health1 code, they can be ordered as a standalone package for $80.00 or added to any existing Nutrient Advantage test order for $70.00.

Find out more

To order the soil health package or for further details, please visit soilhealthtesting.com.au or call 1800 803 453.

Sustainable farming practices put to the test at demonstration sites

The Soil Wealth and Integrated Crop Protection (ICP) project works with growers to put soil management and plant health research into practice. In this column, we showcase the latest news from our network of demonstration sites across Australia, including Victoria, New South Wales and a new site in Queensland. *Soil Wealth ICP Phase 2* (VG16078) is a strategic levy investment under the Hort Innovation Vegetable Fund.

Marc Hinderager oversees the Cowra demo site with Ed Fagan.

The Soil Wealth ICP team works with vegetable growers to integrate profitable and sustainable practices into modern commercial production systems through a diverse range of demonstration sites.

These sites provide an opportunity to test new farming practices and technologies out in the field, and share the results and lessons learnt with the wider industry.

Below are some recent highlights from a selection of the project's demonstration sites around the country, but you can find out more at soilwealth.com.au/demo-sites/.

Mulgowie hosts new Queensland demo site

The Mulgowie Farming Company is a family-owned producer growing conventional and organic sweet corn, green beans and broccoli across Australia. With a strong focus on innovation and sustainable farming practices, Mulgowie has teamed up with Soil Wealth ICP to take their soil management to the next level.

Andrew Johanson, Mulgowie's Agronomy Process Improvement Manager, has driven advances in soil health through controlled traffic farming, cover crops and minimum tillage.

"This has seen the soil's water infiltration and holding capacity increase – the soil becomes more friable and less compacted, and yields increase, with plants showing more resilience to weather extremes," Andrew said.

The next step in improving their soils is to understand how to manage beneficial soil biology. Working with Kelvin Montagu from the Soil Wealth ICP team, Mulgowie will be looking at how to get the beneficial fungi, mycorrhizae, back into their soil.

Previous sampling has shown very low levels of mycorrhizae in the soil and corn roots at the home farm at Mulgowie in the Lockyer Valley.

"Mulgowie's reduced tillage is giving mycorrhizal fungi a fighting chance to re-establish in the soil now that they are not being regularly chopped up by cultivation. We now need to see if we can use soil phosphorus test results to target paddocks to give the mycorrhizal fungi the best chance to re-establish," Kelvin said.

Keep an eye out for future updates on re-establishing mycorrhizal fungi in vegetable soils, and what benefits this brings to the corn and bean crops and soil.

For more information on boosting mycorrhizal fungi in Australian vegetable soils, see this case study: soilwealth.com.au/resources/case-studies/boosting-mycorrhizal-fungi-in-vegetable-crops/.

A breezy video update from Koo Wee Rup, Victoria

Soil Wealth ICP team member Carl Larsen braved the windy spring weather at the Koo Wee Rup demonstration site in Victoria to bring growers a short update on how things were progressing at the site.

Check out the video as Carl prepared to take some pre-plant pathogen soil tests before a leek crop was planted in October 2021: soilwealth.com.au/resources/videos-and-apps/a-breezy-video-update-from-koo-wee-rup/.

Additional updates are available on the Koo Wee Rup demo site Facebook page, including videos on how to take soil samples, the role of cover crops and reduced tillage, and informing irrigation decisions through remote weather stations: facebook.com/SoilWealthICPKooWeeRup.

Cowra hosts virtual shed walk on microwave weed technology

The Cowra demonstration site in New South Wales is the latest site to host Growave's next generation microwave technology to control weeds.

The unit was adapted following lessons learnt from a test run at the Koo Wee Rup demonstration site in Victoria in early 2021, before heading north to New South Wales.

In this virtual shed walk, Liam Hescock and the team from Growave explain how the microwave technology works. Grower Ed Fagan also discusses his experience and expectations of how the unit could control wireweed, caltrop (catheads) and nutgrass in his crops at Cowra.

Watch the video: soilwealth.com.au/resources/webinar-recordings/virtual-shed-walk-microwave-technology-for-control-of-weeds-diseases-and-pests/.

New resources from the Soil Wealth ICP project

The Soil Wealth ICP team recently released some useful resources to help vegetable and potato growers improve their management of soils and plant health. Take a look below or explore the full range of resources at soilwealth.com.au/resources/.

7-part video series: Soil Biology in Vegetable Production Masterclass

In August 2021, Soil Wealth ICP's first Soil Biology in Vegetable Production Masterclass was run online over two days. The project has released seven videos from the masterclass, where team members and expert speakers focus on a different topic.

- **Part 1:** Soil biology in vegetable production – basic principles: youtube.com/watch?v=AFzU2G-8vcw&t=9s
- **Part 2:** Breakdown of organic matter and agrichemicals in vegetable soils: youtube.com/watch?v=wP9mwli26Jg&t=89s
- **Part 3:** Nitrogen availability: youtube.com/watch?v=cBfVGRpkLn4&t=1s
- **Part 4:** Soil biology and soil structure: youtube.com/watch?v=ZxVHY0GjL8E
- **Part 5:** Soil fumigation and effects on soil biological communities: youtube.com/watch?v=Bv8cXlElYjQ
- **Part 6:** Soilborne disease suppression in vegetable crops: youtube.com/watch?v=ODBcwdj2zXM
- **Part 7:** Use of biological products in Australian vegetable production: youtube.com/watch?v=CWRmJw11ixM

You can access all of the videos and presentation slides at: soilwealth.com.au/resources/webinar-recordings/.

What changes can Aussie growers expect in ICP?

This global scan looks into the changes affecting ICP tools available to vegetable growers.

Read more about the restrictions and de-registrations that have occurred internationally and suggestions about how vegetable growers can prepare for possible changes in Australia: soilwealth.com.au/resources/global-scan-and-reviews/what-changes-to-expect-integrated-crop-protection/.

Webinar recording: Advancements in ICP for profitable veg production

There are a number of important advancements and lessons from Europe implementing a mandatory ICP approach in vegetable production systems.

Watch this webinar recording to hear from leading researchers and practitioners from Europe and Australia about building ICP into your production system and preparing for potential changes: soilwealth.com.au/resources/webinar-recordings/at-the-cutting-edge-advancements-in-integrated-crop-protection-for-profitable-vegetable-production/.

Find out more R&D

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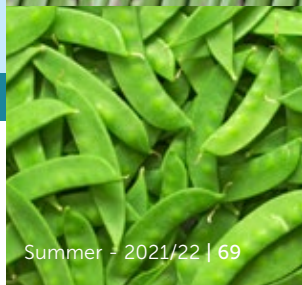
Project Number: VG16078

Hort Innovation Strategic levy investment | VEGETABLE FUND



Australian vegetable exports continue despite ongoing challenges

Throughout 2021, Australian vegetable grower-exporters have demonstrated resilience and hard work to ensure high-quality vegetables continue to make their way onto consumer tables around the world. This is despite rising freight costs, a rapid increase in farm input costs, difficulties with international shipping as well as labour shortages. AUSVEG International Trade Specialist Andrea Lin reports.

Vegetable trade highlights from January to August 2021

The first eight months of 2021 have seen a decline of fresh vegetable export value by 0.9 per cent (AUD$1.5million; M) to AUD$171.5M compared to January to August 2020.

As a further reference of continued vegetable export performance, the pre-COVID trade value was AUD$186.9M during the same eight-month period in 2019. Despite the decline in export value, total export volume has bounced back slightly by 4.3 per cent (6,907 tonnes) to 167,102 tonnes in 2021. Against the pre-pandemic period of January to August 2019, which saw total vegetable export volume of 178,852 tonnes, this year the overall export volume has decreased by 11,750 tonnes in comparison. ASEAN and the Middle East remain as the main Australian fresh vegetable export destinations. Malaysia, Thailand, South Korea, New Zealand, and Taiwan have recorded strong growth in this period.

Malaysia

Fresh Australian vegetable exports to Malaysia recorded an increase of 7.1 per cent in value from AUD$18.7M to AUD$20M, and an increase of 23.8 per cent in volume from 17,340 tonnes to 21,471 tonnes.

The increase was primarily driven by strong imports of carrots, onions, and spinach. Carrot exports to Malaysia rose by 8.6 per cent in value from AUD$8.7M to AUD$9.5M and increased by 18.7 per cent in volume from 9,543 tonnes to 11,323 tonnes.

Onion export value to Malaysia grew by 40.4 per cent from AUD$2.1M to AUD$3M and export volume improved by 85 per cent from 3,046 tonnes to 5,639 tonnes. Spinach export value to Malaysia improved by 70 per cent from AUD$233,719 to AUD$397,612 contributing an additional 29 tonnes of spinach landing in Malaysia.

These are encouraging signs as Malaysians continue to favour Australian fresh vegetables above other international competitors.

Thailand

Despite the global supply chain disruptions and challenges to land fresh vegetables in Thailand, Australian vegetable exports increased by 39 per cent from AUD$8.4M to AUD$11.6M, with export volume climbing by 66.7 per cent from 9,209 tonnes to 15,351 tonnes.

The major driver of this increase was the increased imports of onions, potatoes and asparagus. Onion exports to Thailand have doubled in export value from AUD$3.7M to AUD$7.5M and in volume from 6,034 tonnes to 12,170 tonnes.

Potato exports to Thailand have recorded a significant 160 per cent increase in value from AUD$790,584 to AUD$2.1M and export volume jumped by 136 per cent from 739 tonnes to 1,744 tonnes, aided by the recently changed zero per cent tariff for Australian potatoes entering Thailand under the Thailand-Australia Free Trade Agreement.

Asparagus export value to Thailand also grew by three times from AUD$3,128 to AUD$14,605, from about one tonne in total exports.

Table 1

Change in vegetable exports by crop January to August 2019-2021 *(Source: Global Trade Atlas 2021)*.

Crops	2019		2020		2021		% ▲	
	AUD$	Tonnes	AUD$	Tonnes	AUD$	Tonnes	AUD$	Tonnes
Carrots	63,854,446	72,570	63,524,133	69,870	60,771,008	69,148	-4.3%	-1.0%
Onions	38,771,135	45,560	30,208,565	38,214	32,005,026	47,024	5.9%	23.1%
Potatoes	28,771,254	43,561	31,489,787	38,631	30,387,004	37,679	-3.5%	-2.5%
Brassicas	16,927,055	5,400	14,705,914	3,776	12,659,819	2,773	-13.9%	-26.6%
Celery	6,258,920	3,520	5,829,170	3,371	5,696,960	3,188	-2.3%	-5.4%
Lettuce	8,485,478	1,299	6,244,032	977	5,607,255	809	-10.2%	-17.2%
Beans	5,088,026	908	3,742,861	722	4,547,917	896	21.5%	24.1%
Tomatoes	2,304,528	523	1,589,428	288	3,135,017	669	97.2%	132.3%

Table 2

Change in vegetable exports by destinations January to August 2019-2021 *(Source: Global Trade Atlas 2021).*

Trade Partner	2019		2020		2021		% ▲	
	AUD$	Tonnes	AUD$	Tonnes	AUD$	Tonnes	AUD$	Tonnes
Singapore	31,913,252	18,969	34,177,714	19,544	31,476,502	18,812	-7.9%	-3.7%
United Arab Emirates	21,770,606	30,736	22,370,221	23,774	21,464,165	24,095	-4.1%	1.4%
Malaysia	17,824,129	17,435	18,652,936	17,340	19,985,289	21,471	7.1%	23.8%
Hong Kong	12,553,013	7,199	12,539,575	7,083	1,898,118	6,041	-5.1%	-14.7%
Thailand	11,214,204	12,724	8,406,232	9,209	11,664,707	15,351	38.8%	66.7%
South Korea	10,766,634	17,161	8,439,030	13,246	10,609,708	16,759	25.7%	26.5%
Saudi Arabia	13,001,225	13,830	11,438,977	12,694	10,214,914	11,644	-10.7%	-8.3%
New Zealand	8,834,959	2,229	5,333,869	1,092	7,962,760	1,932	49.3%	76.9%
Taiwan	6,806,476	6,907	6,107,478	7,386	6,613,636	9,030	8.3%	22.3%
Qatar	8,254,179	8,812	8,485,963	8,388	6,472,741	6,754	-23.7%	-19.5%

New Zealand

Overall Australian vegetable exports to New Zealand have increased by 49 per cent in value from AUD$5.3M to AUD$7.9M, with an additional 100 tonnes of fresh vegetables being exported to our close neighbour.

Bean exports to New Zealand grew by 25 per cent in value from AUD$3.6M to AUD$4.5M. It also saw a growth of 26 per cent in volume from 701 tonnes to 885 tonnes, almost matching the 2019 result for bean exports to New Zealand.

Tomato exports to New Zealand also increased, recording AUD$669,590 in export value for 198 tonnes, which was a strong improvement on AUD$53,233 and 21 tonnes in 2020.

Outlook

With a number of key trading partners starting to ease COVID restrictions and begin the journey towards a post-pandemic normal, global supply chain disruptions remain as huge challenges for producers around the world.

Continually rising freight costs, limited availability in freight capacity and port congestion remain unresolved, and Australian vegetable growers are now faced with compounding pressure from a rapid surge in farm input costs.

Fertiliser, fuel, cardboard and packaging prices have skyrocketed over recent months – some to record highs. These are additional pressures facing growers and exporters on top of the already difficult year with growers already battling to secure harvest labour to continue production.

There are various drivers behind the surge in some farm inputs. Fertiliser supply is being impacted by rising gas prices in Europe and logistical issues where shipping companies that transport fertilizer are also facing labour shortages and price increases, adding to costs. Fertiliser plants in Europe have been temporarily closed due to high gas prices leading to the uncertainty over European fertiliser supplies.

On a more positive note – with the Federal Government beginning to relax international border restrictions and commercial airlines rapidly recommencing passenger flights into key destinations – 2022 will bring opportunities for exporters to travel back into export markets to reconnect with customers and begin rebuilding relationships face-to-face. This change is happening quicker than some were forecasting, and many exporters will welcome the opportunity to recommence customer facing activities in the near term.

Find out more R&D

Growers interested in identifying export events or discussing export opportunities can contact the AUSVEG Export Development team on 03 9882 0277 or email export@ausveg.com.au.

Sentinels without borders: Cross-country travel on the agenda

Despite ongoing movement restrictions around the country, the iMapPESTS team has demonstrated a successful rollout of the new and improved mobile surveillance units across multiple locations around Australia. As the project heads into its sixth year, the smart surveillance system takes focus on showcasing the benefits of the pest and disease monitoring technology to industry. Shakira Johnson provides a project update.

Prototype sentinel, Sentinel 1 deployed at the Mid-North High Rainfall Zone, Northern Adelaide Plains. Image courtesy of Andrew Baker from Data Effects.

The *iMapPESTS: Sentinel Surveillance for Agriculture* project has delivered a suite of new surveillance and diagnostics tools. These tools are driven by industry needs following extensive research and development into a flexible, cost-effective system using the latest technologies.

Australia's agriculture and horticulture industries are working together in a unique collaboration to develop a national surveillance system capable of rapidly monitoring and reporting the presence of airborne pests and diseases for multiple agricultural sectors, including viticulture, grains, cotton, sugar, forestry and horticulture.

iMapPESTS is made up several sub-projects, each focused on the research and development of a national surveillance system that delivers accurate data for improved pest management on-farm.

The system comprises of advanced pest and disease surveillance, and new approaches to diagnostics, including a suite of custom-designed mobile surveillance units (sentinels) that incorporate specialised trapping equipment and technology.

The information generated by the system could be used by industry to guide crop scouting and crop protection decisions. During this proof-of concept phase of the system, the project is reporting on a handful of high-priority airborne pests and diseases across all plant industries, but also has the capacity to monitor targets of biosecurity concern in the event of incursion or extension of range.

Adaptive response to COVID-19 yields cost-effective, flexible solutions for industry

Following the first remote deployment of the prototype sentinel (Sentinel 1) in early 2020 to Cairns in far-north Queensland, the COVID-19 pandemic struck and Sentinel 1 was withdrawn from its trial and returned to its home base in Adelaide.

During this time, the project took advantage of the situation by taking learnings from the long-distance travel required to deploy the unit remotely and outcomes from the six months of in-field trials and adapted the plan for future sentinel units.

iMapPESTS has delivered a suite of seven sentinels that have been adapted to provide a more effective, flexible range of options to meet various industry needs. The sentinels range in size, deployment method (trailer, skid, modular unit) and composition of traps. Every sentinel looks unique but all seven share similar features – each is equipped with several airborne samplers, power supply, a weather station, telemetry and an industrial computer for remote control and monitoring. They also include automated technology to configure samplers for different sampling requirements.

The new edition units – Sentinels 4 to 7 – are smarter, smaller, lighter, and more flexible compared to earlier sentinels, which is particularly important in a period where movement of people and goods can change quickly, and especially important for responsiveness to biosecurity incursions.

In addition to the sentinels, the team are now working on smaller, individual airborne suction traps, called 'S-boxes'. These individual trapping units can be deployed at varying heights, within crop, and networked to a sentinel across a landscape for multiple monitoring sites within a crop. These are expected to hit growing regions in early 2022.

Identifying what's in the air around the crop

While the sentinels trap airborne pests and pathogens, researchers are trialling new and emerging diagnostic tools that aim to speed up the delivery of accurate information on what exactly is captured.

iMapPESTS includes the development of more diagnostic tests using next generation sequencing by Agriculture Victoria, Sugar Research Australia and University of Queensland.

In addition to speeding up accurate reporting of target pests, the iMapPESTS diagnostics collaboration is exploring something known as high throughput sequencing (HTS) to investigate ways of reporting on a wider range of insects captured, including targets of biosecurity concern.

This is because the HTS approach takes a sample of insects or fungi captured by the trap and sucks out all the genetic code, resulting in a 'DNA soup' that can be scanned using a reference tool, or database, of known DNA codes for hundreds of thousands of different insects or fungal species. If a particular species was trapped, its DNA code will be present in the soup and flagged by the reference database, indicating its presence in the trap. These techniques have the potential to detect many targets in one test and pick-up biosecurity threats early, allowing for a more effective response to an incursion.

To further investigate the impact of this new diagnostics method and how it might work in the iMapPESTS surveillance

Sentinel 6 deployed in the Darling Downs.

system, a selection of insect samples from the sentinels are being processed at Agriculture Victoria Research's AgriBio facility. This is using its HTS diagnostic method, and the results will be made available on the iMapPESTS website.

South-east Queensland trials in response to serpentine leaf miner

Sentinels 5 and 6 were showcased in Queensland at Hort Connections and the Lockyer Valley Growers Expo in June 2021.

While Sentinel 5 was deployed down into the grains growing regions of northern New South Wales, Sentinel 6 completed a scoping trial in the darling downs beside a crop known to be infested with the serpentine leafminer (SLM).

The purpose of this trial was to confirm the capacity of the sentinel to trap SLM in its two-metre insect suction trap.

Over four days of sampling, the sentinel collected one SLM. Noting the behaviour of SLM and its strength as a flying insect, the two-metre trap may not be the optimal sampling height for some airborne insects. In the case of monitoring for SLM, the S-boxes may provide an ideal solution to monitoring for this target.

Following its scoping trial in the darling downs, Sentinel 6 was deployed to the vegetable growing region of Lockyer Valley where it monitored airborne pests and diseases over the transition from winter to spring.

Data collected over the period showed a persistent population of onion thrips and some notable peaks in detection of Sclerotinia – the causal agent of white rot, and *Botrytis cinerea* – the causal agent of grey mould.

While the sentinel collected some native leafminers species, no SLM were detected by the sentinel during this trial. For more information on the Lockyer Valley trial, please visit imappests.com.au.

Keep up-to-date with the latest news and data

The iMapPESTS website includes an interactive map of locations for current and previous sentinel trials that will take you to individual trial pages where stakeholders can interrogate the data collected for insects and pathogens trapped at a particular site.

During sentinel trials, data is regularly shared through these pages as summaries and observations from iMapPESTS entomologists, plant pathologists and local service providers (crop consultants, agronomists, etc) and a data dashboard that features, weather (temperature, rainfall, and humidity), pest and pathogen counts.

By the end of the project in 2022, the team hopes to have a demonstrated a proof-of-concept surveillance system that is suitable to different regions and supported by the appropriate rapid diagnostic tests for key insect pests and pathogens across industry sectors.

The iMapPESTS team will work with growers and industry representatives to understand the best way to communicate and visualise the dynamic pest and pathogen information for end-users. Growers and those involved in plant pest management are encouraged to visit the iMapPESTS website for more information or get in touch.

Find out more R&D

Please contact Engagement and Adoption Coordinator for iMapPESTS Shakira Johnson on 0433 937 564 or email shakira.johnson@ausveg.com.au.

Further details can be found at the iMapPESTS website: imappests.com.au. You can follow the project on Twitter: @iMapPESTS.

The program (2017-2023) is supported by Horticulture Innovation Australia Limited, through funding from the Australia Government Department of Agriculture, Water and the Environment as part of its Rural R&D for Profit Program and Grains Research & Development Corporation, Sugar Research Australia, Cotton Research & Development Corporation, Wine Australia, AgriFutures Australia, and Forest and Wood Products Australia.

Project Number: ST16010

Sentinel deployment locations

As the focus switches to engaging more closely with industry to understand the benefits of the sentinel surveillance system, the iMapPESTS team is deploying sentinels to multiple strategic locations across the country for in-field trialling, including key vegetable-growing regions:

Current trials

- Peri-urban: Virginia, South Australia
- Northern Adelaide Plains, SA
- Adelaide Hills, SA
- Sunraysia, Victoria
- Riverina, New South Wales
- Cairns, Queensland

Future trials

- Wimmera, Victoria
- Mallee, Victoria
- Peri-urban: Virginia, SA
- Atherton Tablelands, QLD
- Riverlands, SA
- Bowen Gumlu, QLD

Photography by Caroline Ellis.

Ryan Shadbolt: Growing an accomplished family business

Name: Ryan Shadbolt
Age: 24
Location: Beverford, VIC
Works: Scotties Point Farms
Grows: Pumpkin, beetroot, broccoli and onions

How did you first become involved in the vegetable industry?

My family has always been in the vegetable industry. My grandfather started our farm in the 1960s, and it has been in the family ever since. I grew up as a little farm kid who loved getting out into the paddock with dad and helping from a young age. My parents have some photos of me when I was only about six years old out on the farm in my gumboots helping cut broccoli – this is one of my first memories of working on the farm.

I was never very interested in school and decided to leave at the age of 16 to start my apprenticeship in the family business. After finishing that, I worked for another three years before moving away to Melbourne to race motocross at a high level. While I was there, I worked in the construction industry, which taught me lots of different new skills but also made me very keen to get back to the farm. I've been back on the farm for two years now and am enjoying taking on more responsibility as time goes on.

What is your role in the business? And what are your responsibilities connected to your role?

My role in the business is to work alongside my dad, Peter, and older brother Jake, to manage everything from planting to packing. I really enjoy the hands-on, practical side of the farm.

I am a Production Manager – this means I'm responsible for a lot of the spraying, fertilising, ground preparation, irrigating and organising workers. Because we grow a variety of vegetables, my jobs vary throughout the year, but it also keeps things interesting and exciting.

What are the biggest challenges you face working in the industry, and how do you overcome them?

I find the biggest challenge in farming is the problem solving that is needed to make things work in different situations every day; whether it's fixing breakdowns, bad weather, or just thinking and planning ahead.

I find the best way to deal with this is to break each problem down into smaller things and just get in and get it done. Things normally work out, and we try and remember that they are only veggies!

Where do you receive your on-farm practice advice and information from?

Most of my advice and training has come from my dad – he also grew up on the farm and has many years of experience.

Vegetable farming is something that can only be learnt over time, and as I take on more responsibility on the farm, he has been super helpful with helping me make decisions every day and answer any questions I may have. We also have access to an agronomist who we look to for advice and information on crop health, fertilisers and chemical recommendations.

What new innovations, research and/or practices has your business implemented recently? What are you doing differently to other growing operations?

We are always trying to research new technologies and innovations that we can use to help the way we do things on-farm. We try to run our business with as little staff as possible, using machines to do as much as we can to maximise efficiency and make life easier.

In the last few years, we have been trialling different cover crops and strip till sowing some of our vegetable crops with some promising results so far. In our broccoli and pumpkin crops, we have been able to eliminate 3-4 passes in ground preparation while also being able to reduce the amount of water and herbicides needed over the crop's lifespan.

What do you both enjoy most about working in the vegetable industry, and how do you maintain your enthusiasm?

I like that no two days are the same on the farm. We grow a handful of different crops, so it gives us a good variety of jobs to keep things interesting. I take a lot of pride in what I do and love the satisfaction of seeing the truck roll out the front gate with high quality fresh produce.

Where do you see yourself in five years' time?

I'd like to see my brother and myself taking on more responsibility from our dad as he slows down on the practical side of the business. I would love to see the farm remain in our family for generations to come, so I want to continue to build and grow it sustainably.

We are big believers in creating a good work/life balance, so we don't necessarily want to grow the business any bigger than it is right now – but want to make sure that we are maximising our efficiency and always exploring new possibilities.

How do you think more young people could be encouraged to study and take up jobs in the vegetable industry?

Studying horticulture enables young growers to upskill and brings new knowledge to their farm and helping it to evolve. The vegetable industry is constantly changing, and its future is looking bright for the next generation. There are plenty of opportunities right now in a wide variety of roles!

Indian Meal Moth larvae ('grubs') in cucumber seeds. Images courtesy of the Department of Agriculture, Water and the Environment.

Safeguarding Australian veg from seedy biosecurity risks

Global online shopping has boomed in recent years, and there are some parcels that can have a detrimental effect on Australia's biosecurity system. Seeds and other plant material purchased overseas have the potential to harm our horticultural industries – including vegetables – with unwanted pests and diseases entering the country. Australian Chief Plant Protection Officer, Dr Gabrielle Vivian-Smith, outlines these threats and how they are being managed.

Many Australians have turned to online shopping to purchase goods from overseas, and this includes seeds.

While this might seem like a convenient and cost-effective idea at the time, some online shoppers might not be aware that they are potentially wasting money and putting our country at risk.

The import of seeds and other plant products into Australia is tightly regulated under the *Biosecurity Act 2015,* to ensure harmful pests and diseases are not introduced into Australia. These can cause significant agricultural, environmental and economic harm.

Seeds that are bought online from overseas can pose a significant biosecurity risk for Australia. They can carry a range of diseases – including viruses, exotic insect and weed pests – that could impact on our vegetable and fruit industries, backyard gardens and environment.

Australia has strict conditions for seed imports, and these are in place to manage the significant risks. Some seeds cannot be imported to Australia as the risk of introducing unwanted plant diseases and serious weed species is too high. Others can, provided you meet strict import conditions.

The mail on seeds

Seeds are the most intercepted biosecurity risk item through the mail. In 2020, over 55,000 intercepted mail articles contained seeds – equating to 72 per cent of the total interceptions for the period. Any of these seeds could have posed a biosecurity risk.

Since July 2020, there have also been continued reports of Australians receiving unsolicited packets of seeds from overseas. It is suspected that this could be part of an e-commerce brushing scam.

As of 24 August 2021, there had been 335 cases of unsolicited seeds destined for addresses across Australia. These seeds can also pose a biosecurity risk, as they have arrived in Australia without adhering to the appropriate import conditions.

Recently, the Department of Agriculture, Water and the Environment, in collaboration with Agriculture Victoria, conducted a research project where a range of cucumber, melon and zucchini seeds were purchased online from overseas suppliers. These were imported under a specific biosecurity permit for testing purposes.

Disease threats

Almost 75 per cent of the seed consignments that arrived as part of the project carried vegetable and fruit viruses that are a biosecurity concern.

If these seeds were bought by members of the public and planted, it could have had devastating impacts.

The viruses that were detected include Melon necrotic spot virus (MNSV), cucumber green mottle mosaic virus (CGMMV), Squash mosaic virus and potyviruses.

These viruses are a significant risk to Australia's vegetable and fruit industries, as well as backyard gardens, our environment, and overall plant health. Some viruses are very hardy and once they are present in cultivated fields they are often there to stay.

MNSV causes disease in cucurbit crops, including cucumber, honeydew melon, rockmelon, and watermelon. It impacts on fruit quality but can also cause fruit to rot prior to harvest. It can survive in the soil through its association with a fungal parasite that is present in Australia.

CGMMV mainly affects cucumbers and melons. It is another devastating fruit disease that affects fruit quality and makes them generally unmarketable. It is difficult to manage as it is highly contact transmissible and can readily survive in water and soil from one crop to the next, and is spread in infected seed and plants.

Squash mosaic virus affects squash plants, including melons. Fruit of infected plants become mottled and misshapen.

Damaged, contaminated and infested samples of zucchini seed.

Examples of unidentified, unsolicited seeds received through the mail.

Images courtesy of the Department of Agriculture, Water and the Environment.

Protecting our country

To better manage seed biosecurity risks, last year Australia banned imports of cucumber, melon and zucchini seeds – as well as seeds of other high-risk commodities – through international mail.

On arrival in Australia, biosecurity officers check that imported seeds are free from biosecurity risk material and meet all import conditions. Seeds that do not meet the import conditions may require testing or treatment.

If the biosecurity risk cannot be successfully treated, the seeds will be exported or disposed at the importer's expense.

Illegal imports of seeds can be subject to enforcement action by the department. There are significant penalties if you are found to have breached Australia's biosecurity conditions. This can include fines and potential prosecution.

The recent testing of seeds from overseas demonstrates the reality of the risks that Australia is potentially facing. It is a vital reminder that we all need to play our part and not purchase goods from overseas that could be a biosecurity risk.

If you are considering buying seeds online from overseas, don't just click purchase. Be biosecurity aware and check the conditions first.

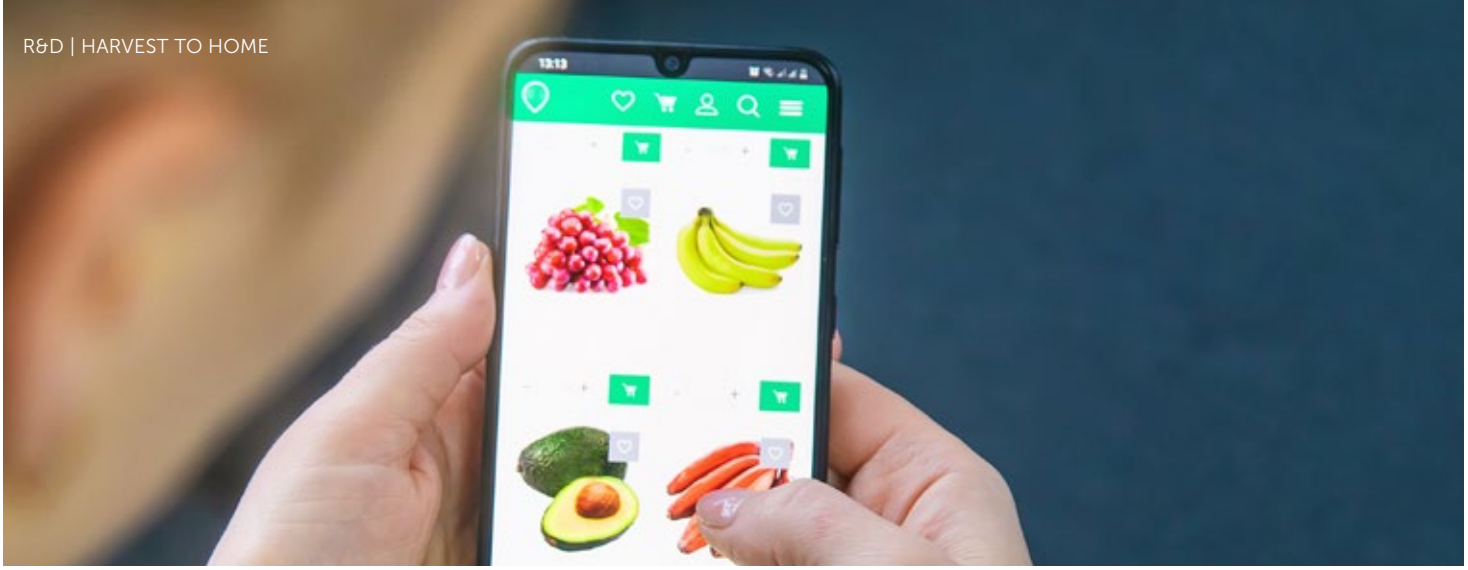
If you are unsure, don't buy them.

Find out more R&D

For more information on the biosecurity conditions for seed imports, please visit awe.gov.au/travelling/bringing-mailing-goods.

It is vital that any unsolicited seeds be reported to the See. Secure. Report hotline on 1800 798 636 or visit agriculture.gov.au/pests-diseases-weeds/report.

For further details on AUSVEG's biosecurity activities, please contact the AUSVEG Extension & Engagement Team on 03 9882 0277 or email science@ausveg.com.au. The Farm Biosecurity Program is funded by the Plant Health Levy.



Life beyond COVID-19: Key trends as we move to post-COVID 'normal'

Hort Innovation has worked with global information and measurement company, NielsenIQ, to bring growers the largest series of insights into market performance and shopping behaviour yet. As we begin to re-open post lockdown, NielsenIQ has looked at how the produce market has shifted and what behaviours will be key. NielsenIQ Director Llew Stevens reports.

The COVID-19 pandemic has been impacting the way consumers shop and buy fresh produce for almost two years.

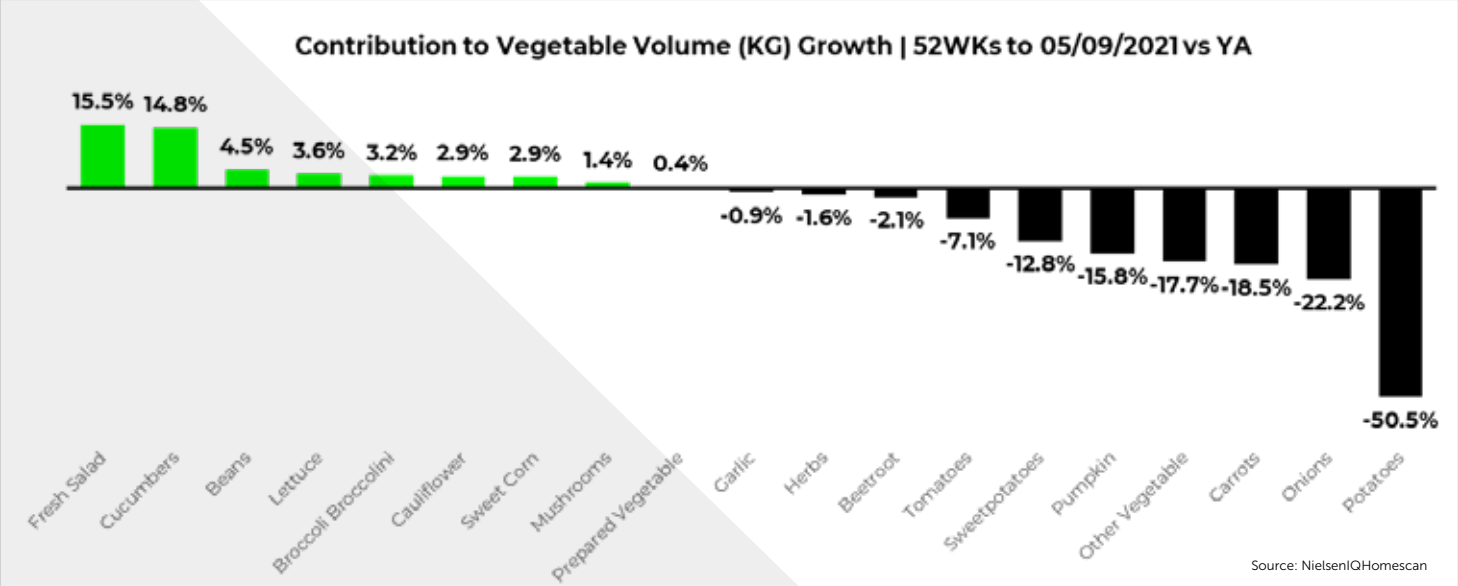
As we moved through 2021, we began cycling the extreme purchasing of the first Australian lockdown. Currently, we see total fast-moving consumer goods (FMCG) continue to grow despite experiencing a slow-down as we cycled these high growth periods of 2020 – currently up only 1.6 per cent versus last year, but a strong 13.1 per cent increase versus 2019.

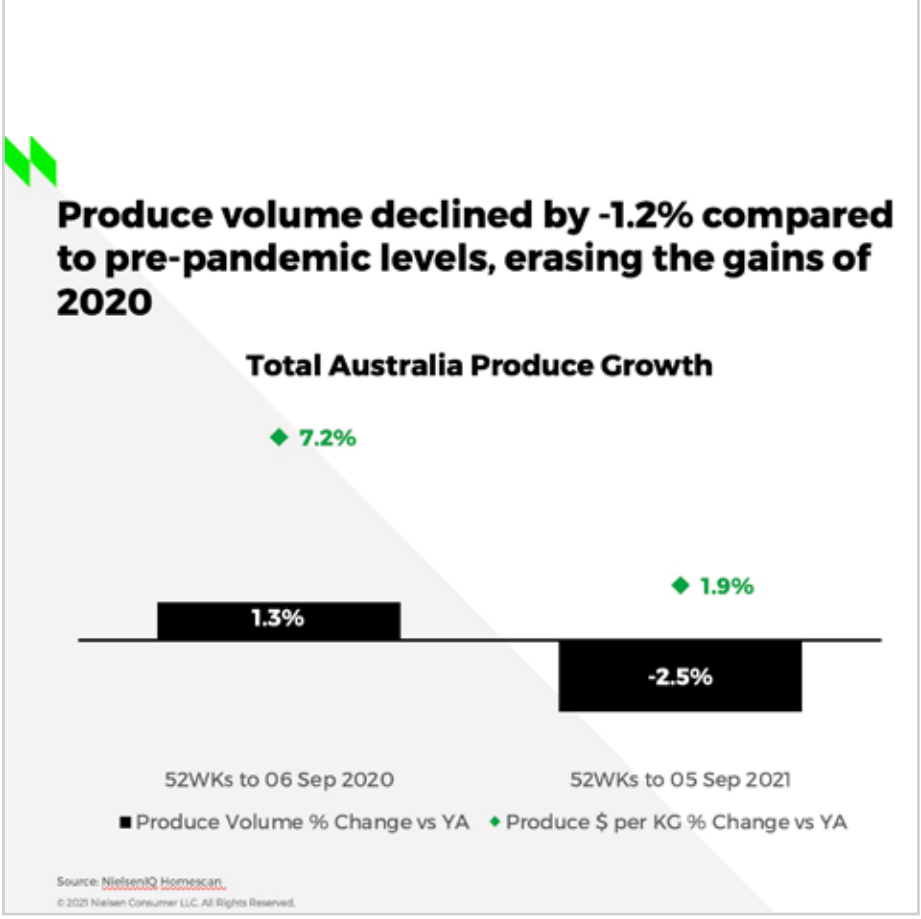
As we start moving into 2022, we will also begin to see the longer-term shifts in customer behaviour and how we may still feel the impacts even after we begin to move past lockdowns. Frequency of trips, after experiencing a sizeable increase during the early days of the pandemic, has contracted back down to below pre-pandemic levels. Meanwhile basket size continued to increase, rising more than AU$5 over the past two years, to sit at an average of almost $49 per trip.

Interestingly, while Victoria contracted in the number of trips per household throughout the past 18 months, consumers were still making more trips the average Australian household despite lockdowns.

Produce trends in 2021

Produce by kilogram (kg) volume declined by 1.2 per cent compared to pre-pandemic levels – erasing the gains of 2020 – with both fruit and vegetables in volume decline versus 2020. This decline was seen across almost all of Australia with all mainland states declining in kg volume versus 2020, and all except Victoria seeing volume kg decline versus 2019 – however the NT was an exception, with growth versus 2019 and 2020. Potatoes stood out in the vegetable category as the largest driver of declines versus last year, where it was the biggest





driver of gains in NielsenIQ's summer 2020 update. This turnaround was driven primarily by the strength of potatoes during those early pandemic months of March to May 2020 where we saw around 63 per cent of Australian households purchasing potatoes in each of those months, with strong volume gains to show for it.

In 2021, we saw household penetration hover between 55 per cent to 58 per cent during those months – more in line with its long-term monthly average – as well as reduction in average trips and volume of potato purchased per trip. So, while there were sizeable declines at the yearly level these came predominantly from cycling through the high growth we saw in early 2020.

This year also saw a consolidation of spend back into major supermarkets (Woolworths, Coles, and Aldi) as the increased repertoire of 2020 faded. Currently they sit on a combined 75.5 per cent share of produce value – up from 74.3 per cent last year, and higher than their pre-pandemic share of 75 per cent in 2019 – leaving major supermarkets well-positioned as we head into Christmas 2021.

Sources

NielsenIQ Homescan Data to 05 September versus Prior Year and versus Two Years Ago.

Find out more R&D

Please contact Llew Stevens at Llew.x.Stevens@NielsenIQ.com.

These data and insights were produced independently by NielsenIQ and shared through the Harvest to Home platform, supported through the Hort Innovation vegetable, sweetpotato and onion research and development levies. For more insights, visit harvesttohome.net.au.

The Harvest to Home dashboard is an initiative of the Vegetable Cluster Consumer Insights Program and is funded by Hort Innovation using the vegetable, sweetpotato and onion research and development levies and contributions from the Australian Government.

Project Number: MT17017

Hort Innovation

2022 trend predictions

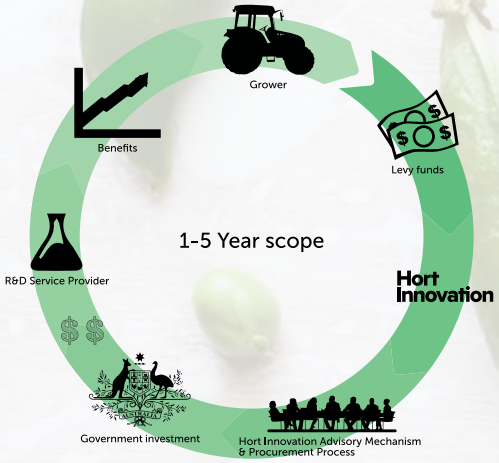
There will be greater consolidation into major supermarkets – online and bricks and mortar – as customers are already doing fewer trips as they seek to make the most of it. Throughout the pandemic, we've seen online grocery shopping jump from 3.5 per cent of produce dollar sales up to 7.3 per cent in the latest year. While growth may slow as we exit lockdown and more normal shopping behaviours have a chance to resume, it can be hard to break a habit you've spent 18 months building.

Shelf stability and long-term freshness will be key for producers as households will make fewer fresh top-up shops. Fewer trips to the shops mean fewer chances to pick up fresh produce, as well as longer lags between trips. Longer shelf stability will help ensure customers have the best chance for getting fresh produce when they shop, and that it stays fresh once they get it home.

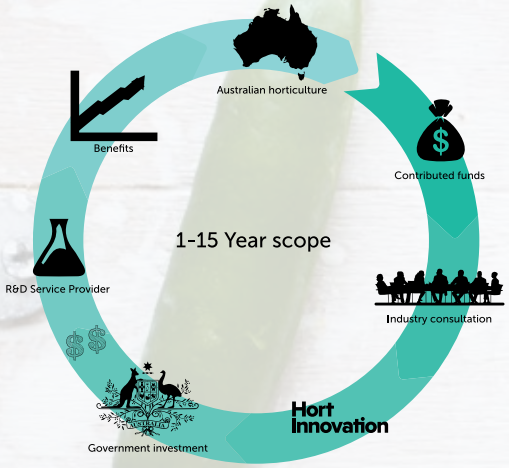
Prices for produce will be top of mind as the impacts of supply booms and shortages continue to work their way through the supply chain both globally and locally. As some prices continue to increase due to constraints – while others reduce thanks to seasons of high supply – customers will need to be savvy to get the most out of their grocery spend.

THE VEGETABLE R&D LEVY AT WORK

STRATEGIC LEVY INVESTMENT



HORT FRONTIERS



WHO PAYS THE VEGETABLE R&D LEVY?

The levy is paid by growers who produce and sell vegetables in Australia. The charge is set at 0.51 per cent at the first point of sale. The Federal Government also provides funding in addition to grower levy payments. Once paid, the research and development levy funds are managed by Hort Innovation.

HOW IS LEVY MONEY INVESTED?

Hort Innovation has two funding models for investment in research and development. The industry's levy is invested with Australian Government contributions through the Hort Innovation Vegetable Fund, which is part of the organisation's strategic levy investment activities.

All investments through the Vegetable Fund are made with advice from the industry's Strategic Investment Advisory Panels (SIAPs) – skills-based panels made of panellists from across the vegetable industry, the majority of whom are levy-paying growers.

Strategic levy investments have a one- to five-year scope and the R&D is designed to directly benefit growers in the vegetable industry. Project topics range from pest and disease management to biosecurity matters, with findings communicated through a variety of channels, including *Vegetables Australia*.

You can find information on all current strategic levy investments, and details of the SIAP, on Hort Innovation's Vegetable Fund page at **horticulture.com.au/growers/vegetable-fund/**.

The second Hort Innovation funding model is the strategic partnership initiative known as Hort Frontiers. Hort Frontiers projects do not involve levy dollars, unless an industry chooses to become a co-investor in them, through advice of the SIAP. Instead, Hort Frontiers facilitates collaborative across-horticulture projects involving funding from a range of co-investors. These projects have a long-term focus and are designed to solve major and often complex challenges to secure the future of Australian horticulture.

You can read more about Hort Frontiers and the seven funds within it at **hortfrontiers.com.au.**

HOW CAN GROWERS GET INVOLVED?

All vegetable growers are encouraged to share their thoughts and ideas for the research they want to see, both within the levy-specific Vegetable Fund, and within the wider Hort Frontiers strategic partnership initiative.

Ideas can be submitted directly to Hort Innovation through the online Concept Proposal Form at **horticulture.com.au/about/investing-is-our-business/concept-proposal-form/.** Growers are also encouraged to reach out to the SIAP panellists for the industry (available from the Vegetable Fund page).

Hort Innovation Strategic levy investment | VEGETABLE FUND

This project has been funded by Hort Innovation using the vegetable research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

Getting value for dollar with spray applications

In this edition of 'Ask the industry', Syngenta Portfolio Lead – Viticulture and Fruit, Scott Mathew, shines a light on spray application and outlines the role chemistry within crop protection products can play in achieving the correct coverage required for maximum performance.

Syngenta Portfolio Lead – Viticulture and Fruit, Scott Mathew.

Achieving the best performance from a spray application is dependent on a number of factors, and the three key points are retention, coverage and mode of action.

In general, small droplets are better retained on plant surfaces as compared to large droplets particularly on smooth, shiny leaves. This has never been truer than on difficult to wet plants like onions, making fine-medium sprays very important. Except when controlling onion thrips, where a coarser droplet size might support improved penetration down into the neck of the plant.

The downside to small droplets is that they are more prone to drift, losing valuable product and potentially causing off-target damage. Large drops are surprisingly well retained on easy to wet leaves, such as mature carrot plants, and many broadleaf weeds.

Adjuvants can be critical to spray retention, so it's always best to follow the label directions. Where the label does not state to add an adjuvant, then please don't add one to the tank.

Product performance

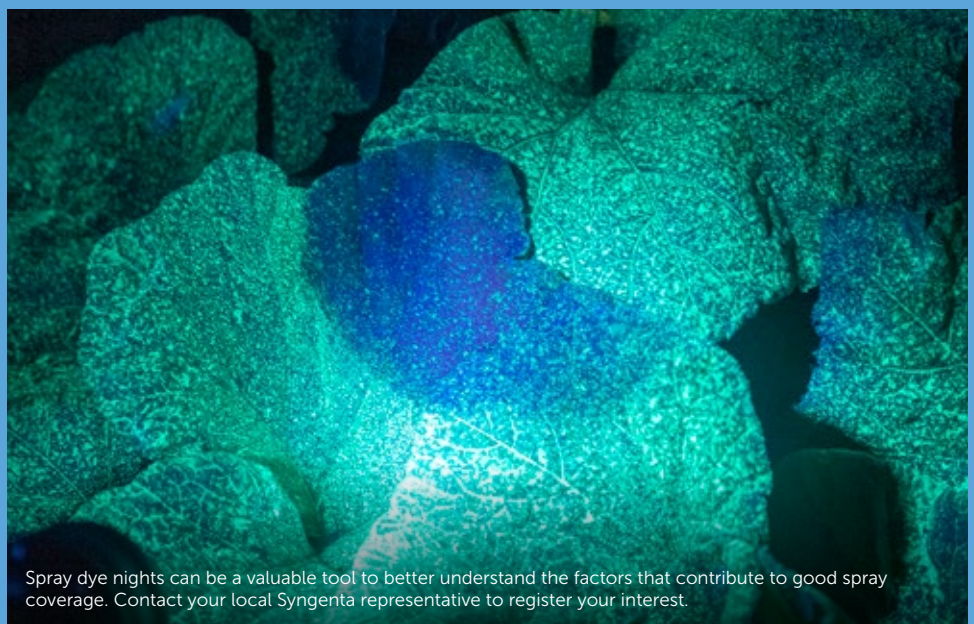
Penetration into the crop is one of the key factors that will govern the performance of an applied crop protection product. Achieving good coverage only on the tops or outside of plants may not control pests or disease occurring on the lower leaves or at the soil level (e.g., sclerotinia).

In general terms, coarse drops will provide the best penetration in upright leaf crops. Finer drops will achieve better penetration in broadleaf crops as they can move in air currents around leaves, depositing the spray further down in the canopy.

The coverage required for your application will depend on the crop protection product you are applying. The activity of many contact protectant fungicides is determined largely by the even spreading of the active ingredient(s) across the plant surface to form a protective barrier.

The activity of systemic fungicides and many insecticides is influenced by the ability of the active ingredients to penetrate plant tissue, form a reservoir within the plant tissue (and for some how they may move in the vascular system of the plant).

Crop protection products can behave very differently within the plant. So, an understanding of the product chemistry can help ensure you achieve the correct coverage required for maximum performance.



Spray dye nights can be a valuable tool to better understand the factors that contribute to good spray coverage. Contact your local Syngenta representative to register your interest.

Contact/protectant products (e.g., BRAVO® WEATHER STIK® fungicide) and many insecticides require more drops and better coverage because the active ingredient(s) do not move from the point of application and protect only the plant material they contact.

Translaminar insecticide products (e.g., PROCLAIM® Opti insecticide) and fungicides (e.g., REVUS® fungicide) will protect the plant material they come in contact with, but importantly they will move to the direct opposite side of the leaf from the initial contact point to offer great protection of both upper and lower leaf surfaces.

Systemic fungicides (e.g., RIDOMIL GOLD® MZ fungicide) and many insecticides (e.g., CHESS® insecticide) require fewer droplets/coverage than protectant fungicides/insecticides because the active ingredient(s) move within the plant to increase the protected area (xylem mobile i.e., upwards and outwards on the leaf from point of application).

Also remember that some products are more systemic than others, and the movement of the product in the plant does not make up for poor application techniques that deliver poor coverage.

Referring to the application guidelines on product labels covers these issues and advises a best course of action. This can be complicated with tank mixes, which may require consultation with your advisor and/or the manufacturer's representative.

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Find out more R&D

For more information or to ask a question, please contact your local Syngenta Territory Manager, the Syngenta Advice Line on 1800 067 108, visit syngenta.com.au or email *Vegetables Australia*: communications@ausveg.com.au. Please note that your questions may be published.

The R&D content for this article has been provided to *Vegetables Australia* to educate Australian vegetable growers about the most relevant and practical information on crop protection technologies and their on-farm applications.

A view from above: Peninsula Fresh Organics' Barham farm, located in the western Riverina district of New South Wales.

Natasha Shields: Investigating alternatives to plastic packaging on fresh produce

Owner of Peninsula Fresh Organics, Natasha Shields was awarded a Nuffield Scholarship with support from The William Buckland Foundation. Through her scholarship, Natasha travelled to Asia, Europe, the Middle East and North America to find alternatives to plastic packaging on fruit and vegetable products, such as bioplastics and misting systems in supermarkets.

Natasha Shields has been an organic vegetable grower alongside her husband, Wayne, for over 10 years. The pair run Peninsula Fresh Organics, located in Baxter on Victoria's Mornington Peninsula.

Over the years, which have involved attending hundreds of farmers' markers, one thing became clear to Natasha and Wayne: their organic veg consumers do not like plastic coverings on fresh produce.

In that time, Peninsula Fresh Organics has grown from just three acres in 2010 to almost 200 acres today, and it has also expanded beyond the local markets. It now supplies two supermarket chains and wholesale markets in Victoria, New South Wales and Queensland – which has created a 'plastic problem' for Natasha and Wayne.

"A requirement of the supermarkets and some of the wholesale retail stores, is that our organic produce is placed in a plastic sleeve/bag – usually with a barcode, so that it can be scanned at the register to get the correct price," Natasha says.

"Without this system, the organic produce could easily be confused with the equivalent conventional item also for sale. The plastic sleeve/bag on the produce also prolongs its shelf life, as it is protected from the drying air in the stores. Plastic and other forms of packaging have another added benefit of protecting the item from being handled by consumers, thus adding another layer of food safety."

Scholarship success

This conundrum spurred Natasha to apply for a Nuffield Scholarship, which was successful. She travelled around the world as part of the six-week Global Focus Program with a group of nine scholars. She attended exhibitions at the Sustainable Food Summit in Singapore, the Asia Fruit Logistica in Hong Kong and FachPack in Nuremberg, where she

was able to speak to many company representatives about some of the great innovations around packaging and produce currently being used around the world.

In March 2021, Natasha released a report that looked at finding alternatives to traditional plastic packaging for fresh food producers available in the global market. This focused on sustainability, affordability while ensuring food safety, and how friendly it is for the environment.

It was also timely given the global COVID-19 pandemic. Since the pandemic began, Natasha observed that many consumers at local farmers' markets have been asking for the produce to be packaged – more than ever before – to reduce the risk of the virus potentially being present on their food.

"Consumer demands and perceptions dominate the need for packaging of some kind, and the demands from the retail and wholesale sectors around ease of purchasing and to some extent, food safety, also drive this requirement to find cost effective and sustainable packaging," Natasha says.

"The implications of COVID-19 and the need for increased hygiene standards demonstrate that the 'war on waste' will have to wait, as consumers demand protection from handling and contamination of their fresh food in supermarkets and other settings."

Current available options

Natasha travelled to Singapore, Japan, Indonesia, France, Canada and the United States of America (U.S.A.) with the scholar group in 2019, and then to Hong Kong, Singapore, Ireland, Italy, the United Kingdom, Denmark, Sweden, Germany, Spain, Dubai, and the U.S.A. to conduct independent research.

In her report, Natasha outlines five examples of new technologies that are currently available in the global market as alternatives to traditional plastic packaging. This is based on what she observed on her travels. These include:

- **Misting systems:** There are several retail stores and supermarkets around the globe that are using misting and watering systems. Contronics in The Netherlands has developed a Dry Mist technology that helps to counteract the effects of typical store conditions. Aside from the benefits of reducing both packaging and food waste, Natasha believes the Dry Mist system looks really good and gives produce a bit of a 'wow factor' with the 'show of mist above the produce' in the many stores it is installed in.

- **Cellugy:** Cellugy is a company that initially formed at Aarhus University in Denmark. It was started in a living room in 2017 by two researchers exploring the potential use of nanocellulose for bioplastics. The product is a cellulose derived from food waste – primarily fruit pulp which turns into sugars when fermented.

- **Grounded Packaging Company:** Natasha met with Nathan Graham from Grounded Packaging, which has manufacturing plants in the U.S.A., Germany, Israel, China and Malaysia. Its product is a compostable film or flexible sleeve made from rice, potatoes, corn and copolymer.

- **Nativia by Taghleef Industries:** Natasha met with Olivier Nickel from Taghleef Industries while attending Fachpack in Nuremberg. Olivier was keen to explain the processes involved in manufacturing his company's product, Nativia Bio Based Films. Nativia is a bioplastic made primarily from corn starch and/or sugar cane or cellulose. Due to the bio-based content and lower energy consumption, Polylactic Acid (PLA) delivers a lower carbon footprint.

- **Jonatura – Biodegradable packaging:** Patrick Stumel from Jonatura declared that the aim of the company is to replace conventional packaging made from fossil fuels to that of raw materials from renewable sources. It believes that this is what forms the basis of an ecological packaging industry.

Natasha's recommendations following her scholarship report

- Further research is needed to better understand the economic impact of COVID-19 restrictions and short- and long-term future preferences for wrapped or packaged food for fresh produce.
- Further government investment is needed into creating more standardised labelling and verifications.
- Further investment is needed to research plastic alternatives in Australia.
- For compostable packaging to be a future consideration, the cost would mostly likely need to be reduced – and the easiest way to do this would be to increase demand (bulk buying by multiple producers); therefore, bringing the cost or production down.
- Major retail chains need to be consistent with their fresh food packaging preferences to eliminate the need for growers to have multiple types of packaging.
- Local government needs to play a greater role in sustainability and enforcing either recycling or composting options to consumers.

"These examples provide alternatives to plastic packaging that Australian producers, retailers and consumers can consider as comfortable solutions to the current impasse in single-use plastics and waste management," Natasha says.

"The challenge lies in the major retailers and their willingness to look at either recyclable packaging or finding a way to effectively handle compostable packaging and educating consumers on the correct way to deal with the packaging chosen. Another factor to consider is the availability of plastic alternatives in Australia, and the cost of this to the producer."

The bottom line

The issues and challenges surrounding plastic packaging on fresh produce are ongoing in Australia and globally, Natasha says.

"There are alternatives to plastic packaging being used in the global market, and most of these are economically viable options to keep produce fresher for longer," she explains.

"Consumer perceptions, retail demands, different needs of wholesalers and issues around food safety – in particular during COVID-19 and the need for increased hygiene standards – have all indicated that alternatives to traditional plastic packaging are needed.

"While these may enable a more 'circular economy' in relation to produce and packaging, ultimately the results will depend on consumer awareness and understanding, and the requirement for labelling and national and international standards to ensure a competitive and level market. The innovations and solutions examined – including misting and various bioplastics and compostable packaging – are all part of the solution."

Driving growers' knowledge and businesses

A strategic levy investment under the Hort Innovation Vegetable Fund, *Nuffield Scholarship* (VG14065) provides funding to support Nuffield Scholars in the vegetable industry. There has been one Hort Innovation scholarship awarded each year of the project's life from 2016-2021.

Nuffield Scholarships are a chance for Australians in agriculture to grow their practical knowledge and a broad variety of skills, while heading overseas to study a topic related to their industry.

Hort Innovation-supported growers from 2016-2021 include:

- **Michael Vorrasi**, who explored ways to overcome barriers to consumption and the role that value-added vegetables can play.
- **Bao Duy Nguyen** researched currently available methods for Australian horticulture producers to boost the efficiency and productivity of low-tech greenhouse systems and unlock new market opportunities.
- **Steve Grist** researched applications and solutions for small farms to turn waste from a costly problem into a resource.
- **Christina Kelman** is looking at ways the horticulture industry can increase outputs while reducing inputs and farming sustainably.
- **Catherine Velisha** is researching how horticultural family businesses can build and harness the skills they need to be competitive in the marketplace.
- **Michael Densham** will investigate how the design of intensive production systems can drive increased productivity and profitability of small-scale farming operations.

Links to each grower's report can be found at horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/vg14065.

Find out more R&D

To read Natasha Shields' report *Alternatives to Plastic Packaging on Fresh Produce – Options for Vegetable Growers*, please visit nuffield.com.au/natasha-shields-2019. For more information, or to read more reports like Natasha's, please visit nuffieldscholar.org/reports.

Customer focus keeping Australian manufacturer ahead of the pack

edp Australia specialises in the supply of fresh fruit and vegetable preparation and packaging machinery to the vendors of the Australian wholesale and retail markets.

For almost 75 years, edp Australia has been meeting the exacting standards of its customers. Its fresh fruit and vegetable preparation and packaging machinery is proudly designed and manufactured here in Australia. In an age when time is money, edp's locality is one of its biggest advantages.

Innovation has been at the core of edp Australia since its founder, Eric Douglas Parsons, designed and hand-made a three-legged orange fruit picking ladder from a mobile workshop in the early 1950s. That ladder became an industry icon, sighted on orchards across the east coast of Australia for generations to come.

Parsons went on to establish a permanent workshop in Mooroopna, beginning the edp brand. The business – now owned by Ian and Helen Parsons – is still located on the same site in Victoria's Goulburn Valley region.

Remaining local has been to a key to the business' success.

"We can build full turnkey projects within 12-16 weeks and have them installed and operational five or six days later," edp General Manager Ray Thrum says.

"When you compare that to a machine built overseas, you've got a three-month build followed by another three-month wait to have it packed and shipped. Then you wait for a service technician to travel over and install it, so you're looking at a 12-month turnaround after you place the order."

Business operations

Celebrating its 75th anniversary in July 2022, edp's wealth of knowledge and experience is evident in the workmanship that goes into its range of machinery including grading and sorting lines, bin tippers, carton fillers, pre-pack bagging equipment and power ladders.

"We have the know-how to deliver turnkey projects for a wide range of fresh produce, including potatoes, broccoli, Swedes, sweetpotatoes, onions and carrots, to name just a few," Mr Thrum says.

"Our drafting team uses Solid Edge 3D drawing, and we have a state-of-the-art manufacturing facility that allows us to build custom designs according to our customers' needs.

"Once we finish a build, the customer can visit our workshop to trial and fine tune their machine. It means that once the installation is complete at their facility, all they need to do is turn the key and away they go."

The ability to adjust on the run has served edp well during the COVID-19 pandemic. Unable to consult face-to-face, the company has used Microsoft Teams to communicate with its customers and ensure it remains connected to projects.

A trailblazer in packaging

edp also sells a wide range of packaging materials under its consumable's portfolio. It is the Australian agent for Giro, the Spanish-based world leader in net packaging and machinery. It also represents fellow packaging solutions provider Daumar.

The company's Retail Packaging Division Manager Robert Marsters says it is well-positioned to meet emerging packaging trends in the Australian market.

"There's a big push to reduce the amount of plastic in packaging, with leading supermarket chains taking this direction in order to be seen as good corporate citizens," Mr Marsters says.

"Consequently, we're seeing more demand for knitted net packaging, as companies look to move away from extruded net. For comparison, Giro's market-leading kitted net has six grams of plastic per metre, while extruded net has between 22-25 grams per metre."

Mr Marsters says Giro is also leading the development of clipless packaging solutions, with a number of options currently being trialled.

Best-in-class palletising solutions

The company has also brought IPLA's range of specialist automatic box and RPC/tray palletising machines to the Australian market.

Having already installed a number of these palletising lines, edp Business Development Manager Michael Schirmer says these automated solutions are overcoming labour shortage problems, while also improving the presentation of the finished stacked pallets.

"Having the ability of a specialist palletising company gives us a lot of confidence as a distributor to work with our customer and get the right result," Mr Schirmer says.

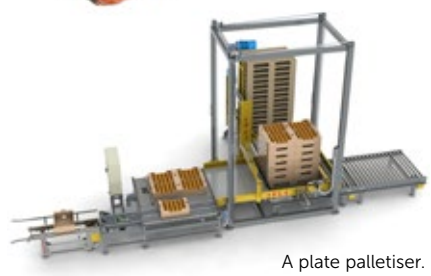
"Throughout the sales process, we engage live via Microsoft Teams meetings with IPLA in Spain and our customer. Together, we sell the solution live to the customer – whether it's exchanging drawings, showing videos or offering solutions, we're both involved in the whole process.

"That's the difference in dealing with a specialist palletising company versus a non-specialist – you get that ability to customise your solution and have complete confidence that it will meet your needs."

Find out more

Please visit edp.com.au or phone 03 5820 5337.

A compostable bag.



A plate palletiser.

Hort Innovation vegetable fund investments (levy projects)
Ongoing investments 2020/21

Project code	Delivery partner	Project title	Project description
VG20005	Department of Agriculture and Fisheries, Queensland	Management strategy for serpentine leafminer, *Liriomyza huidobrensis* (MT20005)	This project is developing and delivering targeted R&D specifically for serpentine leafminer in response to the incursions detected in late 2020. The project is building on the initial work of recently completed *RD&E program for control, eradication and preparedness for vegetable leafminer* (MT16004). Areas of work include: • Identifying and monitoring parasitoids. • Refining development and validation of surveillance and diagnostic protocols. • Using predictive forecasting to manage and assess the risk of serpentine leafminer. • Delivering an industry communication program. • Developing an industry management plan, grower guides and industry focused workshops.
MT19003	Victorian Department of Jobs, Precincts and Regions	Parasitoids for the management of fruit flies in Australia	This investment is delivering the knowledge needed to evaluate the use of parasitoid wasps as a potential strategy for fruit fly management. The use of natural enemies such as parasitoids against insect pests is regarded as a core component in sustainable pest control and will provide horticulture industries with another method to use for fruit fly management. This research is being conducted through two complementary components – firstly by improving current knowledge of fruit fly parasitoid distribution in Queensland and northern New South Wales, and secondly by trialling a new mass rearing and release strategy for the southern states.
ST16010	Plant Health Australia	iMapPESTS: Sentinel Surveillance for Agriculture	iMapPESTS is a national program of research, development and extension designed to put actionable information into the hands of Australia's primary producers to enhance on-farm pest management decision-making. This project is a collaborative piece of work funded through the Australian Government's Rural R&D for Profit initiative. Over a five-year period (2017-2023), iMapPESTS will lay the foundations for a national cross-industry surveillance system that can rapidly monitor and report the presence of airborne pests and diseases affecting major agricultural sectors across the country, including grains, cotton, sugar, horticulture, wine, forestry and emerging industries. This will be achieved through a range of surveillance, diagnostics, and engagement and adoption activities.
ST19000	NSW Department of Primary Industries, University of Tasmania, University of Adelaide, Plant and Food Research Australia and University of New England	Novel technologies and practices for the optimisation of pollination within protected cropping environments	This project is a collaborative piece of work funded through the Australian Government's Rural R&D for Profit initiative. This investment will improve the quality and yield of fruit and vegetable seeds produced in protected cropping environments by developing advanced technologies for pollination in protected cropping horticulture sector.

Project code	Delivery partner	Project title	Project description
VG16078	Applied Horticultural Research	Soil wealth and integrated crop protection – phase 2	This investment continues to provide vegetable producers with the latest information in soil and pest related areas, in formats that are readily accessible and easy to use, through soilwealth.com.au, workshops, webinars and other resources. The focus is on helping growers deal with future challenges posed by changes in the natural and business/market environment. Helping growers implement the efficient use of appropriate, trialled and tested new technologies as they become available, is also key.
VG16063	AUSVEG, with additional components with Freshcare and Growcom	The EnviroVeg Program 2017-2022	The EnviroVeg Program is the vegetable industry's environmental best management practice (BMP) program, and has existed in evolving forms since 2000. It involves a range of resources and services so that Australian vegetable growers can benchmark and improve their BMPs and showcase their environmental credentials through certification. This latest iteration of the program is working to align components from EnviroVeg, Hort360 and Freshcare Environmental to deliver a clear pathway to environmental assurance for Australian vegetable growers.
VG17012	Applied Horticultural Research	Internal fruit rot of capsicum	Beginning in late 2019, this investment is investigating the causes behind internal fruit rot in capsicums and developing management techniques for growers to both prevent infection and minimise the risk of sending damaged fruit to market. Ultimately, this project aims to deliver capsicum growers with an integrated disease management strategy to control internal rot, as well as developing a predictive model that will help growers identify crops at risk and diagnose infection early.
MT19006	Bryant Christie Inc	Across horticulture support for export MRL compliance	Industry requires access to up-to-date international chemical maximum residue limits (MRLs) to ensure that Australian produce is grown in a manner which is complaint with our trading partners food safety systems. This multi-industry investment provides this data to growers in a readily accessible and up-to-date format.
MT14052	Department of Agriculture and Fisheries, Queensland	Essential market access data packages	This multi-industry project is developing phytosanitary data packages to support industries long-term international market access aspirations.
HA19005	RM Consulting Group	Feasibility study into opportunities for high-technology horticulture production in urban environments	This project is exploring the potential of emerging production technologies for application in the Australian urban landscape. The outcomes of the study will identify future priorities for research, development and extension activities into high technology horticulture in urban areas. The project team will identify a range of high technology systems and assess their applicability to urban Australia by considering factors such as regulation and planning, farm input and waste, and supply chain logistics. This will include new technologies such as robotics, automation, big data, IoT and genomics.

Fall armyworm larvae feeding damage in sweet corn cobs.

Managing fall armyworm: A destructive, fast-moving pest

In early 2021, a multi-industry project was established to examine the potential of endemic parasitoids of fall armyworm and deliver extension material to growers on how to effectively manage the pest. Project Lead and DAF Senior Entomologist Dr Siva Subramaniam spoke to *Vegetables Australia* and outlined the team's activities so far, and how this research will ultimately benefit the Australian horticulture industry.

Fall armyworm (FAW) was first detected in early 2020 in far-north Queensland. It has quickly spread to several locations in Queensland, Western Australia, Northern Territory and New South Wales.

Within a short period from the initial detection, significant crop damage (up to 80 per cent) was recorded in organic and conventional sweet corn crops and the pest has become a major concern for other vegetable crops. The rapid rise in FAW numbers and the high use of pesticides to manage the pest are a major threat to the existing Integrated Pest Management practices adopted by the vegetable industry.

A project was established in early 2021 to examine potential parasitoids of FAW and deliver extension materials to growers on how to effectively manage the pest.

Project team members are located in key production areas of QLD, WA and NT, and are from the Queensland Department of Agriculture and Fisheries (DAF), the Western Australian Department of Primary Industries and Regional Development, and the Northern Territory Department of Industry, Tourism and Trade.

Identifying potential parasitoids of the fall armyworm, Spodoptera frugiperda, and the risk to Australian horticulture (MT19015) is a multi-industry strategic levy investment under the Hort Innovation Melon, Nursery, Sweetpotato, Turf and Vegetable Funds.

Project objectives

The project proposal was developed in consultation with major sweet corn companies and their agronomists in QLD and WA. Project team members in each location have consulted with local growers and farm managers to understand their farm biosecurity and COVID-19 plans to facilitate property access and sampling. Growers' local agronomists and farm managers are supporting the crop survey and sample collections.

The research aims of this project are to conduct a comprehensive literature review of FAW parasitoids, undertake an economic risk analysis for relevant horticultural crops in Australia, and conduct field surveys to study FAW host plants and its endemic parasitoids.

"Project staff are conducting regular field surveys and crop sampling to study the host crops and endemic parasitoid fauna associated with FAW. The team is collaboratively conducting a literature review, and collection of field data for crop risk analysis and extension activities," Dr Subramaniam explained.

Data on host plants and crop losses caused by FAW are generated through crop surveys in production areas and discussions with technical experts, and is supplemented by international experience. The project team will calculate the risk that horticultural crops in Northern Australia face from FAW populations.

"The project team has developed a standardised sampling plan and protocols to conduct crop and parasitoid surveys on a national basis. This protocol has considered current farm biosecurity measures, work, health and safety procedures and COVID-19 mitigation measures," Dr Subramaniam said.

Survey updates

The first field survey commenced in crops and weeds in the FAW-established locations such as Bowen and Burdekin in QLD, Darwin and Katherine in NT, and Kununurra and Broome in WA.

Highly preferred FAW host crops such as sweet corn, maize and sorghum have been targeted for collection of life stages of FAW and other Lepidopteran pests.

At the time of writing, autumn and winter field surveys had been completed in the QLD, WA and NT locations, targeting sweet corn, capsicum, melons and maize crops. Parasitoids and other beneficials reared from the field collections have been curated and sent to insect taxonomist Dr Erinn Fagan-Jeffries, who is based at the University of Adelaide, for identification and confirmation.

Five endemic parasitoid and three predator species that attack egg and larval stages of FAW were discovered by the team during the season.

"The project team has already progressed with the comprehensive literature review on FAW parasitoids that were reported in various countries where FAW has established several years ago. Also, crop surveys conducted in north QLD have identified and confirmed FAW infestation in capsicum crops and quantified the damage pattern in the fruit," Dr Subramaniam said.

The team has also established contact and collaboration with several international scientists working in government agencies, universities and private companies in the United States, Switzerland, China, Africa and India.

"We have learnt more about FAW monitoring and biology, host crop range, insecticide resistance issues, potential biological control agents in various climatic conditions and new tools and technologies used in its management," Dr Subramaniam added.

Industry benefits

The literature review will provide detailed information on FAW, and associated parasitoids (and other biocontrol agents) reported in Australia and overseas and will investigate the potential species that are suitable for tropical and sub-tropical production regions of Australia.

"Understanding the parasitoid and predatory fauna that are naturally occurring in the production regions will result in a positive economic impact for growers. This will allow growers and consultants to make better decisions on whether to spray crops or select 'softer' insecticides and measures to preserve the beneficial populations," Dr Subramaniam said.

"Local information on FAW-established locations, host range, infestation levels and damage patterns will improve the adoption of pest management practices and result in a reduction in economic damage. Knowing the host plant range will enable growers to manage cultivated crops and surrounding non-crops (e.g., weeds and cover crops) to reduce FAW populations."

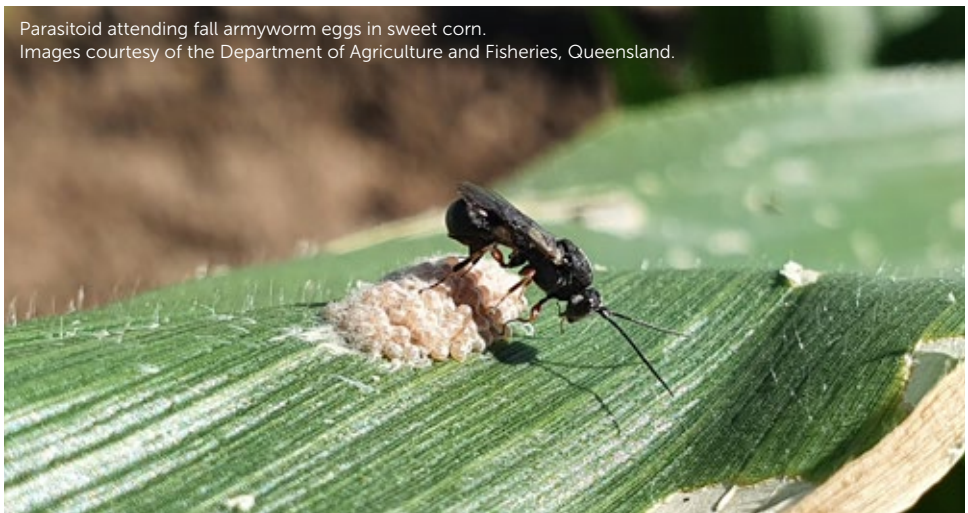
Find out more R&D

Please contact Dr Siva Subramaniam at siva.subramaniam@daf.qld.gov.au.

This project has been funded by Hort Innovation using the melon, nursery, sweetpotato, turf and vegetable research and development levies and contributions from the Australian Government.

Project Number: MT19015

Hort Innovation



Parasitoid attending fall armyworm eggs in sweet corn.
Images courtesy of the Department of Agriculture and Fisheries, Queensland.

Fully grown fall armyworm larvae feeding inside fruit.

MT19015: The bottom line

The long-term aims of this multi-industry project, led by Dr Siva Subramaniam, are:

- To establish a list of endemic parasitoid species present in horticultural crops and recommendations of potential candidates for future biological control of fall armyworm (FAW).
- Generate local information on FAW-established locations, host range, infestation levels on horticultural crops and damage patterns.
- This information can then be utilised to develop an environmentally sustainable and long-term management strategy for vegetable crops.

MT19015 is complemented by another FAW project entitled *Co-developing and extending integrated Spodoptera frugiperda (fall armyworm) management systems for the Australian vegetable industry* (VG20003), which is a strategic levy investment under the Hort Innovation Vegetable Fund. This is also led by Dr Subramaniam from the Department of Agriculture and Fisheries, Queensland.

Outcomes from VG20003 will provide the foundation for a FAW Integrated Pest Management program and support further development of potential biological control agents for FAW management. This project will be featured in the next edition of *Vegetables Australia*.

Darren Long says cover cropping has been the single most important change to farming that he's seen in 30 years. You can read Darren's story on the next page.

Hort Innovation: Supporting the Australian horticulture sector

Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australia's horticulture sector. It works closely with industry to invest the vegetable R&D levy – together with Australian Government contributions – into key initiatives for growers, through the Vegetable Fund. *Vegetables Australia* has compiled the highlights from the Vegetable Fund Annual Report 2020/21.

Throughout another challenging year for the horticulture sector, Vegetable Fund activity remained strong.

Readers are encouraged to download a copy of the overarching Hort Innovation Annual Report 2020/21 to better understand how Hort Innovation worked for the benefit of the horticulture sector during the year. This can be found at horticulture.com.au/annual-report-portal.

2020/21 snapshot of Vegetable Fund investment:

- $14.3 million invested in research and development.
- 58 active research investments.
- $10.2 million in levies collected by the government and passed on to Hort Innovation for investment.
- 35 per cent of Australia's vegetable production volume goes to processing and 17 per cent is sent to the foodservice sector (down this year due to COVID-19).
- In the five years to 2019/20, vegetable crops with the highest annual growth rate in value were asparagus (16.5 per cent increase), garlic (15.5 per cent increase) and pumpkin (13.1 per cent increase).
- Vegetable crops with the highest share of production volume exported in 2019/20 were asparagus (37.1 per cent), carrots (35.1 per cent) and celery (8.3 per cent).

**Source: Australian Horticulture Statistics Handbook 2019/20.*

Highlights for 2021/22

- A host of resources on how to use cover cropping to manage intensive vegetable growing soils. Access these materials at hortinn.com/cover-cropping.
- Preparation support for pest incursions such as fall armyworm and serpentine leafminer, including emergency minor use permits and longer-term investments to bolster the horticulture sector's response.
- The industry communications program plus nationwide VegNET program to support growers in accessing information and adopting best practice on-farm.
- Vegetable Harvest to Home dashboards providing regular household purchase data and insight reporting. These can be found at harvesttohome.net.au.
- Continued export development work to prepare the industry to take advantage of export opportunities.
- The Good Mood Food across-horticulture campaign to support industries through the effects of another challenging year. Details can be found at horticulture.com.au/the-good-mood-food.
- Investments in the Hort Frontiers strategic partnership initiative to address longer-term and often complex issues and opportunities critical to the future of Australian horticulture. Visit horticulture.com.au/hort-frontiers for details.
- Projects supported by grants secured by Hort Innovation, ranging from cross-sector Rural R&D for Profit initiatives to horticulture-specific work to aid in access to crop protection products.

You can visit horticulture.com.au/vegetable at any time to access information on new, ongoing and

completed projects, and to download resources produced by levy investments such as fact sheets and guides.

Making sure that levy investment decisions align with industry priorities

The Vegetable Fund's focus over the next five years

The vegetable Strategic Investment Plan (SIP) was created in 2021 to reflect current priorities for the vegetable industry. This involved extensive consultation with vegetable growers and industry stakeholders, including AUSVEG. The SIP is the roadmap that helps guide Hort Innovation's oversight and management of individual levy industry investment programs.

The vegetable SIP lays the foundation for decision making in levy investments and represents the balanced interest of the particular industry from which the levy is collected. The most important function of the SIP is to make sure that levy investment decisions align with industry priorities.

The vegetable SIP identifies four outcome areas that will contribute to the productivity and profitability of the vegetable sector. They are:

- Industry supply, productivity and sustainability.
- Demand creation.
- Extension and capability.
- Business insights.

Project investments for next year

The vegetable Annual Investment Plan (AIP) 2021/22 will detail how levy funds will be spent over the 12-month period. Investment decisions will be guided by the industry SIP and prioritised based on potential industry impact, as well as availability of levy funds.

The AIP is developed by Hort Innovation, and is informed by the SIP and industry consultation, including collaboration with AUSVEG. The AIP is then discussed with the industry SIAP for feedback and prioritisation. All investments will need to link to the industry's SIP by addressing a minimum of one KPI against a strategy under one of the four outcomes.

Annual Investment Plans will be published each year over the lifespan of the SIP and industry stakeholders will be advised via established communication channels.

Hort Innovation will continue to report on fund performance regularly, with more focus on reporting on outcomes and the impact of investments.

When available, you can view both documents and get a full picture of how your levy will be invested over the next five years. These will be made available at horticulture.com.au/vegetable-fund-management. →

R&D case study

Darren Long: Cover crops: a "game-changer" for growers

Vegetable and potato grower and Managing Director of Tasmania's MG Farms, Darren Long, believes the advancements made in cover cropping as part of this project have been the single most important change to farming that he's seen in 30 years.

"It's an absolute game-changer," he says.

"Growers need a full suite of approaches, and although there will always be a need for traditional methods, this new research gives growers the ability to improve on-farm productivity and sustainability.

"The ultimate aim is to be farming smarter and using cover crops to improve the overall health of our soils and the soil structure. There is a strong focus on how cover crops are grown and incorporated into the soil using a variety of low impact machinery with minimal passes.

"The biggest learning curve that growers are getting out of the project's research is what's available and what's beneficial to the soil, how it works and the different types of root systems – the exposure to all of these new cover crops takes out the guess-work.

"We can access material where the research tells us the companion plants that work well, which means we don't have to guess what will or won't work."

The collaborative nature of the project is also something Darren finds particularly useful and says that by sharing information with other growers, the industry benefits as a whole.

Project details:
Optimising cover cropping for the Australian vegetable industry (VG16068)

Key research provider: Applied Horticultural Research

Defeating the pests, bugs and diseases putting the squeeze on veggie productivity and profitability

Beginning in 2018, this investment is responsible for developing an 'area wide management' (AWM) strategy to address high-priority viral and bacterial diseases affecting vegetable crops.

There are two teams working on this project, one in New South Wales and one in Queensland, with the aim of investigating the most damaging bacterial and viral diseases of brassicas and cucurbits and delivering this information to industry levy payers to better manage diseases.

Thanks to this project, an area wide management strategy has been developed, identifying and tackling the most pressing viral and bacterial pests impacting Australia's vegetable crops.

Most recently, the project team have produced a number of fact sheets detailing the symptoms, spread and control measures for viruses affecting various vegetable crops

The next phase of the program will build on the extensive research already collected and analysed, ramping up pathology to identify diseases, working closely on the ground with AUSVEG.

Research outcomes from the program are communicated to growers as they become available, via workshops and grower meetings, field days, industry journals, newsletters and fact sheets.

Project details:
Area wide management of vegetable diseases: viruses and bacteria (VG16086)

Key research provider:
The Queensland Department of Agriculture and Fisheries

David De Paoli from Austchilli in Bundaberg, Queensland.

Growing Australian vegetable exports in an ever-shrinking world

With the pandemic placing extra stress on Australian vegetable exports, growers need more help than ever to build export capability and capacity, and to improve their export readiness. This investment gives vegetable growers the tools and techniques they need to grow during COVID.

Founder of Austchilli and renowned Bundaberg farmer, David De Paoli, says we've got to act locally, but think globally.

"Whether it's COVID or a natural event going through a specific area, even though we are growing produce in Australia we are all intrinsically connected – whether we like it or not. We can't take one size fits all approach," he says.

David believes Hort Innovation's vegetable industry export program has allowed his business to meet these and other challenges, helping him to operate in a global market, giving him the tools to better understand his customers' needs, and providing valuable research and export assistance.

"This program does a great job at marketing the Australian brand overseas and leveraging it to the benefit of our growers. While there's a lot you can learn as you go, it's good to have people there who can help you so that you make fewer mistakes along the way," David says.

Despite the many challenges posed by COVID-19, with the help of this program, Australian vegetable exports remained resilient.

Project details:
Vegetable industry export program (VG16061)

Key research provider:
AUSVEG

Find out more R&D

To read the 2021/22 Vegetable Fund Annual Report, please visit horticulture.com.au/annual-report-portal.

Hort Innovation Strategic levy investment | VEGETABLE FUND

The 'Warty Goblin' pumpkin.

An example of how FreshChain connects growers with consumers.

Themed digital platform's spooky success for pumpkin growers

The FreshChain Systems team has been working with Queensland pumpkin growers to create Halloween-themed events on its traceability platform. These featured the 'Warty Goblin' pumpkin variety, with the aim to introduce the business to consumers and educate children about where their fresh food come from.

FreshChain Systems has been adding fun to its digital traceability platform when working with 'Warty Goblin' pumpkins.

The business was keen to use its traceability and provenance platform to provide critical information, as well as build curiosity for the next generation of children around fresh food. Therefore, a Halloween theme was established using the pumpkins.

"The serious pursuit of finding solutions comes off the back of building curiosity for young minds," FreshChain Director Greg Calvert said.

"Making engagement fun, factual and a bit silly is a great way of achieving these goals. Digital transformation is simply an enabler for our community to be more actively involved in finding out where their food comes from and information about the growers who are up before dawn. It is about consumers being part of the fresh food future."

Introducing 'Warty Goblin'

The opportunity to work with Ken and Sonia Duncan from Kenrose Co. on their specialty Halloween pumpkin, Warty Goblin, was a lot of fun. The Duncans' business is based in Ayr, located in northern Queensland's Burdekin region.

"The challenge was making the content both informative and entertaining, without scaring the little ones," Greg said with a smile.

Sonia Duncan was delighted with the themed digital platform and the opportunity to highlight Kenrose Co.'s exclusive variety of Warty Goblin.

"Halloween is a festive time to dress up, spending time with family and concocting some great pumpkin creations," Sonia said.

"The fact that we can work with FreshChain to create themed events on its platform without losing the core traceability elements is wonderful. Ultimately, we want people to love our product and look for it in-store as well as engage with us and leave valuable feedback."

FreshChain provided content that introduced the growers, the farm and the product. It was described as both exquisitely ugly and beautiful at the same time, which made a few people laugh and nod in approval.

"The goal is to work hard, have fun and make curiosity of fresh food a strategic priority for health, wellness and our nations prosperity. Seeing a smile on a kids face as they place their pumpkin design on the table with lit candle or making noughts and crosses with celery sticks should be celebrated," Greg concluded.

Find out more

Please contact Greg Calvert at gcalvert@freshchain.com.au or visit freshchain.com.au.

About FreshChain: Traceability from farm to fork

FreshChain is a fully integrated, blockchain enabled, paddock to plate assurance system that verifies the food you eat. In just a few seconds, it can provide traceability throughout the supply chain and provide real time insights to make better decisions during a product's lifecycle.

Using the latest in artificial intelligence, machine learning and deep learning algorithms, the business combines real world practicality with the smart technology.

Further details about FreshChain, including an introductory video, can be found on its website.

Project Lead Tim O'Hare.

Purple sweet corn was investigated during the *Naturally Nutritious* project.

Researchers delved into the concept of orange capsicums during the five-year project, which was conducted at The University of Queensland.

Naturally Nutritious: Five-year project comes to an end

It has been shown that education around the benefits of healthy eating does not necessarily lead to consumers eating more fruit and vegetables. To address this issue, the *Naturally Nutritious* project investigated the potential to increase the nutrient density of a range of fruit and vegetables, such that increased nutritional benefit would be possible without necessarily having to increase intake. *Vegetables Australia* has published excerpts from the project's final report, collated by Project Lead Tim O'Hare from the University of Queensland, in collaboration with Hort Innovation and the Department of Agriculture and Fisheries in Queensland.

Over the course of five years, the *Naturally Nutritious* project investigated the health benefits of a range of fruit, vegetables, and nuts.

The project aimed to capitalise on the already existing knowledge that fruits, vegetables and nuts are good for you, and to explore the possibilities of further enhancing their health benefits through increasing their nutrient density.

A wide range of fruit, vegetables, and nuts presently exist; and within each of these, numerous varieties also exist with a huge diversity in their nutrient content. Some of these nutrients are linked to the colour of the fruit or vegetable, while others are much less obvious.

The project aimed to document the range of specific nutrients, and to determine if it is possible to further enhance these levels through targeted breeding programs. The *Naturally Nutritious* project also investigated which fruit, vegetables and nuts make you eat less by making you feel full, and those that keep you feeling full for longer (see box-out).

Vegetables on the menu

Purple sweet corn

Among the vegetable components of the project was purple sweet corn. Purple sweet corn is non-GMO and has been naturally developed from combining the sweet flavour of sweet corn with Peruvian purple maize, a traditional food of Peru (and the Incan Empire). It tastes very similar to standard yellow or white sweet corn, with an additional slight raspberry undertone, but has a very different appearance, being purple with a white centre.

The purple sweet corn contains a pigment called anthocyanin, which has been linked to lowering blood pressure and cholesterol levels. While normal yellow sweet corn does not contain this pigment, it does contain lutein and zeaxanthin, which are important for macular degeneration, a very different health issue.

From the initial consumer focus group, purple sweet corn was generally approved of as a novel product, with an overwhelmingly positive response from consumers. It is considered that education regarding the nutritional benefits of purple sweetcorn would be also important for consumers. From the feedback, purple sweetcorn could be sold at a premium price point – akin to pomegranate.

Orange capsicum

Among all the reasons behind blindness in people in Australia, studies have showed that age-related macular degeneration (AMD) is the leading cause. The macula of the eye is the central region of the retina that we use for reading, driving, recognising faces, thus the degeneration of the macula leads to debilitating 'central' blindness.

PhD student Rimjhim Agarwal pictured with the orange capsicum.

Zeaxanthin and lutein are carotenoid pigments derived from plants that we absorb from our food to form protective macular pigments. They play a protective role in shielding the retina from light damage and reducing the progression of AMD.

A comparative analysis of different fruits and vegetables identified orange capsicums as the richest source of zeaxanthin by far. One capsicum (typically 300 grams) was found to contain zeaxanthin levels equivalent to greater than 30 supplement tablets, with two milligrams of zeaxanthin the daily recommended dose. Some varieties of orange were found to contain less zeaxanthin, while some contained more.

A consumer focus group study was conducted to evaluate the consumer acceptance of orange capsicums bio-fortified with zeaxanthin. The focus groups involved discussions with young professionals, couples with children, and empty nesters.

Overall, the concept of orange capsicums – biofortified with zeaxanthin – was well-received across the different demographic groups. Consumers were attracted by the vibrant orange colour and indicated that they would purchase them to try, based on the visual appeal. The health benefit of zeaxanthin was more appealing to the empty nester older demographic group, who were aware and concerned about macular degeneration.

Industry feedback

Although orange capsicum cultivars are presently available to growers, the lack of orange capsicums on the market is largely a decision by larger supermarkets, in which the orange capsicum are just seen as another colour of capsicum. It is possible that yellow capsicums (that do not contain zeaxanthin) may be currently preferred to orange capsicums, possibly due to a larger visual colour difference to red and green capsicums – although this has not been confirmed.

In glasshouse-grown environments, the decision of growers to grow or not grow orange capsicums is based largely on market demand. For field-grown capsicums, the price of seed becomes an important factor, with seed of red cultivars being significantly cheaper than orange capsicums.

Based on the discussions with the vegetable industry, there is a need for natural preservation solutions that are environmentally friendly for storage life extension of fresh-cut capsicum. A storage period of more than one week for fresh-cut capsicum is attractive for industry adoption.

A pilot study for shelf-life extension of fresh-cut capsicums using plant extracts indicated that the natural plant extracts used were very effective as an antimicrobial preservation solution. Plus, there was significant reduction of microbial counts during the two-week storage period at chilled temperature. Undertaking full-scale commercialisation with an industry partner will need further trials for scale up and validation at factory premises.

Promoting nutritional value of hort products: Satiety and satiation focus

Taken together, the large body of data obtained from the *Naturally Nutritious* project can be summarised into a number of key messages that could be used to promote the nutritional value of horticulture products in general or specific crops in particular:

- Fruits, vegetables and nuts can deliver short-term and long-term fullness comparable with protein-rich foods.
- For immediate fullness, a hard tissue structure, requiring more chews prior to swallowing, will lead to more efficient satiation than softer tissue structures.
- From previous data, juiced or pureed fruits and vegetables are less efficient in providing both satiation and satiety compared with intact plant tissues.
- The factors determining effective satiation are different to those for satiety, so marketing messages can be tailored accordingly e.g., cut carrots emphasising calorie-efficient fullness or macadamia nuts emphasising long-lasting fullness.
- Food factors mostly determine the portion size for comfortable fullness, so there is the opportunity to define relevant pre-packed serving sizes to effectively achieve satiation.
- However, the subjective perception of fullness as satiation or satiety is mostly determined by characteristics of the individual (physiological and psychological).

These findings led to a number of identifiable industry opportunities:

- Identification of horticulture product portion sizes for efficient satiation or satiety.
- Marketing messages on the effective short- and longer-term fullness provided by intact horticultural products, comparable with protein foods.
- Raw vegetables such as carrots for energy efficient short-term alleviation of hunger.
- Nuts for effective longer-term satiety.

Find out more R&D

Please contact Associate Professor Tim O'Hare, Principal Research Fellow at the Queensland Alliance for Agriculture and Food Innovation (QAAFI), The University of Queensland at t.ohare@uq.edu.au.

The final report for this project has been made available on InfoVeg. Readers can search 'HN15001' on the InfoVeg database: ausveg.com.au/infoveg/infoveg-database.

Naturally Nutritious has been funded by the Hort Frontiers Health, Nutrition and Food Safety Fund, part of the Hort Frontiers strategic partnership initiative developed by Hort Innovation, with co-investment from the University of Queensland and contributions from the Australian Government.

The Queensland Alliance for Agriculture and Food Innovation (QAAFI) is a research collaboration between University of Queensland and the Queensland Government through the Department of Agriculture and Fisheries.

Project Number: HN15001

hort frontiers | HEALTH, NUTRITION & FOOD SAFETY FUND

VLM leaf mining damage on siratro in Queensland. Image courtesy of Dr Elia Pirtle, Cesar Australia.

Liriomyza flies in-focus: Have you seen an exotic leafminer?

Exotic leafminers have been the centre of our attention recently – and with good reason. There are three *Liriomyza* leafminer species that are now present in Australia: Vegetable leafminer, serpentine leafminer and most recently, American serpentine leafminer. AUSVEG Biosecurity Officer Zali Mahony reports.

Leafminers are small flies that belong to the family Agromyzidae, and concerningly, each species has a wide host range including many vegetable, ornamental and legume crops. Yield losses vary but leaf damage can reduce photosynthetic activity, causing premature leaf drop. These pests are a major threat to Australia's vegetable industry.

Current situation in Australia

There are three exotic *Liriomyza* leafminers now present in Australia – vegetable leafminer (VLM; *Liriomyza sativae*), serpentine leafminer (SLM; *Liriomyza huidobrensis*) and the most recently detected American serpentine leafminer (ASLM; *Liriomyza trifolii*).

VLM was first detected in 2008 in the Torres Strait Islands and in 2015 at the tip of Cape York Peninsula in Queensland. No further detections have been made. SLM was first detected in western Sydney, New South Wales in October 2020 and a month later in Queensland's Fassifern Valley. The pest is now considered established in both states.

Most recently, ASLM was detected in July 2021 in the Torres Strait Islands and across northern Western Australia. There have since been further detections in Kununurra (WA), Darwin and Katherine in the Northern Territory, and the Northern Peninsula Area of Cape York (QLD). There has been a single detection in Broome (WA).

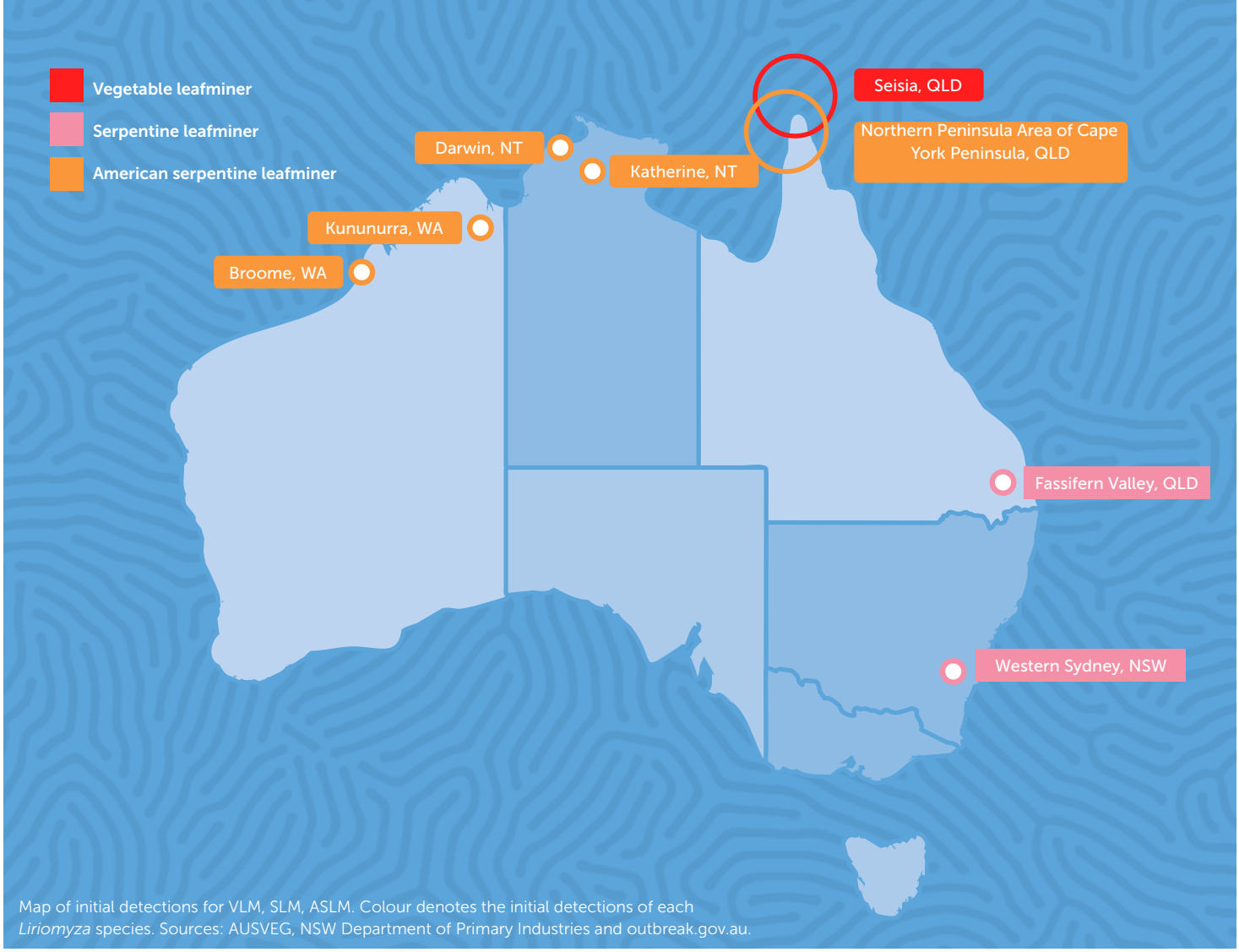
Containment versus management strategy

All three species are considered National Priority Plant Pests. With each pest detection, the Consultative Committee on Emergency Plant Pests (CCEPP) – Australia's key technical body for coordinating national responses to emergency plant pest incursions – is responsible for determining whether a pest is technically feasible to eradicate.

Following their detection, the CCEPP determined that VLM and ASLM are not technically feasible to eradicate largely due to the pest's biology, current distribution and wide host range.

A **containment strategy** is in place for ASLM due to its current distribution limited to some locations in northern Australia. Movement restrictions from the far northern biosecurity zones are in place and have been successful in previously preventing further spread of VLM. For ASLM, delimiting surveillance is still being conducted to determine any potential further distribution of this pest.

SLM was also determined not technically feasible to eradicate due to the extent of the pest's infestation across NSW and QLD, its biology and wide host range. As a containment strategy was not feasible, a **transition to management** by industry began in late 2020.



Map of initial detections for VLM, SLM, ASLM. Colour denotes the initial detections of each *Liriomyza* species. Sources: AUSVEG, NSW Department of Primary Industries and outbreak.gov.au.

Lifecycle and damage

The lifecycle for *Liriomyza leafminers* is generally consistent across species. Adults feed on leaves and females lay eggs just below the leaf surface of host plants. This causes 'stippling' damage that can be visible in some instances and can cause a high risk of fungal and bacterial infection for the plant.

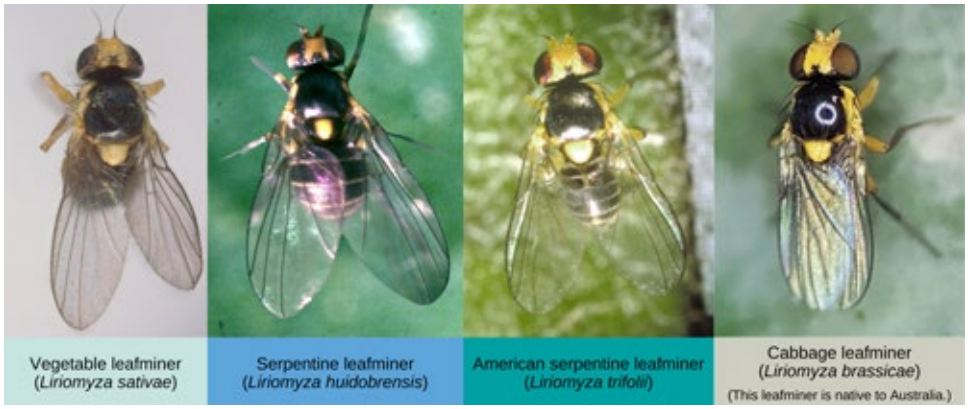
Eggs hatch between 2-5 days after being laid. Eggs are too small to be seen by the naked eye, so a seemingly healthy plant may be harbouring the pest without us knowing. Inside the leaf tissue, larvae begin to feed within the leaf creating tunnels or mines that become larger as the larvae matures. These leaf mines can reduce photosynthetic activity, causing premature leaf drop.

Larvae then exit the leaf to transition to adults (pupate) externally to the leaf, usually in soil below the plant from which adults emerge 7-14 days later. Other species of *Liriomyza* leafminers can transition to adults within the leaf tissue, but this is not the case for VLM, SLM or ASLM.

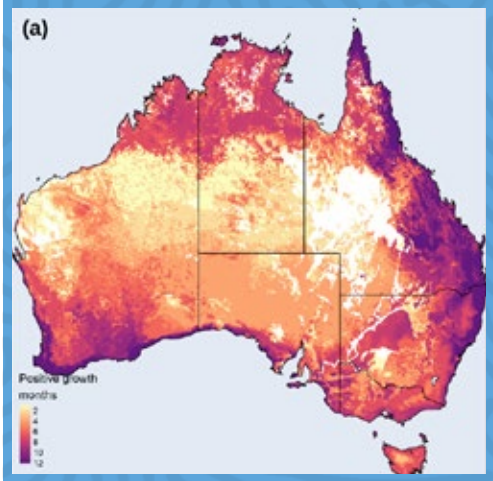
The duration of *Liriomyza* spp. lifecycles does vary with temperature. Favourable environmental conditions can reduce the time it takes for an entire lifecycle, meaning several generations can occur in one season. In unfavourable environmental conditions, the cycle takes longer.

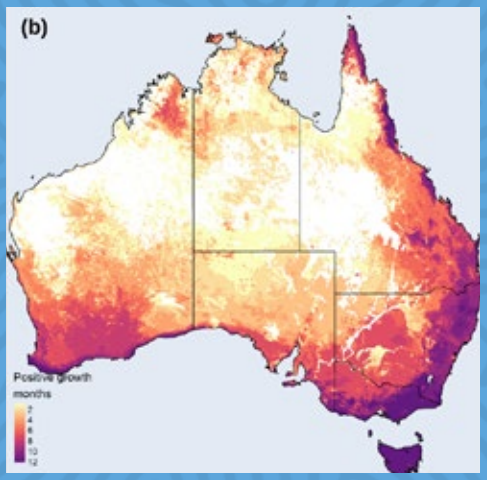
Identification

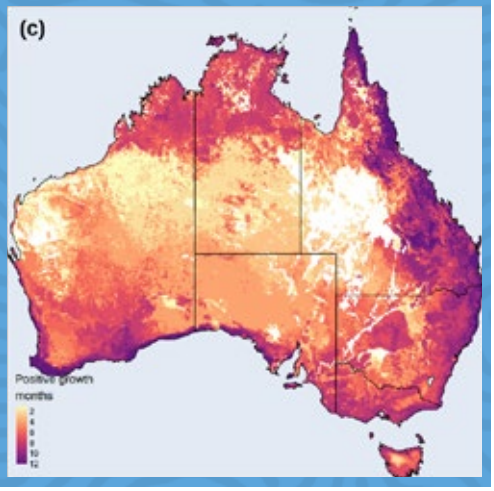
Adult *Liriomyza* species of leafminers are difficult to identify in the field, and molecular diagnostic tests are necessary to confirm species. Exotic species also look similar to native leafminers that are prevalent in Australia (e.g., *Liriomyza brassicae*). Stippling and leaf mine damage do not differ between *Liriomyza* species, so cannot be used to separate species. Stippling and leaf mines are the key indicator to look for when monitoring crops and surrounding vegetation. →



It is difficult to identify *Liriomyza* leafminers based on morphology. Molecular diagnostics are required. Images courtesy of (left) Pest and Diseases Image Library, Bugwood.org; (middle and right) Central Science Laboratory, Harpenden, British Crown, Bugwood.org.







The aggregated yearly establishment potential of (a) VLM, (b) SLM and (c) ASLM as the number of months across the year with increasing population sizes based on temperature and moisture constraints. Images courtesy of Cesar Australia.

Risk of spread and establishment

Major risk pathways of leafminers into and across Australia is by the importation of infested ornamental host plants and cut flowers. Leafy vegetables and seedlings can move leafminers across Australia. Natural pathways (such as wind) or human-assisted entry can also occur at the borders (e.g., on plant material illegally imported).

Globally, *Liriomyza* leafminer dispersal and establishment has rapidly occurred, with populations found on most continents now. Many important vegetable production regions in Australia have the climatic conditions suited to *Liriomyza* spp. establishment.

Climate models and existing pest knowledge have been used to determine the pest's risk of establishment in regions across Australia. A predictive model based on temperature, moisture constraints and predicted dominant stressors (cold, heat, desiccation) was created by Cesar Australia as part the strategic levy investment *RD&E program for control, eradication and preparedness for vegetable leafminer* (MT16004), which developed a contingency plan for each pest (see further reading section below).

VLM and ASLM are suited to similar climatic conditions and are predicted to likely establish along the northern, eastern, southern and southwestern coastline of Australia and Tasmania (see map images a and c). Both are heat tolerant species, meaning they will thrive in tropical conditions.

However, they are not only tropical pests and are also suited to temperate regions. VLM and ASLM are not as suited to cool-climate regions as other species, but they are still predicted to be able to maintain populations year-round across Australia. ASLM has been reported to have delays in development (diapause) at low temperatures, which will allow them to survive cold conditions, until warmer weather arrives.

Comparatively, SLM adults are reported to be more resilient and able to survive winter temperatures (as low as -11.5°C), with pupae able to survive and transition to adults in temperatures between 5.7°C to 30°C. SLM is most likely to establish along the eastern, southern and south-western coastline of Australia and Tasmania (see map image b).

Pest management

International management of *Liriomyza* leafminers includes the use of natural enemies such as parasitoid wasps that attack larvae. Research has indicated that exotic *Liriomyza* leafminers are rapidly targeted by Agromyzid parasitoids, and many are reported to affect these pests overseas. This is promising for future management as these parasitoids tend not to be host-specific, and Australia has several native species that are likely to affect these leafminer pests. There is also initial evidence of the presence of native predators in the Australian environment.

Pest management practices should be mindful of preserving natural enemies and consider the use of pesticides that don't harm these beneficial insects.

SLM stippling damage caused by adult feeding and egg laying. Image courtesy of Bahram Fayaz, H.M.Clause.

Chemical control options

Liriomyza leafminers can rapidly develop resistance to various chemical groups – particularly organophosphates, carbamates, diamides and pyrethroids – which can make control difficult. Application of broad-spectrum insecticides often results in larger leafminer populations as these insecticides reduce the reservoir of natural enemies (parasitoid wasps as well as other generalist predators like spiders), which keep leafminer populations in check. Translaminar and systemic chemical options support better support the management of leafminers as they are not harmful to the natural enemies.

Several insecticides are used overseas for the control of exotic leafminers, including – but not limited to – abamectin, azadirachtin, chlorantraniliprole, cyromyzine, indoxacarb, spinetoram and spinosad.

There are several minor use permits currently available for *Liriomyza* leafminers for the vegetable and potato industry. For more information, please visit horticulture.com.au/growers/serpentine-leafminer-update.

Further reading

- Management of leafmining flies in vegetable and nursery crops in Australia: bit.ly/2X1vkps
- Monitoring for serpentine leafminer in Australia: bit.ly/3D21UqC
- AUSVEG biosecurity alerts: bit.ly/3hjOjTo
- Plant Health Australia – *Liriomyza* spp. fact sheets, diagnostic protocols and contingency plans:
  - Vegetable leafminer: bit.ly/3tuLDau
  - Serpentine leafminer: bit.ly/2X59Rfj
  - American serpentine leafminer: bit.ly/38P6gEE

Find out more R&D

Please contact the AUSVEG Extension & Engagement Team on 03 9882 0277 or email science@ausveg.com.au.

Leafminer snapshot

- Adult flies are between 1-1.7 mm.
- Adults are a mixture of black and yellow which differs for each species.
- Larvae are initially transparent transiting to yellow-orange as they mature.

Commodity Profile:

Cabbage

1,294 tonnes

of cabbage was exported by Australia for the year ending June 2020. 51% of exported fresh cabbages were sent to Singapore.

Source: Australian Horticulture Statistics Handbook 2019/20

78,918 tonnes

of fresh cabbage was produced and valued at $59.5 million, with 15% sent to processing for the year ending June 2020. The wholesale value of the fresh supply was $66.2 million, with $56.8 million distributed into retail and $9.4 million into food service.

Source: Australian Horticulture Statistics Handbook 2019/20

Cabbage is rich in nutrients and an excellent source of vitamin C and dietary fibre. It supplies your body with vitamin K, which is important for the health of your bones and for the formation of blood clots after injury.

Source: The Better Health Channel

In 2016, a project entitled *Pre-harvest practices that will increase the shelf-life and freshness of vegetables* was completed. This comprehensive review aimed to compile current knowledge on the effects of pre-harvest factors on shelf-life and quality of vegetables (including cabbage). The final report can be found by searching 'VG14025' on the InfoVeg database: ausveg.com.au/infoveg/infoveg-database.

Veggycation® states that storing red cabbage at 0°C optimises storage life. Early crop round cabbage can be stored 3-6 weeks, while late crop cultivars can be stored for up to six months. For the latter, storage at -0.5°C is sometimes recommended.

Cabbages are sensitive to ethylene, which causes leaf abscission and yellowing. Adequate ventilation during storage is important to maintain low ethylene levels. It does not increase the disorder 'black speck' or 'pepper spot'.

Source: Veggycation®

The Better Health Channel explains that cabbage seeds arrived in Australia on the First Fleet in 1788 and were planted on Norfolk Island. The popularity of this vegetable increased until, by the 1830s, the markets of Sydney were doing a roaring trade in cabbages.

In 2012, Hort Innovation – in partnership with AUSVEG – sought research to explore the potential for optimising portion sizes to drive increased purchase and consumption. The research focused on six vegetables including carrots, pumpkin, cabbage, cauliflower, celery and broccoli. Search 'VG12094' on the AUSVEG, InfoVeg database to read the final report.

Workshop participants using footbaths prior to walking on-farm. Image courtesy of Maddy Quirk.

Green peach aphid specimens pictured at the SA Produce Market Workshop held in Adelaide in September. Image courtesy of Yanyu Liang, AUSVEG SA.

Serpentine leafminer adults on a yellow sticky trap in the Sydney Basin. Image courtesy of Bahram Fayaz, HM Clause.

Peri-urban biosecurity focus for vegetable growers

In spring 2021, the AUSVEG-facilitated Peri-Urban Biosecurity Program held three workshops to update vegetable growers on current pest and disease threats, as well as provide biosecurity advice and discuss the latest R&D activities in this space. Maddy Quirk reports.

The AUSVEG-facilitated Peri-Urban Biosecurity Pilot Program – funded by the Department of Agriculture, Water and the Environment – is an 18-month vegetable industry-focused program that commenced in January 2021.

Project Coordinator Maddy Quirk is working with vegetable growers, consultants, and agronomists to form pilot surveillance networks across three pilot locations: Virginia, South Australia; Werribee, Victoria; and Greater Sydney, New South Wales.

Three recent workshops – one face-to-face and two virtual – have recently been held, targeting priority plant pests and diseases specific to each region.

Market breakfast

In September, AUSVEG and Primary Industries and Regions South Australia – South Australian Research and Development Institute (PIRSA-SARDI) hosted a vegetable industry pest and disease management breakfast at the South Australian Produce Market.

Topics included farm biosecurity and the 'Clean Your Farm' program, as well as current biosecurity threats of fruit and vegetables, specifically addressing tomato potato psyllid and fall armyworm.

Disease diagnostics and sampling procedures in horticulture were also discussed with a focus on how industry can access SARDI's pest and disease diagnostic services. An update on the iMapPESTS cutting-edge mobile plant pest surveillance units was also provided (turn to page 72 to read the latest on the iMapPESTS project).

Sydney Basin webinar

Due to COVID-19 restrictions, the Sydney and Werribee workshops were moved online. A Sydney-based virtual masterclass saw Shannon Mulholland from the New South Wales Department of Primary Industries, Crop Doc Consulting's Dr Len Tesoreiro and Maddy Quirk discussing topical pest and disease issues across the Sydney Basin with 37 growers, agronomists, and service providers in attendance.

After consulting industry about what they wanted to learn more about, the key topics included tospoviruses (impatiens necrotic spot virus and tomato spotted wilt virus in hydroponic lettuce and tomatoes), serpentine leafminer in hydroponic lettuce and other crops, and cucurbit diseases.

Werribee event

At the time of writing, the Werribee webinar was yet to take place but was on track to be equally successful. AUSVEG – in partnership with Agriculture Victoria and NielsenIQ – was set to discuss priority pest and disease issues being faced across Werribee, including the state of silverleaf whitefly, vegetable viruses (tomato yellow leaf curl virus, alfalfa mosaic virus, cucumber mosaic virus, and tomato spotted wilt virus), and fungal and bacterial pathogens.

Growers and consultants across Werribee, the Sydney Basin and Virginia are encouraged to contact Maddy to express their interest in the project and stay up-to-date on peri-urban biosecurity across the pilot regions.

For those who missed the workshops, webinar recordings are available on AUSVEG's YouTube channel: youtube.com/ausveg. Be sure to keep an eye out for the next round of workshops across the three pilot regions, which are set to take place in late 2021 and early 2022.

Find out more R&D

Please contact AUSVEG Project Officer Maddy Quirk on 03 9882 0277 or email madeleine.quirk@ausveg.com.au.

The Peri-Urban Biosecurity Pilot Program is funded through the Department of Agriculture, Water and the Environment – Plant Biosecurity and Response Reform.

Minor use permits

Permit Number	Crop	Pesticide Group	Active	Pest/Plant disease/ Target weed	Date Issued	Expiry Date	Permit Holder	States
PER11764 Version 5	Snow peas and sugar snap peas (field and protected cropping)	Fungicide	Spiroxamine	Powdery mildew	01-Jul-15	31-Aug-26	Hort Innovation	All states and territories except VIC
PER86482 Version 2	Taro	Fungicide	Thiabendazole	Taro post-harvest rots and moulds *(Athelia – Sclerotium rolfsii)* *(Fusarium)* *(Penicillium)*	04-Dec-18	31-Dec-22	Hort Innovation	All states and territories except VIC
PER82459 Version 2	Various vegetables. Please refer to the APVMA website for full list.	Herbicide	Clethodim	Various grasses as per product label	19-Apr-17	30-Sep-26	Hort Innovation	All states and territories
PER14210 Version 5	Lettuce (Head, Cos, and leafy varieties) –grown in protected situations only.	Miticide	Bifenazate	Two-spotted mite	17-Oct-13	31-Oct-26	Hort Innovation	QLD, SA and WA only

Fungicide label extension

In September 2021, Zampro label extension was approved for the control of downy mildew in various vegetables as part of Hort Innovation Strategic AgVet Grant Funded Projects *Generation of data for permit pesticide applications in horticulture crops* (ST16006; bulb vegetables, leafy vegetables and beetroot) and *Generation of data for pesticide applications in horticulture crops 2018* (ST17000; cucurbits).

These multi-industry projects have been funded by Hort Innovation, using industry research and development levies, co-investment from the Department of Agriculture, Water and the Environment and contributions from the Australian Government.

This included data generation to support the following:

- Bulb vegetables (including bulb onion, spring onion).
- Leafy vegetables including head lettuce and brassica leafy vegetables (field and protected).
- Beetroot.
- Cucurbits (field and protected).

For further details, please contact Hort Innovation Regulatory Affairs – Crop Protection Manager Jodie Pedrana at jodie.pedrana@horticulture.com.au.

Tasmanian Farmers and Graziers Association

Tasmanian growers are continuing to experience good demand for fresh and processing vegetable crops. An abundance of rainfall during winter and spring delayed some plantings but ensured water storages were full across the state.

Investment in irrigation continues with not only managed water schemes, but also in above and below ground farm improvements towards pipelines, drainage and pivot /linear construction.

Land values in all areas have had noticeable increases, partly attributed to either existing or potential infrastructure that provides efficient management and irrigation of crops and livestock. We have certainly come a long way from solid set sprinklers shifted by hand to mobile phone operated pivots covering large areas.

The disruptions around the world have had certain effects here with postponements of capital investment in some situations and delayed delivery of products and machinery in others. Prices for most inputs for Tasmanian vegetable growers have risen sharply. At the moment, the most valuable items we can use are a pen, piece of paper and a calculator.

Our costs of production have been shot to pieces this year and it will be important for everyone in the industry to navigate their way through challenging times. Whatever the season brings, we always get to harvest and put top quality produce on the shelf.

We deal with many issues on a daily basis, and we need to have our voice heard while our politicians are arguing about air.

Farmers, packers, processors and transporters can't be left to carry the can in the climate debate. People need to eat during all these climate emergency conferences too.

My main concern is that our climate strategy for Australia will be dictated by the European Union (EU) – either in the form of Carbon Dioxide tariffs for exported goods, or simply market restriction for countries that don't bow to the environmental demands of the EU.

Tasmania is already a positive contributor to low CO^2 emissions with our hydroelectricity schemes, but this is largely due to our state being 60 per cent World Heritage, National Park and managed forests – a fact often forgotten.

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NSW Farmers' Association

NSW Farmers has responded to the looming harvest worker shortage with the release of a 10-point plan addressing short- and long-term solutions to tackle the ongoing crisis. The Association has developed this plan in response to the large number of concerns raised by our members, and in light of fast approaching horticulture peak harvests.

There have been longstanding challenges in attracting workers to agriculture, particularly domestic workers; however, the pandemic has forced the industry to adapt very quickly to having fewer workers entering the state. In the years prior to the onset of COVID-19 related border restrictions, up to half of the state's harvest workforce was comprised of overseas workers. Imposed international and state border restrictions heavily limit the movement of workers to farms in time for fruit and vegetable harvests, raising serious concerns that produce will be left to go to waste for the second year in a row.

In the short-term, we need certainty and clarity for farm workers amid changing conditions of travel and border restrictions, ensuring mobility of workers across state borders. We also need timely inflow of international seasonal workers through schemes such as the Pacific Australia Labour Mobility (PALM) scheme and the newly introduced Agriculture Workforce Visa. The recent announcement and implementation of the Agriculture Workforce Visa is one of many steps needed to tackle the sectors workforce shortage.

Also needed is better coordination to overcome the accommodation and transport challenges facing those interested in seasonal labour.

NSW Farmers has called for an expansion of the 'Help Harvest NSW' program to include coordinators as the conduit between interested workers, farm businesses, government agencies and relevant stakeholders in the regions to streamline efforts for getting more people to farms. Furthermore, an Agriculture Workforce Working Group comprising government agencies and industry stakeholders would greatly assist efforts to find timely and sustainable solutions to seasonal worker shortages in agriculture.

Different regions face their own sets of challenges, and we have called on the government to provide grants to implement novel or localised initiatives to attract and/or facilitate the COVID safe movement and stay of seasonal workers. Agility in training is required, and we support expanding access to fully funded short courses relevant to agriculture and primary industries.

Attracting domestic workers to agriculture also involves targeted communication campaigns highlighting the abundance of opportunities in agriculture, and NSW Farmers has called for an industry-wide coordinated campaign.

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Growcom

As part of its policy platform ahead of the last state election, Growcom – together with colleagues on the Queensland Horticulture Council – called on the next Queensland Government to support the development of an industry strategic plan for the state's fresh produce sector.

We're a sector worth $3 billion to the state's economy, responsible for growing wealth and creating new jobs in many regional communities, and yet lack any vision of where we are headed and how we are going to get there. Too much is being left to chance.

So, we're particularly pleased that the Palaszczuk Government (Agriculture Minister Mark Furner and his department) are lending their welcome support to this important initiative.

Growcom – on behalf of the fresh produce sector – has been charged with bringing key stakeholders along the supply chain together and guiding the development of the strategic plan, called Future Fields.

To be successful, Future Fields must be owned by all stakeholders with a role to play in bringing its vision to life including growers, their suppliers, their buyers, government agencies, and those in research, banking, insurance, logistics, marketing and processing.

With a broad scope, we'll be focusing our attention on just a few key fields where there's big gains to be made with multiple parties coming together, and solutions that require collaboration.

Future Fields is about the horticulture industry and supply chain partners joining forces and taking their futures into their own hands. This approach is underpinned by the understanding that people who take responsibility in a situation have the best chance of taking actions that will make a difference.

While the strategy enjoys the explicit support of the Queensland Government, it is not a government document and nor will the actions arising from Future Fields necessarily rely on further government support or funding.

The success of Future Fields then will be a product of how much we're willing to put into it.

The view at Growcom is that this is an exceptionally important opportunity to set up the Queensland fresh produce sector and supply chain for years to come, and to ensure we remain the premier state for horticultural production, supply chain innovation and food processing.

We believe this view is widely shared among our friends and colleagues in horticulture and along the supply chain.

Starting with a summit of industry leaders and experts held in late October, our consultation process will extend into February 2022 and include workshops in each major production region.

For more details on how you can get involved and contribute, please visit the Growcom website: futurefields.info.

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vegetablesWA

Access to labour continues to be a key issue for growers in Western Australia as it is throughout the rest of Australia.

The announcement of the Agriculture Visa has been welcome news; however, growers need to be aware of the timelines for the development of the visa and understand that the arrival of any significant numbers of workers into Australia is not likely to occur until mid-2022.

Growers should also check any claims being made by labour and immigration providers against official Federal Government information to ensure that what is being offered can actually be delivered. vegetablesWA will continue to work with industry and government, so WA growers can take advantage of the Ag Visa and other opportunities to source the labour they need.

Sea freight access and costs in WA are ongoing issues for the industry. While exporters are experiencing the direct impact of increasing costs of shipping containers, along with freight and handling charges, most growers are reporting increases in prices and supply issues for farm inputs. These price increases are largely attributed to international freight disruptions, so this is an issue for the whole industry. vegetablesWA is working with the State Government to look at ways to address some of the local port and logistical issues that are adding to the global freight disruption.

vegetablesWA held its Annual General Meeting in October. All Committee of Management members are continuing in their roles for the next 12 months except for Lauren East, who has stepped down.

Lauren has served on the committee for the past three years, and we thank her for her contribution and wish her well. We are pleased to welcome Renae Adams from Twin Lakes in Manjimup to the committee. Renae brings great skills, experience and networks to the committee through her work with Twin Lakes as Chief Financial Officer and other horticultural businesses in WA's south.

vegetablesWA is pleased to partner with AUSVEG to deliver the WA component of the Hort Innovation funded VegNET 3.0 extension project. We are in the process of recruiting a new Regional Development Officer for the project and look forward to working with the other delivery partners to extend R&D to the vegetable industry.

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AUSVEG SA

As we move closer to the March 2022 State Election, AUSVEG SA is engaging with all sides of politics to put forward an agenda to grow horticulture in the state.

Central to our discussions have been breaking the impasse on long-standing issues such as a sustainable pricing model for the Northern Adelaide Plains Irrigation scheme and securing funding for key infrastructure projects, such as Gawler River Flood Mitigation works.

In addition, securing long-term access to labour is a key priority for our association moving forward; in particular ensuring South Australia has the access to quarantine places and flights necessary to facilitate in-bound workers through both the Seasonal Worker Scheme and soon to be finalised Agriculture Visa.

With our industry located in many of the expected battleground states in the coming election – be it in the hills or Adelaide's north – it is AUSVEG SA's intention to have many of the longstanding issues impeding our industry feature in the upcoming election.

Likewise, AUSVEG SA continues to engage strongly with the AUSVEG national policy team around the development of policy for the expected Federal

Election in early 2022. Key issues such as access to labour, water issues and infrastructure are expected to feature and AUSVEG SA will ensure that the perspective and views of our SA growers are accounted for in these critical national discussions.

After a tough couple of years with COVID-19, it is clear that both sides of politics have developed a new-found interest in food production as a critical industry and the potential for agriculture (and horticulture) to help lead Australia's recovery moving forward.

It is critical we harness this interest and put forward our vision as a collective industry at a time when the Federal Government is allocating significant funds towards areas like drought mitigation, biosecurity and other areas to assist primary production.

On the program side, AUSVEG SA has recently renewed the VegNET – South Australia extension project for another five years.

This important project funds our R&D program of events and grower support, so we are thankful that we will continue to be delivering it to industry for a number of years to come.

In the final quarter of 2022, we will hold our first-ever Ag-tech Meetup Breakfast at the SA Produce Market. The breakfast will bring together a number of Ag-tech start-ups in the state along with key growers with a view to better understanding the needs of horticulture.

I am hopeful that better dialogue and understanding of the opportunities in ag-tech will help assist our growers to trial new emerging technologies available in their business. We are already seeing some exciting work in areas such as field robotics trials in the Mallee potato industry, and AUSVEG SA wants to ensure that we support industry to build these important relationships with ag-tech moving forward.

Jordan Brooke-Barnett
AUSVEG SA
Chief Executive Officer

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NT Farmers Association

It has been a busy season across the Top End, and the challenges of labour and workforce have continued. Many of our growers adapted their farm management plans and total areas of crops planted to accommodate these ongoing challenges.

We are approaching the end of the Northern Territory's mango season. NT Farmers assisted members to access staff by chartering two flights (one from Vanuatu and one from Samoa) to bring seasonal workers in. This was achieved in collaboration with other horticultural industries and organisations, including the Pacific Labour Scheme.

As the Harvest Trail Service Provider for the Top End region (including the top end of WA), NT Farmers has supported farmers to access Australian workers. NT Farmers continues to advocate for improvements to on-farm quarantine arrangements in the Territory, and approval from the NT Government Health Department to bring workers in from other countries. The Australian Agriculture Visa will support requirements for next years' workforce.

NT Farmers has developed a Research and Development Sub-Committee to assist in setting the priorities and direction of R&D projects that will be undertaken in the Northern Territory. The Committee is made up of government, universities and industry and will be doing a call for R&D project ideas early in the new year.

As part of the VegNET 2.0 water efficiency projects, soil moisture probes at regional vegetable sites have finished for the year. These probes will start again next year at the commencement of the 2022 growing season. Data has been collected, and NT Farmers will work with the grower/s on how water efficiencies can be made in preparation for the next season. This data will be used to promote the value of using this technology to assist with productivity.

VegNET 2.0 has officially ended and has now moved into VegNET 3.0. The five key focus areas –Integrated Pest Management (IPM), Water Efficiencies, Soil Health, Biosecurity and Protected Cropping – will continue to be targeted over the next five years to support and enhance sustainable practice change for industry. These align closely with the National Vegetable Extension Plan 2020-2026.

At the time of printing, the wet season will be upon us – time for a well-deserved break!

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AUSVEG VIC

AUSVEG VIC recognises the future benefits of Victoria lifting its COVID-19 vaccination rate and is supportive of greater access for rural and regional communities to get the jab.

However, we will continue to collaborate with the Department of Jobs, Precincts and Regions (Agriculture Victoria) and the Department of Health and Human Services regarding COVID-19, vaccinations and the widespread impact the pandemic will have on farms in the latter half of 2021 and early 2022. AUSVEG VIC will also continue to pose growers' questions and concerns to these organisations.

Currently, there is a large information gap around the mandate. Legal practitioners are currently unable to specify what this will mean for Victorian growers. AUSVEG VIC is speaking with various government departments and is awaiting legal advice to clarify the rights and obligations of employers and employees.

In the meantime, AUSVEG VIC encourages all members to contact their GP if they have any medical concerns or questions regarding the COVID-19 vaccine. We will keep members updated with any further developments on the developing situation, including a response from Victorian Agriculture Minister, the Hon. Mary-Anne Thomas, and her policy team about the possibility of rapid antigen testing.

Additionally, AUSVEG VIC is in constant communication with Agriculture Victoria's Seasonal Workforce Coordinators, labour hire companies, Minister Thomas's office and growers surrounding the Victoria-Tasmania quarantine extension announcement.

In September 2021, AUSVEG VIC welcomed the long-awaited announcement that the Victorian Government will extend the quarantine pathway with Tasmania to allow up to 1,500 workers from the Pacific Islands as part of the Seasonal Worker Programme and Pacific Labour Scheme.

However, it has been noted that there are large delays for many growers, as the workers are only able to present on-farm in December. This is due to the large volume of workers coming into Victoria via the Tasmania hotel quarantine system. AUSVEG VIC will continue to monitor the situation, and members with labour issues are encouraged to reach out and share their concerns.

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