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GROWER
2024 AUTUMN
VEGETABLES / POTATOES / ONIONS

SPOTLIGHT ON THE
Lockyer Valley

Supermarket inquiries ramp up

Latest insights from the Horticulture Statistics Handbook

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Cover. Gatton AgTech, Nov 2023 brought together the latest in technology for growers to explore at the Gatton Smart Farm site in the Lockyer Valley. *Photo courtesy QLD Department of Agriculture and Fisheries. See Page 54.*

Australian Grower is the consolidated magazine comprising Potatoes Australia and Vegetables Australia. Australian Grower was the most widely distributed magazine in Australian horticulture in the most recent reporting period.

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From the Editor

Welcome to 2024!

For some the rain has bucketed, for others it is dry and all the variations in between, I hope in your part of the world you have been able to ride out what remains a challenging operating environment.

In many regions, the major growing season for leafy veg is finishing, while potatoes and onions are coming into theirs. In the north, the wet season will be drawing to a close soon, to give growers a chance to move into full swing.

Last November, the AUSVEG team attended the Gatton AgTech Showcase – what a fabulous presentation of innovations to come, and what is already being achieved. A number of our VegNET RDOs attended with delegates from their region. It was great to see everyone networking and learning together. It also gave an opportunity to visit growers in the region and learn their stories and what makes the Lockyer Valley tick.

The VegNET team will be working hard this year to provide extension on a number of projects and research – don't be shy to reach out to your regional RDO for information or assistance.

From the onion space, plenty is happening to ensure growers are getting the best advice. Last year's Onion Lunch in Murray Bridge was well attended, with growers hearing from guest speaker Lindsey duToit, and the Plant Science Consulting Team on managing ryegrass herbicide resistance.

This Autumn issue also does a deep dive into our trade and production data. With the release of the *Horticulture Statistics Handbook*, there are some terrific insights into our production for a variety of vegetables. The latest ABS and Global Trade data gives the hard figures on our exports and imports.

The AUSVEG Board also bids farewell to long standing Director, Geoff Moar. You can read about his 20 year tenure with the AUSVEG Board on page 86.

As always, stay safe
Deborah

Message from the AUSVEG Chair

Welcome to 2024.

After a difficult 12 months, here's hoping for a better year. Maybe easier said than done, with challenging weather, high input costs, workforce shortages, crippling red tape, and downward pressure on farm gate prices persisting.

Even though it's hard going, there is still room for optimism. The increased public awareness and political activity on a range of issues facing growers will provide opportunities to push for genuine improvements for our industry in the year ahead.

Already this year we have seen escalating levels of political, media and public focus on grower-retailer relations. With a review of the Food and Grocery Code of Conduct underway, a Senate inquiry into supermarket prices initiated, three state-based inquiries and an ACCC inquiry into supermarkets launched, AUSVEG is steadfast in pushing for greater power and certainty for growers. We need to see fair and sustainable farm gate prices paid for the produce that growers are risking so much to produce.

Workforce is another major issue – changes to the PALM scheme have made it unworkable for many, while we also face surging wage costs and major industrial relations reforms, all contributing to an overwhelming financial and compliance burden.

Our efforts on these and many other issues are ratcheting up, through regular meetings with ministers, politicians and other key decision makers, and through our behind-the-scenes and public advocacy.

It is timely also that 2024 marks the 20th anniversary of AUSVEG.

Over two decades, our peak body has grown into a professional, respected and influential advocate and service provider on the issues that matter to growers.

Fundamentally, AUSVEG exists to represent and advocate on our interests as vegetable, potato and onion growers. While we're well supported by professional staff, it is only through grower involvement that we are able to effectively achieve our core mission.

It is crucial for growers to get engaged – whether participating in AUSVEG-delivered programs and activities, attending Hort Connections and local events, or completing surveys and providing on-the-ground information about the issues that matter to you.

Given our status as a truly representative national peak body, I am pleased to confirm the AUSVEG Board for 2024, featuring grower representatives from every state in the country, and the Northern Territory.

Returning board members are myself as Chair (Bulmer Farms - VIC); Renee Pye as Deputy Chair (Zerella Fresh - SA); Andrew Moon (Moonrocks - QLD); Pennie Patane (Patane Produce – WA); Mark Kable (Harvest Moon - TAS); Mitcheal Curtis (King's Farms - NT); and skills-based Director Theodora Elia-Adams (VIC).

I would also like to welcome incoming Director Ed Fagan (Mulyan - NSW), who steps into the position vacated by Geoff Moar, following his recent retirement from the Board. I would like to thank and pay tribute to Geoff for his immense contributions to AUSVEG and our industry during almost 20 years of service, including more than four years as Chair.

In your Board you have a wealth of growing and industry expertise, as well as another line into AUSVEG. I encourage you to make the most of having such high-calibre representatives by reaching out to your local Director with any information or issues you would like addressed.

With current challenges threatening the viability of many vegetable growing businesses, grower engagement and input is more important than ever, as we redouble our advocacy to the highest levels of government and other key stakeholders.

In the face of so many challenges, many in the Australian vegetable industry are doing it tough. While we are at the coal face of an industry that is crucial to our nation, at the heart of it we are people – and tough times can take a toll. Please remember to look out for each other – reach out to a trusted friend, family member or colleague, and know there is never shame in seeking professional help for your mental health when you need it.

Be assured also that AUSVEG will be looking out for growers in the Australian vegetable industry, through all the channels available to us, as we push to translate the opportunities of 2024 into outcomes that once again make growing the vegetables, potatoes and onions that feed Australia the rewarding and viable calling we know it can be.

Bill Bulmer
AUSVEG CHAIR

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Where Service is Part of the Sale!

The state of the sector, with the AUSVEG CEO

As we embark on a new year it is timely to reflect on the past 12 months and consider how the Australian vegetable industry is placed for 2024.

For many growers, 2023 will be remembered as one of the most challenging, often hostile operating environments of their working lives. Severe weather events, rising input costs, workforce shortages, IR law and PALM scheme changes, the ongoing threat of biosecurity incursions and pressure to accept lower and lower prices from buyers for produce, left many questioning their futures.

It was a year where the fight to maintain a viable vegetable growing business could be won or lost at the margins – a saving made here or a productivity improvement made there often the difference between a slim profit, or a terminal loss.

This has all served as a timely reminder that as important as it is to consider the big picture, you can't afford to lose focus on the details.

For its part, AUSVEG continues to focus on both – in line with our core mission to advance the interests of the vegetable, potato and onion growers of Australia and an industry that supplies the produce that is so crucial to the national interest.

Professional service delivery

For AUSVEG, 2023 was a year of building on our record of delivering the services that make a positive difference to growers and their businesses.

From an individual paddock or farm level, to the industry as a whole, we continued to provide, direct to growers, the services, expertise and knowledge geared towards improving the sustainability and productivity of their businesses. This includes through our comprehensive biosecurity, communications and export programs, as well as our coordinated national extension efforts via the VegNET program.

There is more of this to come in 2024. As tough times continue, we are committed to ensuring Australian vegetable growers and their businesses have access to the professional expertise and information they need, when and where they need it.

We are here to assist, so if there is information you would find helpful, or activities you feel you would benefit from, please do reach out.

Effective, relevant advocacy

Our busy advocacy agenda is also progressing on the issues most important to the Australian vegetable industry. On the biosecurity front, engagement and representations continue to the highest levels of government, on matters such as varroa mite and the biosecurity levy.

We maintain major focus too on other policy and regulatory matters having significant negative impacts on Australian vegetable growing businesses. This has included major changes to Australia's industrial relations laws, and to the PALM scheme, which are swamping many growers in red tape and compliance burden. As we have continued providing industry with practical information and updates, we have pushed for common-sense, practical and fit-for-purpose solutions that actually address the workforce pressures so many growers are confronting.

Opportunities to drive improvement

Already this year we have seen an elevated level of political and public interest in grower-retailer relations, in the context of ongoing cost-of-living pressures.

The review of the Food and Grocery Code of Conduct, a Senate inquiry into supermarket pricing, three state-based inquiries, and the launch of a year long ACCC inquiry into supermarkets, are just some of the recent developments.

In this dynamic environment, AUSVEG advocacy has forged ahead, ensuring we are well placed to make the most of the opportunities presented by these various reviews and inquiries. We continue to emphasise that the sustainability and viability of Australian vegetable growing businesses depends on growers being paid farm gate prices that actually reflect the surging cost of production.

While we need to see stronger, effective and enforceable measures that help fix supply chain power imbalances, and which provide greater certainty for growers in relation to price and volumes, we must also acknowledge the complexities of these issues.

In this heightened environment, it is also important to ensure we avoid unintended consequences that could artificially distort the market to the detriment of vegetable growers.

On these and many other issues, AUSVEG will continue engaging and advocating to ministers, politicians, regulators and other key decision-makers, as we seek measures that support the sustainability and viability of Australian vegetable growing businesses.

▸ CONTINUED ON PAGE 6

The state of the sector, with the AUSVEG CEO

The bigger picture

While the prices paid to growers for produce are a key part of the equation, they are just one part. The surging prices of inputs like fertiliser, fuel, power and wages are contributing factors to the high cost of vegetable production and record low sentiment in the industry.

In order to secure a brighter future for the Australian vegetable industry, governments must consider and address the whole equation.

In our submission ahead of this year's Federal budget, AUSVEG has proposed a range of practical investments and policy commitments the government can enact to better support and promote the vegetable industry.

These include piloting a Harvest Visa to help address chronic workforce shortages; increasing the capacity of biosecurity agencies to respond to incursions; and the implementation of a national labour hire licensing scheme.

In addition, AUSVEG's budget submission (ausveg.com.au/articles/federal- pre-budget-submission) seeks significant investments geared towards improving the sustainability and self-sufficiency of the industry, and by extension, national sovereignty.

This includes a recommendation for a $100 million investment over five years for a national behaviour change campaign to increase average daily vegetable consumption by one serve by 2030.

Addressing declining consumption

Concerningly, the most recent Australian National Health Survey released by the ABS late last year revealed that the number of children meeting national vegetable consumption recommendations fell from just 6.3% to 4.6% in the five years to 2022. The percentage of adults meeting those requirements dropped from 7.5% to 6.5% over the same period.

Given the downward trend, it is clear the fact that vegetables are good for you is no longer enough for our industry to trade off. A new approach is needed.

Increasing daily vegetable consumption by one serve will bring significant flow on benefits to the national industry, economy and society. When you total up increased demand and production, jobs created, and the reduced burden on the healthcare system, you are looking at billions of dollars in additional value.

Looking ahead to this year, AUSVEG will be working with Hort Innovation to initiate a long-term strategy and program to increase vegetable consumption. We will keep you updated as this work takes shape, as another example of AUSVEG's commitment to the long-term interests of the sector.

The global picture

While many within the Australian vegetable industry will be hoping for a better year, challenging conditions prevail.

With the high-inflationary environment likely to persist well into 2024, the associated difficulties posed by rising input and wage costs, and added barriers to accessing finance will also remain in place.

The situation is fuelled further by global and geopolitical factors, including ongoing conflicts creating challenges to global supply chains, including disruptions to major trade routes such as the Suez Canal. Domestically, this volatile environment is exacerbated by local industrial action on the Australian waterfront.

While our position in a global supply chain means there are some factors we can't control or influence, there are others we can – at both macro and micro levels.

Although some challenges may feel insurmountable at times, we cannot try to address them if we don't know about them. Echoing the call of the AUSVEG Chair Bill Bulmer, I encourage all growers to keep engaged with your peak body, and let us know about the issues that matter to you.

The more information we have, and the better our networks, the more effective AUSVEG's advocacy on behalf of industry will be.

Hort Connections 2024

As we embark on another challenging year, I also want to emphasise how important it will be for the Australian vegetable industry to come together in 2024.

An important opportunity for that is the 2024 Hort Connections event, which will be held at the Melbourne Convention and Exhibition Centre from 3 - 5 June.

As the largest horticultural event in the southern hemisphere, this year's conference will be a chance to come together for a showcase of all that is great, innovative and vibrant about Australian horticulture.

The program will once again be packed full of informative and insightful presentations and exhibitions to help build your network and make genuine productivity gains within your business. It will also provide an opportunity to step away from the day-to-day and come together with thousands of like-minded professionals.

Amid the current operating environment, I encourage all involved in the Australian vegetable industry to make the most of the many benefits of attending Hort Connections 2024.

Michael Coote
CEO, AUSVEG

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Spotlight on grower-retailer relations

ANDREW MACDONALD – NATIONAL MANAGER – COMMUNICATIONS, AUSVEG

The complexities of grower-retailer relations have long been the subject of discussion and debate among the Australian vegetable industry, other businesses in the supply chain and the retail sector.

These issues have also periodically pushed their way onto the public and political agenda – usually linked to one-off events such as a retail price spike for a commodity or aggressive specials, marketing and 'price war' campaigns.

However, as 2024 gets underway, the behaviours and practices of the super-market giants and their treatment of the vegetable growers who supply them with fresh produce is shaping up as a major area of public and political focus.

Amid a cost of living crisis and high inflation environment which continues to squeeze households and businesses alike, a range of reviews and inquiries are set to cast new light on issues surrounding these complex relationships and dynamics.

In short order towards the end of 2023, a scheduled review of the Australian Food and Grocery Code of Conduct (FGCC) was confirmed for completion by mid-2024, a Senate inquiry looking at supermarket pricing was established to commence early this year, and the Independent Reviewer of the FGCC released his annual report.

As the public and media focus on cost of living intensified in early 2024, the Prime Minister announced the initiation of a year-long Australian Competition and Consumer Commission (ACCC) price inquiry into the supermarket industry.

In light of this heightened focus, 2024 will present significant opportunities for Australia's vegetable industry, and its peak body AUSVEG, to push not only for improvements in grower-retailer relations leading to fair and sustainable prices being paid to growers at the farm gate, but also to a range of the issues growers are facing in the prevailing challenging operating environment.

A challenging environment for growers

Following an extremely difficult 2023, Australian vegetable growers are continuing to grapple with a livelihood-threatening set of challenges including the high cost of inputs like fertiliser, fuel, power and wages; workforce shortages; increased compliance costs and burden; as well as severe weather events and the threat of biosecurity incursions.

In this environment the need to ensure growers are receiving a fair and sustainable price at the farm gate for their produce has become more important than ever.

Instead, as retailers contend with the competing political and shareholder imperatives to both ease pressure on household budgets and deliver profits, many growers report they are facing increasing pressure to accept lower and lower farm gate prices.

With Harvest to Home research showing that upward of three quarters of retail fresh vegetables are sold through Coles, Woolworths, and Aldi, they are often left with little option but to do just that.

Grower-retailer relations

One of the biggest issues growers have raised in their dealings with retailers is the lack of ongoing certainty in relation to price and volume. With often millions of dollars' worth of crops planted, based on non-binding supply agreements, growers are bearing all the risks.

Weekly price negotiations are based on very asymmetrical data flow: the retailer – who has the most comprehensive data on availability, volume, demand and price – and the grower – who simply does not have this level of detailed information and market intelligence available to them. With perishability and cash flow pressures, growers often have few options but to accept a below-cost offer from their biggest customer.

This asymmetry plays out in a range of other ways. Other common issues consistently reported by vegetable growers include:

- Insistence of retailers to price match competitors, and consistently drive prices down, to the detriment of growers;
- Retailer strategies that consistently de-values fresh produce in the eyes of the consumer;
- Ever increasing compliance burden placed on growers;
- Opportunistic purchasing, and leveraging wholesale market prices and volumes to manipulate growers;
- Lack of negotiation power in the retailer-grower transaction; and

- Questionable behaviour by retailers through actions such as unauthorised deductions, unplanned specials, late cancellation of home brand packed orders, and carrying stock through from discounted 'specials' weeks into 'non-specials' weeks, to name a few.

Given the list of issues, you would expect more growers to formally complain. The fact they don't speaks once again to the power imbalance.

According to the report of the Independent Reviewer of the FGCC released late last year, fruit and vegetable suppliers have expressed that Australian retailers have treated them unreasonably, and many are afraid of retribution or losing business if they complain. To emphasise the point, despite a wide range of concerns often shared within industry, the Independent Reviewer received zero official complaints between 2022 and 2023.

Clearly the deck is stacked against the growers who supply 98 per cent of the fresh vegetable produce Australians consume. Something needs to change.

Seeking improvements

The dynamics surrounding grower-retailer relations are complex – if these issues were easy to fix they would have been by now.

While there may be no silver bullet, at the very least, growers will be hoping all this activity results in improvements in the behaviour of the retailers, and a curtailing of the practices which are threatening the viability of many Australian vegetable growing businesses.

While at the time of writing AUSVEG was finalising its submission to the various inquiries a number of practical measures had been identified to improve the situation for growers.

These include:

- Making the FGCC mandatory for all retailers;
- Amending the FGCC to improve relevance and effectiveness for the fresh produce industry – including introduction of a genuinely independent complaints and arbitration mechanism;
- Introducing enforceable penalties and fines for businesses, and individuals, that breach the FGCC;
- Introducing provisions for compensation for growers that have been found to be disadvantaged through breaches of the FGCC;
- Greater power, scope and flexibility for the ACCC to investigate retailer behaviour.

Few would dispute that changes are needed, but there is also a need to proceed cautiously. The complexity of the situation and dynamics at play means care is needed to avoid interventions that artificially distort the market, and further disadvantage vegetable growers.

Every business across the supply chain – from vegetable growers to the retailers – has felt the impacts of the high-inflation environment. Every business across the supply chain also needs to be profitable to keep operating.

A vibrant and thriving retail sector is also key to the success of the Australian vegetable industry. This needs to be a mutually beneficial relationship.

Broader issues

While the prices paid to growers are a key part of the equation, they are just one part – just as competition law is just one aspect of the suite of legislative and policy settings the government has available to it.

The high inflationary environment, fueled by a range of international factors, as well domestic policy settings have driven the costs of production higher – meaning the growers need a higher price at the farm gate to stay viable.

However, to truly secure the long-term sustainability of the Australian vegetable industry, governments must consider and address all the current factors contributing to the margin squeeze threatening the viability of vegetable businesses.

Next steps

As 2024 progresses, the focus on cost of living and the behaviours of the supermarkets will continue, particularly as reviews and inquiries get underway and are finalised.

While it is difficult to predict the precise outcomes of each, early indications are the major retailers will continue to devote significant resources and personnel to defending their practices and reputations throughout the various processes and hearings. There will be those who may expect that this will simply be an extension of the power imbalances that play out in the supply chain, but there is room for some hope.

It has been some time since this level of concentrated public and political attention has been cast on the issue of grower-retailer relations, and that will present opportunities to improve the situation for growers.

AUSVEG, informed by the growers it represents, is well placed, and will continue pushing for the changes needed to secure a better deal, and more sustainable future for the vegetable, onion and potato growing businesses that feed the country.

A National Labour Hire Licensing Scheme for fair employment

The 2022 Jobs and Skills Summit, hosted by the federal government, recommended the implementation of a single national framework for a labour hire licensing scheme, to provide a fair and balanced working environment for employers and employees. AUSVEG spoke with Steve Burdette of Approved Employers Australia (AEA) to find out where things stand currently.

For growers employing workers under the PALM scheme, the use of a reputable labour hire provider is beneficial to ensure that all the requirements are met for employment. In the past, the onus was on the labour hire provider to ensure that all the employment conditions were met, and if these were found to be incomplete, this could result in a penalty and or breach. More recently, that risk has extended to the grower.

Sadly, there are some labour hire providers in the industry who may not have the growers' and employees' best interests at heart. Unfortunately, it is these operators who are not being held accountable for activities such as paying incorrect wages, paying cash only, illegal employment, exploitation and more.

Inset: Steve Burdette, executive officer Approved Employers Australia.

An election commitment by the current federal government is to adopt a national scheme – the National Labour Hire Licensing Scheme – to protect workers and growers from unscrupulous labour hire providers.

Currently, four states and territories (Queensland, Victoria, South Australia, and the ACT) operate a labour hire licensing scheme to register labour hire providers, with varying degrees of success.

Steve Burdette is the executive officer for AEA, an organisation established to inform, educate, and lobby on behalf of members who are Approved Employers of the PALM scheme.

"Currently, growers who use labour hire providers are constantly targeted by authorities who audit them to determine compliance with workplace laws. These are the companies trying to do the right thing while those who are acting illegally are getting away with it. With a licensing scheme for labour hire providers, we hope to redress the balance and level the playing field," said Steve. According to the Fair Work Ombudsman (FWO), the PALM scheme is one of the most regulated and compliant employment schemes of all employment sectors.

Implementation of a National Labour Hire Licencing Scheme is supported but needs to take into consideration the different laws that apply in the various states and territories. Those who do not have a scheme should be provided with a minimum standard they need to apply as a start. We also need to learn from the existing schemes, what works well and what does not. A unified approach across all states would reduce the replication – and cost - of information and auditing for multi-state growers. However, as a federated country, all states and territories must agree to how the scheme will operate.

"To move to a national scheme will be challenging where state systems are already in place. The system in Queensland is probably the strongest that we have worked with in terms of engagement, penalties, collaboration, and effectiveness.

"Whatever scheme is adopted needs to protect employees and employers who are compliant with the law and ensure that those that operate illegally or are non-compliant are penalised and prosecuted where required. In no way should a national scheme restrict or control business growth. All stakeholders, including retail, need to take responsibility to ensure employment practices and conditions are applied across the supply chain, not only the labour hire providers.

Any scheme implemented should be reviewed every two years to determine what is working well and what needs to be improved.

The AEA has developed a suite of policies and procedures to assist their members - both growers and labour hire providers

- with the management of PALM scheme workers to ensure they comply with the PALM Scheme Approved Employer Deed of Agreement and Guidelines, as well as Australian law.

The Fair Work Ombudsman, Australian Border Force and state labour hire authorities are doing a lot more random farm visits to conduct unofficial audits, so growers need to protect themselves and their reputations as employers.

"There is a lot of hearsay about exploitation in the industry, however we have been presented with little data to prove this. Things are not as bad as they are made out to be," said Steve.

"People don't realise the complexities of farming and managing workers under Australia's industrial relations laws and the PALM scheme. What we do is assist growers to have strong policies and procedures in the workplace, making sure they are easy to follow and bringing fairness to the workplace for all parties."

Steve says that for some Approved Employers, PALM scheme workers are like family.

"Growers travel to the Pacific to visit their villages and invest in their schools and livelihoods. Most of the feedback we hear is actually very good news - workers are sending money home to build houses, feed their families and educate their children."

In terms of next steps, the Agricultural Workforce Forum – an outcome of the Jobs and Skills Summit - held its first meeting in November 2023 and will continue to meet on a quarterly basis. They have also expanded their membership to include an additional representative for fresh produce.

AUSVEG will continue to work closely with industry and government for the development of a National Labour Hire Licensing Scheme in Australia and will keep growers up to date through our online Advocacy Updates.

Useful information

Approved Employers Australia: approvedemployersofaustralia.com.au

Labour hire authorities

VIC: labourhireauthority.vic.gov.au
QLD: labourhire.qld.gov.au
SA: sa.gov.au/topics/business-and-trade/licensing/labour-hire
ACT: worksafe.act.gov.au/licensing-and-registration/labour-hire-licensing
PALM Scheme: palmscheme.gov.au

Protecting your business from unethical labour hire providers

Make sure your business policies and procedures are in place to demonstrate that you are employing people ethically and in accordance with Australian law.

Start recording labour hire providers that you believe are operating illegally in your region to Australian Border Force and to your state labour hire licencing authority (where they exist). This is easy to do online and can be done anonymously. You can also report information to the AEA or AUSVEG who will report anonymously on behalf of members.

Download the Visa Entitlement Verification Online (VEVO) app, managed by the Department of Home Affairs, to check the work visa status of any worker present on your property.

For more information contact Lucy Gregg, General Manager of Public Affairs and Communications, AUSVEG.

industry update

Aussie horticulture industries unite to bolster sustainability

Grower groups from across Australia and national representative bodies are jointly supporting the 2023/24 Australian-grown Horticulture Sustainability Framework released in November 2023.

The Framework is a tool to help the horticulture sector share its sustainable, ethical, and safe farming practice stories with stakeholders.

Developed through Hort Innovation, this resource equips growers to proactively manage sustainability now, and in the future.

Federal Minister for Agriculture, Fisheries and Forestry Murray Watt said the Framework provides a sustainability roadmap for the horticulture sector.

"Being able to demonstrate sustainability is becoming increasingly important to domestic consumers and our international trading partners," he said.

"A strong, sustainable hort sector produces nourishing food, fulfilling employment, and helps protect our environment now and for future generations.

"This Sustainability Framework initiative unites the horticulture sector in its journey to monitor the sustainability issues that matter to its stakeholders."

Hort Innovation chair Julie Bird said the Framework was the culmination of an extensive consultation process to understand the horticulture sectors' sustainability priorities for the future.

"Hort Innovation has worked with more than 600 stakeholders to deliver the Framework, which promotes sustainable and responsible care for our natural environment and provides a vital roadmap for a stronger Australian farming future," Ms Bird said.

National Farmers Federation Horticulture Council Executive Officer Richard Shannon said the horticulture sector is now looking at how it can harness the Framework and start telling their story.

"The Council, on behalf of its members, supports the 2023/24 Australian-grown Horticulture Sustainability Framework as an important tool for growers to translate their practices, which in many cases are already leading edge, into a language their buyers, consumers and the public understand," Mr Shannon said.

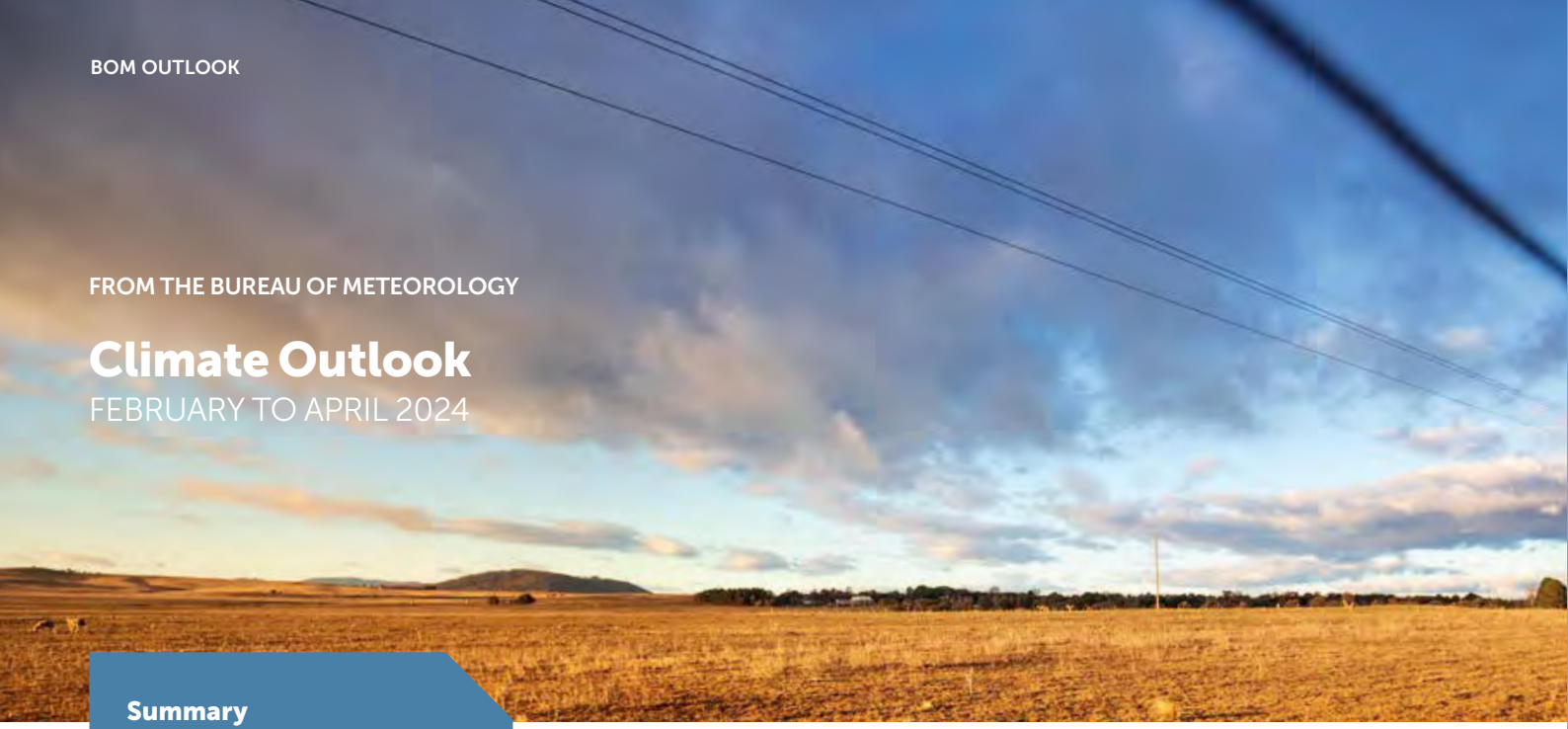
"While horticulture, like any industry, has room to improve, we also have a strong and proud history of proactively providing assurance for consumers and the public where concerns arise, including around food safety and more recently fair employment practices. The Framework captures this existing work and gives us a guide for our future efforts".

Hort Innovation currently invests $80 million in a range of sustainability-focussed initiatives to support the horticulture sector in achieving its sustainability goals. Most of these projects contain Commonwealth contributions and focus on everything from reducing carbon emissions and water use efficiency, to reducing waste, and breeding smaller trees that require less inputs to smart technology.

The Sustainability Framework has identified four areas significant to the sustainable production of fruits, vegetables, nuts and amenity horticulture in Australia:

- **Nourish & Nurture** recognises the role of Australian horticultural produce in improving diets, health and wellbeing by providing safe, quality food and greenlife.
- **People & Enterprise** identifies the strong links between the people, enterprises, communities and economic value of Australian-grown horticulture.
- **Planet & Resources** focusses on sustainable agricultural practices by reducing any impacts on the natural environment and on the dependence of horticultural production on resources, biosecurity.
- **Climate & Waste** is about reducing all forms of waste in horticultural production and resilience to climatic variability.

Hort Innovation resourced the development of the Framework as a whole-of-horticulture project (HA19001/HA21003) from Australian Government contributions. See the Framework at: horticulture.com.au/hort-innovation/our-work/horticulture-sustainability-framework



FROM THE BUREAU OF METEOROLOGY

Climate Outlook

FEBRUARY TO APRIL 2024

Summary

- February to April rainfall is likely to be below median for most of northern Australia, western WA and parts of southern Australia.
- February to April maximum and minimum temperatures are very likely to be above median for most of Australia.
- February to April maximum and minimum temperatures are at least 2 times more likely than normal to be unusually high for much of Australia. Unusually high temperatures are defined as the warmest 20% of February to April periods from 1981 to 2018.
- The long-range forecast is influenced by several factors, including El Niño and record warm oceans globally.

FIND OUT MORE
For the full outlook go to
bom.gov.au/climate/outlooks/#/overview/summary

Temperature

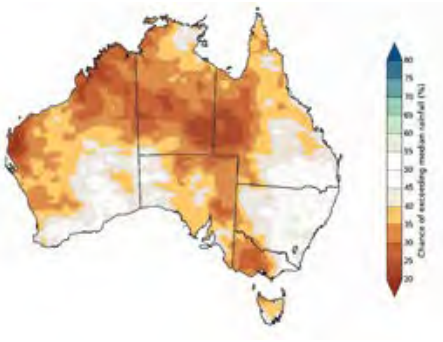
- For February to April, above median maximum temperatures are likely to very likely for almost all of Australia, except parts of eastern Victoria.
- For February, above median minimum temperatures are likely to very likely for most of Australia except far western WA, and southern SA extending into south-eastern WA and western and central Victoria.
- For February to April, above median minimum temperatures are likely to very likely (60% to greater than 80% chance) for almost all of Australia.
- For February to April, most of Australia is at least 2 times more likely than normal to experience unusually high maximum temperatures, except south-east SA, Victoria and south-east NSW. The chance of unusually high maximum temperatures increases to greater than 4 times more likely than normal for parts of northern WA, northern and central NT extending to southwestern and northern Queensland.
- For February to April, much of Australia is at least 2.5 times more likely than normal to experience unusually high minimum temperatures, except for some southern regions of the mainland. The chance of unusually high minimum temperatures increases to greater than 4 times more likely than normal for most of northern Australia extending into the southern interior of WA and north-eastern NSW.

Rainfall

- For February, rainfall is likely to very likely to be below median for the NT, WA excluding some southern areas, most of SA, most of Tasmania, and western parts of Victoria, NSW and Queensland.
- For February to April, below average rainfall is likely for most of the northern half of Australia, western WA, most of SA, western and central Victoria, and most of Tasmania.
- Unusually low rainfall for February to April is at least twice as likely for parts of western and northern WA, most of the NT and north-western Queensland.

Chance of exceeding the median maximum temperature for February to April 2024

Chance of exceeding the median minimum temperature for February to April 2024



Chance of exceeding the median rainfall for February to April 2024

Knowledge grows

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Growing a nature-positive food future.

yara.com.au **1800 684 266**

Giaan Rooney
Master of Ceremonies
Hort Connections

Pia Piggott
Associate Analyst
RaboResearch

Paul Omodei
Director
Planfarm

Lucy Bloom
CEO
Sunrise Cambodia and
Hamlin Fistula Ethiopia

HORT CONNECTIONS HC MELBOURNE 2024

HORT CONNECTIONS 3-5 June 2024 Melbourne Convention Centre

INTERNATIONAL FRESH PRODUCE ASSOCIATION

AUSVEG

Hort Connections 2024 is set to have an exciting line up of speakers

Hort Connection has pulled together an exciting and informative program for 2024. With an exciting line up of trade show speakers and plenary sessions, the event will give delegates knowledge and advice for their business. Hort Connections will also host the national Horticulture Awards for Excellence at the Hort Connections Gala Dinner, the Women in Horticulture event, and farm and retail tours are also on the agenda.

Our MC is none other than former darling of Australian swimming, Giaan Rooney. Giaan holds medals at every level of competition, including an Olympic Gold. In 2006, Giaan retired from swimming to forge a successful career as an Australian TV presenter. Her memorable smile and ability to engage are only trumped by her enormous energy levels.

Since she hung up her goggles, Giaan has worked on a range of high profile broadcasts and shows including the Commonwealth Games and Olympics, as well as Nine's Wide World of Sports and the Today Show.

As a sought after MC, Giaan has hosted some of Australia's largest gala events and awards nights including the Coles Farmer of the Year Awards for the past 10 years and the Women in Sport Awards.

The trade show speaker sessions promise to showcase a range of knowledge from industry leaders. Helping us see the global trends ahead is Pia Piggott.

Pia is an associate analyst at RaboResearch, focusing on horticulture, viticulture, and sugar markets.

Pia's role includes public speaking at events, recording RaboResearch podcasts, and publishing various reports, generating widespread media coverage that resonates beyond the agriculture industry.

Prior to working at Rabobank, Pia worked as a research assistant at the Australian Export Grains Innovation Centre and as an associate at Purposeful. Catch her session: *World Vegetable Map 2024 - Global trends and vegetable trade flows* on the first day of the trade show.

Stick around after Pia's presentation to hear Paul Omodei from Planfarm's talk: *Levelling up vegetable and onion business performance.*

Paul is a director of Planfarm and has been instrumental in developing the vegetable and onion industry business performance benchmarks both in Western Australia and the national program, Level Up Hort.

Paul's experience in horticulture is ingrained, having grown up in WA's southwest on the family potato farm and his journey to become one of WA's leading farm business consultants has seen him forge the way for developing business improvement and advisory services for horticulture.

Lucy Bloom, CEO of Sunrise Cambodia and Hamlin Fistula Ethiopia, is one of our Plenary session speakers.

Lucy is an award-winning leader and speaker. She is a change-maker, exceptional communicator, and business fixer. Lucy led an advertising agency for 20 years before she became the CEO of a brand-new women's health organisation, funding a network of hospitals and a midwifery school in Ethiopia.

She then went on to transform a Cambodian children's charity as its first CEO. She is the creator of an education start-up and the author of two books. Lucy's memoir, *Get the Girls Out*, was published by HarperCollins to rave reviews.

You will find her challenging and entertaining in equal measure, with humour tied into a powerful business message. Lucy Bloom is a rule-breaker, idea-maker and momentum creator.

Register to attend Hort Connections - horticulture's premiere conference and trade show - at: hortconnections.com.au

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Miravis® Duo

syngenta®

IS YOUR CROP PROTECTED? SCAN HERE

Information automation offers unlimited potential

BY CLAIRE HARRIS

Digital payroll systems have become the norm across most industries, but digital enthusiast Sharon Chapman said this is just the tip of the iceberg when it comes to information automation.

Based in Hawke's Bay, New Zealand, Sharon is the founder of ABC Software, which provides software solutions for growers and packers with the goal of reducing admin and paperwork.

Speaking at the Hort Connections conference in Adelaide in June 2023, Sharon said there were many day-to-day on-farm tasks which could be automated, but were still largely carried out manually.

"Whilst most farmers wouldn't manage financial accounts on a paper-based system, many farmers manage spray diaries, worker activity and quality checks on paper," she said.

"Calculating and collating information is a perfect example of a repetitive and time-consuming task – something that digital automation can replace.

"By automating information-related activities, your business can reduce manual efforts, improve efficiency, enhance accuracy and enable faster decision making."

With a suite of benefits and opportunities posed by information automation, Sharon said there was often hesitancy amongst farmers towards adoption of information automation programs and tools.

Barriers and drivers to digital adoption were examined in a 2022 report by AgriTechNZ which comprehensively reviewed the current state of digital technology in New Zealand.

Titled 'Baseline of Digital Adoption in Primary Industries', the report engaged more than 1,000 New Zealand farmers across multiple sectors.

The report revealed that reluctance to move from manual systems, and proof of ROI were the main barriers to digital adoption, while the three main drivers were efficiency, ease of use and compliance/regulation.

"Nowhere in the list is age as a factor – farmers are not saying they are too old to use technology," Sharon said.

"The report found that a farm in a growth stage was more likely to adopt new technology, than a farm that was mature, declining or exiting. This shows digital adoption is about farm stage, not farmer age."

Information is King

Sharon said information availability through digital automation could drive improvements in farming operations in a multitude of ways.

"ABC Software is in the process of canvassing our clients regarding the value they are getting from our worker management software. Efficiency has been a consistent piece of feedback, as having information on hand has given the clients the ability to make fast decisions," she said.

Farmers who source workers through labour hire companies could also benefit from gathering activity data, according to Sharon.

"Is the piece rate right, do workers need more training and supervision, who are your best workers you don't want to lose, can you use the information to motivate 'middle-of-the-pack' workers?" she said.

"If you collected worker activity data, what else could you do with it? (With information automation) you could easily collect this data; the question begs whether or not it is worth the effort. From the mouths of the farmers using our worker management software, it's a resounding yes."

While Sharon acknowledged that implementing new automation systems may take time and effort, the end result was well and truly worth it.

"Implementing new systems is not easy, until it is, and then it's always easy," she said. "The impact that information automation systems can have on your business should not be underestimated. If you can measure it, you can manage it.

"Use your people for the smarts they bring to your business. Use digital tools for the repetitive time-consuming manual tasks."

To view the AgriTechNZ digital adoption report, visit agritechnz.org.nz/resources

FOR MORE INFORMATION
Contact Sharon Chapman at hello@abcsoftware.com

Big picture focus catapults AI opportunities

BY CLAIRE HARRIS

While artificial intelligence allows for horticultural data to be examined in fine detail, New Zealand agritech startup chief executive officer Matty Blomfield insists that having a big picture focus is the best way to support producer viability.

In 2016 Matty co-founded Hectre, an orchard management system which streamlines harvest management, automates administration tasks, records picker performance, and tracks sellable fruit back to the tree on which it was grown.

Hectre's award-winning mobile fruit sizing app, Spectre, measures fruit count, size, and colour, and can be useful in both pre and post periods.

Speaking at Hort Connections in Adelaide in June 2023, Matty provided an insight into the world of Hectre and artificial intelligence.

Hectre is used by some of the world's largest fruit growers and packers, has managed more than 175,000 digital timesheets and has analysed more than 68 million pieces of fruit.

"We operate from the orchard space with management tools to track the labour and the produce, and we then add on quality control information right through to post harvest," he said.

For Hectre, the use of artificial intelligence has always been determined based on what is practical, adds value, and makes sense.

"Initially, the idea was to use a camera to take a photo to give you size and colour and count information, but we wanted to continue to drive that automation," he said.

"We took that tech and scaled it up – now we have a fixed camera in place which analyses fruit on the back of a truck as it passes underneath the camera.

"There are so many different opportunities, and I hope we can continue to drive value in and between different vendors."

Like the majority of people in the artificial intelligence and automation world, Matty said data was a foundational building block.

"AI is always going to be working with data – if operations aren't digitised yet, you're not able to do anything," he said.

Matty said integration was required to make data 'super simple' and able to be connected between different sources, yet integration has traditionally been a common stumbling block in horticulture.

"Integration is not simple, and generally speaking, what we've seen in this industry is a lack of integration compared to other verticals and other industries," he said.

"One of the reasons is definitely the data landscape – it's all over the show and there are different formats.

"There are many agreements that need to happen – who looks after which part of the data, when, when does it get handed over, who takes control of that, what is the access, visibility, and privacy of the data?

"Whether you are trying to get compliance to sell your crop, or chemical applications lined up for different markets, there is a lot to consider."

Matty said all decisions surrounding data agreements must add value to the customer and be in line with all the businesses involved along the supply chain as well.

"Data agreements are a big deal. There is a huge shift in how fast and frequently these are happening in this industry, it's picked up phenomenally. I think a lot more value will be given back to the supply chain," he said.

While horticulture could be a tough landscape for producers, Matty believed that there were a multitude of prospects going forward.

"Robotic harvesting is something that has been worked on for over 15 years. The progress made is phenomenal, some companies are doing exceptional things. It's not quite there yet though, so we have to work out what can add value," he said.

"It's all about demystifying artificial intelligence to build value."

FOR MORE INFORMATION
Contact Matty Bloomfield at support@hectre.com

New website showcases a decade of soil and crop health resources

As part of its new phase, the Soil Wealth ICP project is delighted to announce the launch of its revamped website. This digital overhaul serves as a gateway to the project's significant body of work, highlighting 10 years of research and practical information on soil management and plant health.

With an emphasis on user-friendly design and an expanded array of resources the new Soil Wealth ICP website, with fresh colours and branding, aims to make navigation of its library easily accessible to growers, researchers, and anyone interested in soil and crop health.

From detailed grower case studies and practical fact sheets to informative videos and podcasts, the materials cater to different levels of knowledge and learning preferences.

"Since 2014 the Soil Wealth ICP project has focused on making research on soil management and crop health easy to understand through practical information, trials and events that can help growers improve their productivity, profitability and sustainability," Soil Wealth ICP team member Dimi Kyriakou said.

"Our scientific experts from RMCG and AHR understand the importance of effective communication and the updated website makes it easier to share information with the vegetable and melon industries."

Making it easy to find what you need

With ongoing support from Hort Innovation, the project has expanded its scope to include melons in addition to the vegetable industry.

To ensure growers can access the most relevant content, the new site includes dedicated sections or 'hubs' for the vegetable and melon industries, which also showcase upcoming events, demonstration sites and resources specific to each sector.

Another feature of the updated website is a refined search function for easy navigation of news, demonstration site information and resources based on geographical area, crop type, resource type and topics relevant to soil health, crop health, input use optimisation and climate and carbon awareness.

New resources now available

In response to the ever-evolving needs of Australian growers, the resource library is always being updated, including some recent additions which are highlighted in the breakout box.

Keep an eye out for further updates as the team continues to provide practical and relevant information for the industry. Explore the new Soil Wealth ICP website at soilwealth.com.au

CASE STUDY

Replacing plastic mulch in NSW

Demonstration sites, a crucial component of the Soil Wealth ICP project, allow growers and industry to gain a deeper understanding of the practical applications of research on-farm. The trials serve as living examples of the positive impact that innovative strategies can have on real-world agricultural practices.

Insights and lessons from a recent Soil Wealth ICP demonstration site trial is captured in a new case study on the use of cover crops to replace plastic mulch on a vegetable farm in New South Wales.

The vegetable grower had previously used plastic mulch to control weeds in his vegetable crops but was eager to reduce the use of plastic on his farm, improve soil health and maintain effective weed management.

With support from the Soil Wealth ICP team, the grower has changed his practices incrementally over time, an approach which has been pivotal to his success. Learning from each small change and tweaking his management practices as necessary has made the process time- and cost-effective.

How the grower managed this transition to more sustainable practices, the results of the trial and grower insights have been summarised in an easy-to-read format.

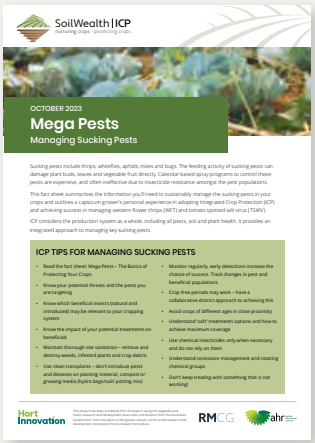
Download the case study here:
soilwealth.com.au/2024/01/replacing -plastic-mulch

FACT SHEET

Managing sucking pests

Want to regain control over chemical-resistant pests? Aiming to reduce costs while meeting quality assurance requirements?

An updated fact sheet is now available on the management of sucking insects, including information on:



- The nature of sucking pests (thrips, whiteflies, aphids, mites and bugs)
- Steps for managing sucking pests
- Use of specific predators and paraistoids
- A case study on the management of western flower thrip (WFT) and tomato spotted wilt virus (TSWV) in capsicums.

Download the fact sheet here soilwealth.com.au/2023/10/mega-pests-managing-sucking-pests/

VIDEO

Five tips for working with cover crops

In this short video, Soil Wealth ICP cover crop expert Dr Kelvin Montagu shares five tips for working with cover crops following a trial in Victoria.

Watch the video here: soilwealth.com.au/2023/09/5-tips-for-working-with-cover-crops

FIND OUT MORE

For more information, please contact project leaders
Dr Gordon Rogers on 02 8627 1040 or gordon@ahr.com.au and
Dr Anne-Maree Boland on 03 9882 2670 or anne-mareeb@rmcg.com.au

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

Project Number: MT22004

Hort Innovation VEGETABLE FUND Hort Innovation MELON FUND

The Soil Wealth ICP focuses on improving soil and crop health across the vegetable and melon industries by addressing growers' specific interests and regional issues, sharing knowledge and elevating sustainability.

Vegetable growers buffer rising input costs but continue delivering for Australian consumers

Production rises in some crops, like cauliflower, offset drops in others.

Australian vegetable growers produced 3.59 million tonnes of vegetables in 2022-23 with a production value of $5.83 billion, newly-released data in the Australian Horticulture Statistics Handbook reveals.

Coinciding with a period marked by severe weather events and major increases in farm input costs, the Handbook shows production volume was down only 3 per cent compared to the previous year.

While the $5.83 billion overall production value – an increase of 5.4 per cent compared to the previous year – represents a record high in dollar terms, this was offset by a 6 per cent increase in CPI over the same period. As a further indication of the financial pressures confronting many vegetable growing businesses, the 4 per cent increase in fresh supply wholesale value from $5.91 billion to $6.17 billion represents a decline in real terms.

The Australian Horticulture Statistics Handbook, released by Hort Innovation, quantifies the value and volume of all major vegetable and fruit crops produced in Australia, including exports, and also includes imports.

"This handbook is an important data source that helps growers and other supply chain stakeholders make informed business decisions and better understand the bigger picture in the Australian horticulture sector," said AUSVEG CEO Michael Coote.

"Australian vegetable growers continue to supply more than 98 per cent of the fresh vegetables sold domestically and employ tens of thousands of people. This data again demonstrates the critical role the nation's vegetable growers play, not only in providing the nation with produce, but also in terms of its major contributions to the national economy."

"These contributions have occurred despite the severe weather events, labour shortages and supply chain issues that have affected production volumes of many vegetables. These challenges have also impacted growers' profitability, with both the overall and fresh wholesale production values of many common commodities down on the previous year, both in year-on-year and actual terms."

"The vegetable sector is also very diverse, and within this data there are crops which have experienced significant production drops, such as tomatoes, asparagus and fresh peas, contrasted against big growth such as cauliflower, Brussels sprouts and beetroot."

Despite the difficult operating environment, Michael said the fact the vegetable industry managed to achieve another year of record overall production value in dollar terms was testament to the contributions vegetable growers made to Australia.

"Hort Innovation's aim in producing the Australian Horticulture Statistics Handbook each year is to ensure the entire Australian horticulture industry has access to the data and insights they need to inform their decision-making," said Hort Innovation CEO Brett Fifield.

"This year's data shows total production value increasing by 2.8 per cent to $16.3 billion, reflecting some of the challenges that industry has faced over the last few years impacting profitability."

"For vegetables, record values were recorded for another year, with overall value reaching an all-time high of $5.83 billion, an increase of 5.4 per cent on 2021/22."

FIND OUT MORE
Head to horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/mt21006/

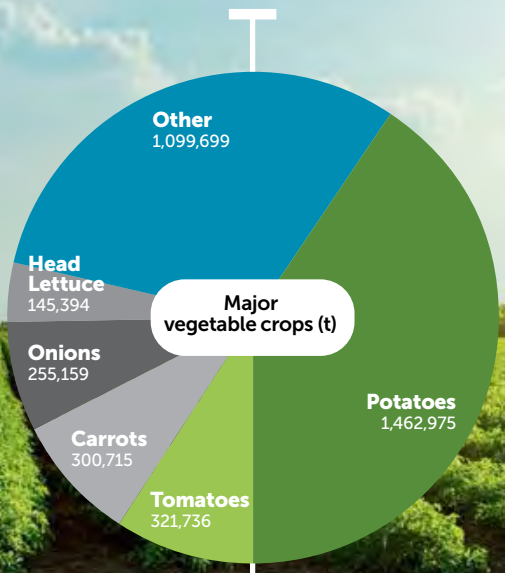
The *Australian Horticulture Statistics Handbook 2021-22 to 2023-24* project has been funded by Hort Innovation using multi-industry research and development levies and funds from the Australian Government.
Project Number: MT21006

Hort Innovation

AUSVEG

Australian Vegetable Industry Insights

3.59 million tonnes
of fresh vegetables grown in Australia



$5.83b gross value

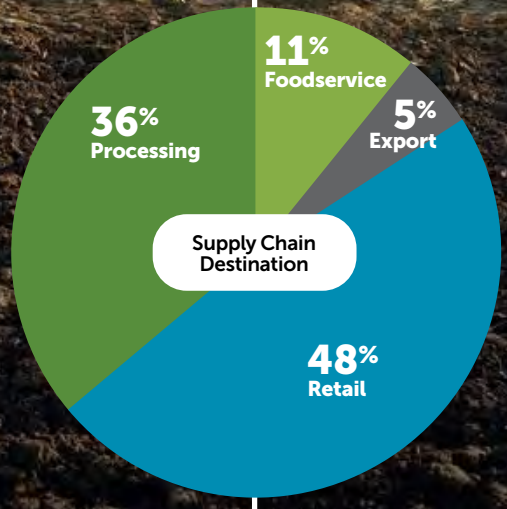
3,600 businesses

$3.27b added to economy

23,000 people directly employed

$251.6m export value

4,900 people indirectly employed



6.5% of adults

4.6% of children

Australians who eat the **recommended daily vegetable intake**

98%

of fresh vegetables sold in Australia **are grown in Australia**

Sources: Australian Horticulture Statistics Handbook 2022-23, National Health Survey 2022, Contribution of Australian Horticulture Industry (2023)

COMMODITY PROFILE

Cucumber

The latest edition of the Handbook was released in February 2024, unpacking the cucumber sector's performance during the financial year of 2022/23.

Latest cucumber industry statistics

The Australian Horticulture Statistics Handbook (Hort Stats) is the leading resource for Australian horticulture statistics and market information. It is an analysis that combines all available data on production, international trade, processing volumes and fresh market distribution to produce statistics on more than 70 horticultural categories.

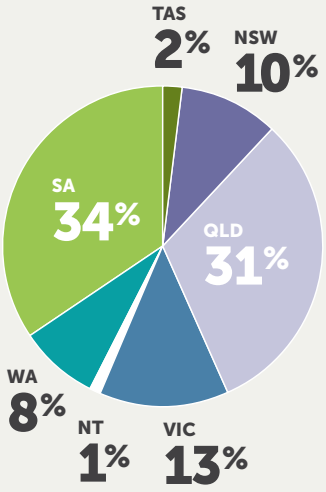
Production - 2020/21 – 2022/23

FRESH CUCUMBER

Year ending June	2021	2022		2023	
	VALUE	VALUE	VALUE % YOY	VALUE	% YOY
Production (t)	90,998	88,429	-3%	93,469	+6%
Production ($m)	$172.7	$229.9	+33%	$213.6	-7%
Fresh supply (t)	85,940	83,503	-3%	88,295	+6%
Fresh Supply wholesale ($m)	$201.9	$268.9	+33%	$249.9	-7%
Retail supply (t)	73,832	71,676	-3%	75,789	+6%
Retail supply wholesale ($m)	$173.5	$230.9	+33%	$214.5	-7%
Food service supply (t)	12,108	11,827	-2%	12,505	+6%
Food service wholesale ($m)	$28.4	$38.1	+34%	$35.4	-7%

Production by state - 2022/23

FRESH CUCUMBER



Seasonality by state - 2022/23

FRESH CUCUMBER

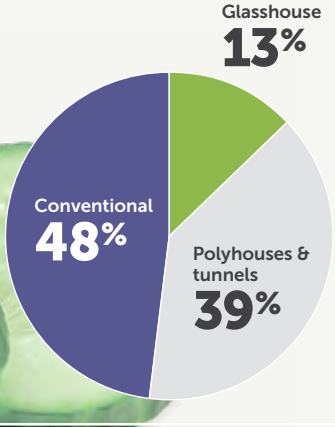
State	Volume Tonne	Value ($M)	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	Jun
QLD	19,807	$18.8												
VIC	19,088	$18.1												
NSW	16,339	$15.5												
WA	5,533	$5.3												
SA	1,797	$1.7												
TAS	282	$0.3												

Availability legend: High, Medium, Low, None

Production by system

2022/23

FRESH CUCUMBER



Hort Innovation

The *Australian Horticulture Statistics Handbook 2021-22 to 2023-24* project has been funded by Hort Innovation using multi-industry research and development levies and funds from the Australian Government.

Project Number: MT21006

Securing our food future

Seeds are the foundation of our food system, and breeding vegetables plays a pivotal role in ensuring long-term food security and environmental sustainability.

World-leading vegetable breeding and seed production company, Rijk Zwaan, develops vegetables to meet the agronomic needs of growers while responding to ever-evolving retail and consumer demand.

Rijk Zwaan Account Manager, Frances Tolson, says increasing the sustainability of agricultural production is of key importance in minimising its negative environmental impacts, and plant breeding is the first of many steps that can help us achieve this.

"Vegetable breeding companies increase sustainability along the entire chain by spending years, in some cases even decades, drawing what we can from nature to create varieties that not only meet consumer demands in terms of taste, convenience, nutrition, and aesthetics, but can also contribute to sustainable production," Ms Tolson says.

"This includes pest and resistance breeding, improving yields and reliability, and selecting natural traits that help to reduce food waste. We are also passionate about creating positive behavioural change around vegetable consumption which itself contributes towards a more sustainable world."

Rijk Zwaan invests 30 per cent of its turnover in Research and Development to create vegetable varieties to help feed the world. One example of their sustainable breeding efforts is the development of lettuce varieties with the Knox™ trait, which delays oxidation and extends the shelf life of cut lettuce. This reduces food waste and landfill, as well as minimising profit loss along the chain. Similarly, the Blueleaf trait in cucumber plants improves productivity, resistance to diseases and pests, and reduces the need for chemical sprays.

Disease resistance is an incredibly important aspect of Rijk Zwaan's role in the sustainability of our food systems. A recent example is the Tomato Brown Rugose Fruit Virus (ToBRFV), an emerging and rapidly spreading plant virus that has had major impact on global tomato production and distribution.

After the highly contaminated virus was discovered, Rijk Zwaan's researchers focused their efforts, uncovering new, unique genetics that had a high resistance level to ToBRFV.

"Soon after, our breeders developed resistant varieties in all worldwide breeding programs and extensively tested these varieties internally, as well as with growers to assess their agronomic value," Ms Tolson says.

Rijk Zwaan is now offering hybrids under its Rugose Defense label in several different tomato types: mini plum, cherry tomato on the vine, cocktail, and medium truss.

"ToBRFV-resistant varieties are now in the market, decreasing the virus' spread, halting astronomic crop losses, and ensuring global tomato supply," Ms Tolson says.

Sustainability is not just ecological. Growers and food producers need to be financially sustainable, and fresh vegetables need to be accessible and affordable for global food security.

Food security, nutrition and sustainable agriculture are intertwined.

"As a vegetable breeding company, we are passionate about vegetables, but we are also passionate about their accessibility and affordability. As well as breeding vegetables, we aim to create long-term behavioural change to increase their consumption," Ms Tolson says.

Ms Tolson is an ambassador for Rijk Zwaan's social initiative, Love My Salad, a platform coordinated by Rijk Zwaan employees together with growers, chefs, bloggers, and health and nutrition experts to promote vegetable consumption worldwide.

Rijk Zwaan Australia also collaborates with non-government organisations, not-for-profits, and knowledge institutions to develop and support strategies that increase vegetable consumption.

Recently, the company partnered with the University of Newcastle, Australia, to develop a free, online culinary nutrition education course. The course is self-paced and enables participants to gain a deeper understanding of the foods we eat and why. It's available to everyone on the website rijkzwaan.com.au.

With Australia's population expected to reach 30 million by 2029, it's now more important than ever that breeding companies are working with the whole chain to develop sustainable vegetable varieties. The adaptability, resistance, and yielding capacity of varieties; alongside cleverly sought traits that reduce negative environmental impacts of production – are driving factors in realising sustainable farming and food systems.

"We pride ourselves on creating good, natural food, and contributing to the betterment of Australians and the environment," Ms Tolson says.

FOR MORE INFORMATION
Visit rijkzwaan.com.au

VEGETABLES
ONIONS

Requirements for healthy school lunches may introduce more young consumers to vegetable snacks

Consumers are increasingly looking for healthy snacks, but opportunities for vegetables mapped by research a decade ago are still proving elusive due to challenging logistics.

In the ongoing drive to increase vegetable consumption, it's important to explore opportunities in every meal, and even between meals.

Snacking is a huge but sometimes over-looked consumption occasion, and it offers significant potential for vegetables. It also has significant challenges, however.

Nine years ago, fresh food market analyst Freshlogic undertook a levy-funded project that dug into just how big the vegetable snacking potential was, where the opportunities lay and what the big hurdles were.

Since that project, vegetables have made some headway into snacking, but Freshlogic's CEO Martin Kneebone says that while the template for success now exists, it's not easy to replicate.

"All consumers are saying 'we would like more nutritious snacks'," says Martin. "Eventually, that ends up as a trade-off with convenience and where they can source the product when they're hungry."

"The challenges of a perishable product trying to manage that through the supply chain make it hard for vegetables, particularly if that product involves a level of preparation."

The size of the snacking market is significant. Freshlogic's levy-funded project, *Market research around the opportunity to create more vegetable snacking options to quantify market size (VG14024)*, found that snacking represented 11 per cent of the total food and grocery market by value, with an annual retail value of $9.33 billion in 2015. 'Healthy' snacks represented about 40 per cent of that, with fruit accounting for half of that.

A consistent theme among the successful snacking products the project identified was their convenience and portability.

"The convenience of delivery and the product form were overarching consider-ations," says Martin. "That invited a look at vending machines to get a fresh, nutritious snacking offer closer to where the need might be, but people had a lot more propensity to buy a packet of chips rather than a sliced carrot in that sort of environment."

"We found that the sweet spot was a vegetable product that stayed whole and was able to travel through the supply chain in that form. At that stage it was pretty clear that a small snacking tomato was successful in that sense."

Snacking success hard to come by

Establishing successful new vegetable snacking products hasn't been easy. Martin says since the original research, only a few have been really successful.

Snacking tomatoes were a fast-growing product when the research was done nine years ago, and in the years since the trail they blazed has been followed by other products, most notably baby cucumbers.

"We've seen the successes replicated with more products," says Martin. "Tomatoes were right up there, and I think cucumbers have levered off the learnings and gotten there a lot quicker, and that's been a successful product too. Products in that whole form that are able to travel are going well."

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Snacking vegetables need to have a level of robustness, however, and fresh cut or trimmed products have struggled with the logistics. Breeders working on new vegetable varieties for the snacking category are focusing on whole vegetables with robustness, shelf life and maintenance of eating quality, according to Martin.

Even after getting the vegetable itself right, however, competition for retail shelf space is intense for new products.

"You've got a perishable product, so the disciplines around performance are absolute," says Martin. "If you take your product to a retailer and convince them there's an opportunity, you've probably got about a month, and if it doesn't perform in that month, the retailer won't continue with the product."

"There isn't an infinite amount of shelf space out there, and you've got higher demand for fresh chilled areas. Anything that might be cut or trimmed that need refrigeration is now under more pressure, particularly with the expansion of the likes of berries."

To see what might be hitting the Australian market in coming years, Martin points overseas. Most of the products that have done well in Australia have already been successful in markets like the UK, which has some of the most developed fresh convenience and fresh cut categories in the world.

Packaging an uncomfortable reality

The shelf life and logistics requirements of fresh snack foods, however, makes packaging very hard to avoid for vegetables.

Ongoing sustainability initiatives by suppliers and retailers are discouraging the use of packaging, and consumers vocally express a dislike of packaging, but their shopping behaviour often doesn't align with their stated ideals, according to Martin.

"Nobody wants packaging until you look at what's in their shopping bag and find that there's packing in there," he says. "It's convenient, and it's also a very efficient way of managing that product through the supply chain."

"With the various barcoding options and the increase in the amount of self-service checkouts, it gives consumers the comfort to be able to shop quickly. If it's a barcode it's easy, but if it's a lookup item it's more complicated.

Post-COVID snacking recovery

The COVID-19 pandemic had a huge impact on the sales of snack foods as millions of consumers were stuck at home during lockdowns or shifted to working from home, cutting into the demand for mobile snacks. Consumers were making fewer, bigger shopping trips, reducing opportunities for impulse sales of snack food.

"There was more food purchased for preparation at home, and lunches that were at work were now at home," says Martin.

As soon as the lockdowns opened up, however, Martin says demand for snack foods bounced back, and have now returned to pre-pandemic levels.

'Snack-sized' or 'down-sized'?

When the project explored how snacking products were consumed, it found snacking vegetables were not only eaten as a snack, but also as a smaller portion replacement for traditional vegetables.

"While we talk about a snacking category, not all of those products are consumed as snacks," says Martin. "Many of them are actually really convenient forms for small or busy households. Meeting that demand has put some volume around what we loosely call a snacking product form."

More than a quarter (26 per cent) of Australian households are only one person, according to the 2021 Census, and Martin says they don't want to buy big quantities of fresh produce that they'd end up wasting.

"They welcome the smaller packs of tomatoes and cucumbers because they don't want to put half a tomato back in the fridge."

Fresh-friendly kids

Martin also sees a brighter future for healthy, fresh snacks as children coming through a much more health-conscious school system become buyers themselves. Children are internalising schools' requirements for lunches brought from home to contain healthy food without disposable packaging.

"Schools and the influence they have will strengthen the fresh component and put pressure on the packaging component," he explains. "The younger ones at school now are going to evolve into a different consumer who will probably warm to these sorts of things."

FOR MORE INFORMATION
Contact Martin Kneebone on 03 9818 1588 or martin@freshlogic.com.au

Or head to horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/vg14024

Hort Innovation VEGETABLE FUND

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Number: VG14024

GREATER SHEPPARTON

A GREAT PLACE TO GROW

Greater Shepparton, located in Northern Victoria, is the food bowl of Australia. With its soils, irrigation water and connectivity to capital cities and export markets, choosing Greater Shepparton as a place to grow just makes perfect sense.

CLIMATE

Greater Shepparton is ideal for growing a wide variety of fruits and vegetables throughout the changing seasons. Commonly grown fruit and vegetable crops in the region are stone fruits, apples, pears, cherries, kiwi fruit, jujube, avacado, tomatoes, capsicums, zucchini, corn, cauliflower and broccoli, just to name a few.

WATER

The Goulburn Murray Irrigation District (GMID), which Greater Shepparton is an integral part of, boasts a world class irrigation system. This irrigation system allows growers to water online from a high quality supply distributed through the automated channel network 365 days a year.

The Water Efficiency Project (WEP) will provide further water recovery, channel rationalisation and modernisation opportunities within the GMID, and is already delivering 7GL of its forecasted 15.9GL water savings. High security irrigation water right in the GMID is among the most reliable in Australia and allows our region to produce the freshest produce in Australia.

SOILS

Our region has some of the most fertile soils in Australia. The Shepparton fine sandy loam, which dominates the fruit growing areas, is highly suited to irrigated annual and perennial horticultural crops.

FOOD MANUFACTURING

Greater Shepparton has a high concentration of food manufacturing businesses, including Campbell's Soups and the iconic SPC. In addition to this are a number of packing sheds in the region including a recent $60 million pack house featuring a 35m tall automated storage retrieval system (ASRS), three sizing and grading lines and seven packing lines.

TRANSPORT & LOGISTICS

The Greater Shepparton freight logistics network efficiently delivers 'fresh' produce across Australia and around the world. Melbourne wholesale fruit & vegetable market is just 90 minutes up the road and Port of Melbourne only 120 minutes. All serviced by an expansive transport network located right here in Greater Shepparton to service the export needs of businesses.

Greater Shepparton – a great place to grow a family and grow a business. Get in touch today.

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export/ trade + biosecurity update

INTERNATIONAL TRADE

Australian vegetable exports performance overview

From January to December 2023, Australian vegetable exports increased by 8 per cent in value, from AUD$229 million to AUD$247 million and total export volume increased by 4 per cent from 185,989 tonnes to 193,984 tonnes. The top five export destinations are Singapore, United Arab Emirates, Malaysia, South Korea, and Thailand.

Singapore was the top Australian fresh vegetable export destination by value at $42 million and saw a slight decline in export volume by 2 per cent, with a slight reduction of 563 tonnes. The United Arab Emirates remained the top export destination by volume, recording an increase of 4 per cent in export value, from AUD$32.5 million to AUD$33.8 million, with an increase in export volume by 10 per cent, from 33,250 tonnes to 36,714 tonnes. Australian fresh vegetable exports to Malaysia increased by 8 per cent in value and volume *(refer to Table 1).*

Root vegetables such as carrots, potatoes and onions remained as top three export crops for the industry *(refer to Table 2).*

Change in vegetable exports by top 10 destinations

TABLE 1. JANUARY TO DECEMBER 2022–2023

Trade Partner	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
Total Fresh Vegetable Exports	**$229,282,836**	**185,989**	**$247,752,893**	**193,894**	**8%**	**4%**
Singapore	$41,942,095	22,839	$42,538,063	22,276	1%	-2%
United Arab Emirates	$32,539,222	33,250	$33,891,943	36,714	4%	10%
Malaysia	$22,998,763	20,180	$24,727,666	21,798	8%	8%
Korea, South	$16,512,819	19,712	$17,108,202	20,669	4%	5%
Saudi Arabia	$13,841,498	14,576	$14,880,859	15,792	8%	8%
Hong Kong	$15,931,076	7,060	$14,132,549	5,662	-11%	-20%
Thailand	$16,266,589	15,784	$14,007,724	12,837	-14%	-19%
Taiwan	$10,093,258	7,741	$12,618,370	9,579	25%	24%
New Zealand	$7,524,120	1,186	$12,476,827	3,349	66%	182%
Japan	$8,843,452	4,785	$8,961,319	3,721	1%	-22%

Change in vegetable exports by crop

TABLE 2. JANUARY TO DECEMBER 2022–2023

Crop	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
Carrots	$88,999,252	93,155	$81,494,828	90,653	-8%	-3%
Onions	$29,683,794	33,902	$43,959,130	41,185	48%	21%
Potatoes	$35,462,713	42,450	$40,725,310	41,747	15%	-2%
Cauliflowers and Broccoli	$11,853,020	2,006	$14,262,118	3,188	20%	59%
Asparagus	$13,487,903	2,697	$12,154,292	2,521	-10%	-7%
Celery	$10,705,503	1,024	$10,217,030	1,116	-5%	9%
Beans	$7,101,668	3,891	$7,857,489	4,245	11%	9%
Tomatoes	$4,850,643	697	$7,645,310	1,642	58%	136%
Lettuce	$5,129,219	848	$6,316,807	1,339	23%	58%
Pumpkins	$7,813,223	1,101	$5,600,482	1,002	-28%	-9%

Source. Global Trade Atlas 2024

Vegetable exports by crop highlights

Carrots

TABLE 3. CHANGE IN CARROT EXPORTS TO TOP 10 EXPORT DESTINATION - JANUARY TO DECEMBER 2022-2023

Countries	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
United Arab Emirates	$27,988,678	30,251	$24,772,410	30,249	-11%	0%
Saudi Arabia	$13,510,110	14,347	$14,288,117	15,488	6%	8%
Malaysia	$13,106,975	14,857	$10,888,380	13,037	-17%	-12%
Singapore	$11,126,727	11,947	$10,048,894	10,479	-10%	-12%
Qatar	$7,473,500	8,104	$4,888,688	5,337	-35%	-34%
Hong Kong	$3,058,843	3,109	$2,731,289	2,607	-11%	-16%
Fiji	$762,732	616	$2,530,411	2,031	232%	230%
Kuwait	$2,206,672	2,336	$2,232,846	2,383	1%	2%
Thailand	$3,808,269	1,781	$1,931,038	1,753	-49%	-2%
Taiwan	$380,066	268	$1,625,898	1,689	328%	530%

Vegetable exports by crop highlights

Broccoli and Cauliflower

TABLE 4. CHANGE IN BRASSICA EXPORTS TO TOP 10 EXPORT DESTINATION - JANUARY TO DECEMBER 2022-2023

Countries	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
Singapore	$6,256,908	1,102	$8,189,730	1,865	31%	69%
Hong Kong	$1,598,264	250	$1,334,152	212	-17%	-15%
Thailand	$1,150,194	177	$1,150,162	211	0%	19%
Malaysia	$810,849	118	$900,055	169	11%	43%
Philippines	$414,677	88	$666,522	192	61%	118%
New Caledonia	$164,570	52	$386,141	204	135%	292%
Vietnam	$415,334	56	$383,076	61	-8%	9%
Fiji	$286,584	33	$277,409	42	-3%	27%
Korea, South	$81,261	8	$239,215	39	194%	388%
Papua New Guinea	$180,813	33	$123,353	35	-32%	6%

Source. Global Trade Atlas 2024

New Zealand study tour a valuable growth opportunity for Elders agronomists

A group of 11 Elders employees were given the opportunity to travel to New Zealand in order to learn about horticulture and viticulture across the ditch.

Corteva Agriscience funded and facilitated the study tour for the group of Elders, Ace Ohlsson and DJ's Growers agronomists, which covered a range of topics specific to horticulture and viticulture on New Zealand's North Island.

The itinerary for the trip included a tour of Corteva's New Zealand Headquarters, visits to various vineyards and orchards, and information sessions from a range of specialists.

A key part of the trip was a visit to Corteva's Global Field Station, 'Waireka', which is used to conduct research and testing at each phase of product development for crop protection.

Brian Husband leads Waireka, said that these types of trips are crucial for advisors to understand the whole product pipeline.

"It is really important for agronomists to understand what goes on behind the scenes to get a product registered," Brian said.

"A lot of people don't realise just how much work goes into the research and testing phases for new products. We are hoping to equip the group with that knowledge, and then they can go home to their clients, and pass those learnings on.

"It helps everyone to have a better understanding of how buying a Corteva product means you are buying a well-researched product which is safe, and one which works."

Paul Reynolds, Elders National Category Manager for Crop Protection, explained that the group was also able to gain an understanding of emerging chemistry which is yet to hit the Australian market.

"Elders is very fortunate to have such a strong relationship with Corteva, as it helps foster access to new molecules that can solve new problems, which may not yet be widely available," Paul said.

"We are very grateful to Corteva for the opportunity."

Horticultural agronomist based at Elders Robinvale, Molly Black, said the tour was a valuable way to build relationships and share experiences to bring back to local growers.

"This trip has been a fantastic way to progress our knowledge and skills," Molly said.

"New Zealand is doing some amazing things in their horticultural and viticultural sectors, but so are we in Australia. It just comes down to being able to exchange information and ideas to better both industries."

Through these activities, the team gained insight into New Zealand's vineyard management systems, and strategies for pest and disease control. With plenty of discussion around recovery from Cyclone Hale and Cyclone Gabrielle, sustainability and climate resilience strategies were also high on the agenda.

John van der Linden, Corteva's Horticultural and Viticultural Technical Specialist, explained that a key focus of the trip was providing the group with exposure to new and diverse environments, and how this can impact management style.

"One of the areas we visited was the Gimblett Gravels, which is one of the world's first appellations based on soil type," John said.

"The gravel was exposed after the Ngaruroro River changed course, and now it has become a really well-known wine growing region.

"It is actually ideal for vines because we can control the grape vigour, and therefore quality. Due to the soils unforgiving nature, we often say that if you can grow wine and grapes in the Gimblett Gravels you can grow them anywhere!"

James Hook, agronomist at DJ's Growers in McLaren Vale, said that it was interesting to get a glimpse of such fascinating parts of the sector in New Zealand, and to better understand some of the strengths and weaknesses of their operations.

"We have seen some really interesting things on the tour," James said.

"In some ways, we have found that New Zealand is more advanced in its horticulture operations, particularly in spray technology, as they are under more severe disease pressure.

"But then in other ways, particularly in terms of labour management, water use and moisture monitoring, Australia seems to have adopted different solutions. So, it has been incredibly valuable to be able to learn and share insights."

Elders thanks Corteva Agriscience, a key crop protection supplier, for their support in sponsoring, facilitating and organising the tour.

Above. The study tour group pictured outside Corteva's Waireka Research Centre.

FOR TAILORED ADVICE
Elders agronomists can help you take your crop to the next level. **Learn more: elders.com.au/our-services/agriculture-services/agronomy**

Vegetable exports by crop highlights

Celery

TABLE 5. CHANGE IN CELERY EXPORTS TO TOP 10 EXPORT DESTINATION - JANUARY TO DECEMBER 2022-2023

Countries	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
Singapore	$2,945,075	1,858	$3,143,176	1,828	7%	-2%
Malaysia	$2,645,712	1,554	$2,954,697	1,679	12%	8%
United Arab Emirates	$490,260	173	$450,289	194	-8%	12%
Indonesia	$280,207	90	$280,501	112	0%	24%
Thailand	$140,784	28	$249,037	62	77%	121%
Hong Kong	$120,216	29	$219,256	127	82%	338%
Vietnam	$89,935	28	$103,323	37	15%	32%
Philippines	$114,369	32	$102,440	40	-10%	25%
Fiji	$18,670	6	$74,041	34	297%	467%
New Caledonia	$79,078	29	$71,218	29	-10%	0%

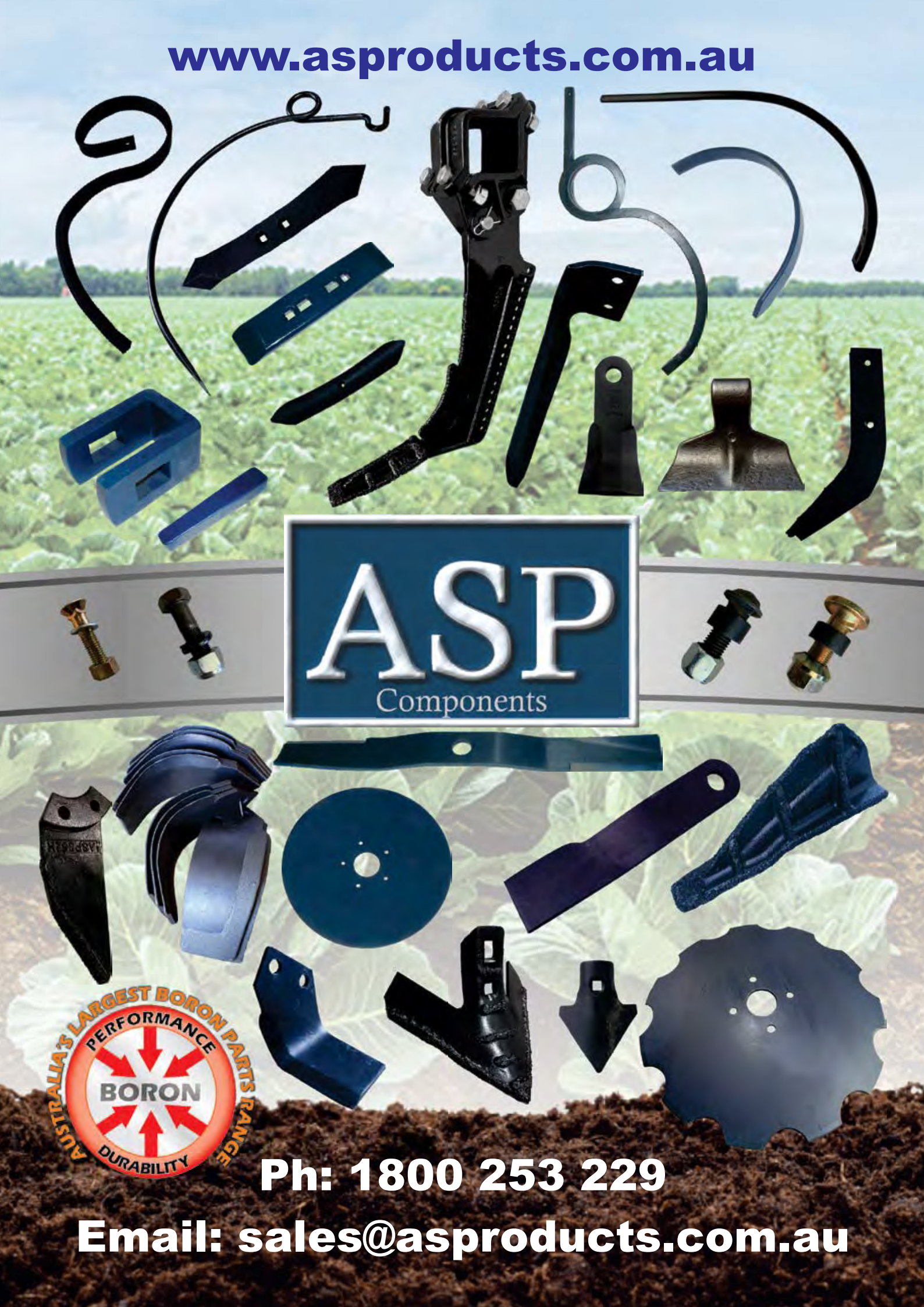
Vegetable exports by crop highlights

Lettuce

TABLE 6. CHANGE IN LETTUCE EXPORTS TO TOP 10 EXPORT DESTINATION - JANUARY TO DECEMBER 2022-2023

Countries	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
Singapore	$3,869,208	487	$2,761,124	585	-29%	20%
Thailand	$958,794	93	$884,398	86	-8%	-8%
Hong Kong	$1,360,669	175	$790,557	93	-42%	-47%
Fiji	$361,410	48	$267,339	42	-26%	-13%
Philippines	$195,828	28	$234,714	44	20%	57%
Brunei Darussalam	$271,199	28	$175,379	26	-35%	-7%
Papua New Guinea	$66,914	18	$124,655	32	86%	78%
Vietnam	$127,915	10	$120,749	11	-6%	10%
Indonesia	$75,829	10	$84,279	12	11%	20%
New Caledonia	$418,980	180	$46,394	42	-89%	-77%

Source. Global Trade Atlas 2024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Useful tools to manage Fall armyworm developed from DAF research

The levy-funded project *Co-developing and extending integrated* Spodoptera frugiperda *(Fall armyworm) management systems for the Australian vegetable industry, VG20003*, has concluded and given industry useful tools to manage the exotic pest and insights into communication and extension methodologies.

The first detection of Fall armyworm (FAW) on Australian shores occurred in early 2020 in Far North Queensland. A known pest overseas, FAW is a destructive migratory pest that is a high risk to the sweetcorn and maize industry, and has also been detected in capsicum, cabbage, eggplant and melons.

From that first detection, FAW has now spread and established in other regions of Queensland, New South Wales, Northern Territory, Western Australia and Victoria.

The project's aim was to develop a strategy for affected regions and for other regions that develop an incursion. The outcomes were then to understand the FAW biology, seasonal patterns, life cycle, the use of appropriate chemicals and cultural practices to provide growers with the tools to manage the pest.

Alongside that, the project team developed communication channels and extension methods to work with industry partners and growers to ensure their understanding of the risk to crops and how to monitor and manage the pest.

Project Lead with the Queensland Department of Agriculture and Fisheries, Dr Siva Subramaniam (Subra) said that the project brought together industry bodies from horticulture to consult on the best management options.

"Crop losses in sweetcorn can be as high as 90 per cent if Fall armyworm is unchecked," said Subra.

"With that level of damage and economic losses, it is clear that the wider industry needed to find a solution. There was a lack of local knowledge about this new pest, so we consulted with peak industry bodies, growers, agronomists, government departments, seed companies and the chemical industry to develop an integrated management system and a way to communicate that information to industry."

In the four years since the first detection, information is now known about the FAW life cycle for the growing regions, seasonal patterns, range of incursion, monitoring systems, what chemistries do – and don't work, as well as management practices including endemic predators, pathogens and parasitoids, and farm hygiene.

Inset. Dr Siva Subramaniam (Subra) in the field.

FAW corn leaf damage.

"The information from overseas is not directly applicable to Australian conditions, so the use of pheromone traps aided with monitoring the range and seasonality of fall armyworm", said Subra.

"We have tested FAW populations for insecticide resistance in Australia. There was clear evidence that FAW had developed a level of resistance to older chemistries including carbamates, organophosphates and pyrethroids, so it is important that growers are aware of what works and what doesn't. So the pheromone traps and field sampling give us an opportunity to monitor FAW, but also to test what insecticides are still effective."

As part of the project, demonstration sites, workshops, industry meetings, newsletters, webinars and an online engagement hub were established to provide information to a broader audience. How well that information has been taken up and adopted formed part of the project outcomes.

Using a collaborative approach – participatory action research (PAR) - the project team brought industry together in the planning, demonstration, engagement, implementation and reflection stages to develop knowledge and information for FAW management. The process also highlighted where the gaps in knowledge of FAW.

A paper entitled *The use of participatory approaches in the development and extension of fall armyworm management practices for the Australian vegetable industry* authored by the team was presented at the APEN Conference in November 2023 and received the best research paper for the Rural Extension and Innovation Systems Journal.

From this process, the research team determined that industry were most interested in knowing:

- whether adjuvants are adding to the efficacy of insecticides or not for FAW management,
- the best time to spray (crop stage, time of the day, insect stage),
- the method to control FAW in the whorl of sweet corn,
- where FAW coming from in the production system,
- how and where FAW survives during the off-season to initiate infestation in the immediate season,
- to fast-track commercialisation of beneficial insects (predators and parasitoids) and biologicals (fungi, viruses), if they are effective in managing FAW, new lure and kill techniques to attract and kill the female moths before they lay eggs in the crops, the toxicity of insecticides on beneficial insects and biological control agents,
- to communicate FAW RD&E information to the industry.

"The participatory process developed a good network to understand what the industry needs were, the issues they were facing, what knowledge gaps were present and the level of adaption needed by growers. The learnings from this project will help us move into the next project, which is around area wide management.

"FAW Area wide management will be a national program with a working group in the Burdekin, Lockyer Valley and Gippsland, where FAW has been identified."

"It will also incorporate the grain and broadacre industries such as maize and sorghum that are hosts for FAW. Extension teams will include agricultural departments, the VegNET team, agronomists and grower networks."

The current project is the *National fall armyworm innovation system for the Australian vegetable industry, VG22006.* Broadly, the aim is to accelerate the generation and use of knowledge and tools for the sustainable management of fall armyworm at an area-wide scale. This knowledge will be passed to growers through demonstrations and field walks, and build upon the communication channels established in the previous project.

FOR MORE INFORMATION
Visit daf.engagementhub.com.au/fallarmyworm

Hort Innovation VEGETABLE FUND

The levy-funded project *Co-developing and extending integrated* Spodoptera frugiperda *(Fall armyworm) management systems for the Australian vegetable industry, VG20003* and *National fall armyworm innovation system for the Australian vegetable industry, VG22006* are strategic levy investments in the Hort Innovation Vegetable Fund. *Identifying potential parasitoids of the fall armyworm,* Spodoptera frugiperda*, and the risk to Australian horticulture (MT19015)*
Project Number: VG20003

FALL ARMYWORM
Preparing for the season

Planting

Choose a seasonal window for planting crops where FAW is (less) not prevalent.

Plant growth

- Start monitoring eggs & larvae from crop emergence to cob development and moth activities using pheromone traps
- Low levels of defoliation do not always mean economic loss
- Use insecticides that work against larval stages.
- Target to control early larval stages (<10 mm size) before they move into whorl
- Chemical control is not always necessary
- Natural enemies & pathogens of FAW
- Spotted ladybird beetles
- Spined shield bug
- Assassin bug
- Glossy shield bug
- Endemic parasitoids (around 20 species) – including Chelonus spp and Cotesia
- Pathogens – Viruses, fungus (Metarhizium *rileyi*) and nematodes.

FAW insecticide resistance 2020-22

- High to moderate level of resistance to synthetic pyrethroids, organophosphate & carbamates
- No resistance evident: Group 28 (Chlorantraniliprole /Tetraniliprole), Group 5 (Spinetoram/Spinosad), Group 6 (Emamectin benzoate), Spodoptera
- *frugiperda* multiple nucleopolyhedrovirus (SfNPV) ()
- Farm hygiene
- Identify crops that have FAW early & remove the infested plants
- Destroy any produce that is rejected from the packing shed
- Destroy the crop and plough it in.

To watch the webinar on preparation go to: youtube.com/watch?v=OjU9DkzhW58

Above L-R. FAW leaf damage. FAW trap.

Verpixo® Adavelt® active a critical new tool for fungicide resistance management

CORTEVA Agriscience's new fungicide, Verpixo® Adavelt® active, is a highly effective new fungicide for managing challenging crop diseases, helping farmers achieve healthy and abundant yields.

The unique structure of Verpixo, based on a naturally occurring compound found in soil bacteria, enables activity across a broad spectrum of ascomycete diseases and builds upon new chemistry first established by Corteva Agriscience.

Trialled extensively under Australian field conditions, Verpixo® Adavelt® active has consistently demonstrated its efficacy in disease control, offering a powerful new solution for growers to protect their crops from yield-limiting diseases. Registered for use with cucurbits, fruiting vegetables, head and leafy lettuce, it has been trialled at various field sites, including an extensive field study at Ashbern Farms, where winter strawberries are grown across 26 hectares of land on Queensland's Sunshine Coast, as well as conventional summer strawberries in Stanthorpe.

Ashbern Farms Director, Brendon Hoyle said a major issue and concern for farmers is managing the implications of existing chemistries that are beginning to face resistance.

"Certain chemistries are experiencing increased pressure in terms of resistance build up, which can result in diseases in crops and ultimately costs us money," Mr Hoyle said.

"We need to be able to produce quality product to remain viable so we can't afford resistance build up in pests or disease. It adds pressure to the crop and reduces quality."

"As growers, we do everything we possibly can to avoid resistance and that's what's really exciting about this new mode of action for botrytis and powdery mildew. It gives us another tool in the toolbox which will allow us to rotate chemistries efficiently and gives us confidence that we have a better chance of disease control."

Corteva Agriscience Horticulture Marketing Manager, Nick Koch said with many existing chemistries under threat of resistance, Verpixo is an excellent new rotation partner offering strength and adaptability for growers.

"Key diseases such as botrytis, also known as grey mould and powdery mildew, have the biology to develop resistance, and there is concern with existing chemistries beginning to experience this," Mr Koch said.

"Verpixo® is a valuable solution, offering a completely new mode of action for these diseases that gives growers more flexibility to manage their disease control programs throughout the growing season."

The trial at Ashbern Farms was highly successful and recorded an increase of up to 14 per cent in marketable yield, and a 12-15 per cent decrease in botrytis fruit infection.

"With existing chemistries under threat of resistance, Verpixo will redefine custom fungicide programs to sustain healthier crops, better yields and greater value," Mr Koch said.

Mr Hoyle said the trial data spoke for itself.

"Seeing the results of the trial and increase in marketable yield was fantastic," he said. "Trials are always exciting. They give us as farmers a feel for the product's capabilities firsthand and an opportunity to see how it's going to fit into our farming system," Mr Hoyle said.

"At the end of the day that's what we're all about, trying to produce quality food and reduce waste."

Another trial in Wamuran showcased Verpixo's strength in managing key diseases in strawberries, highlighting its suitability as a core solution for growers and their resistant management needs.

Corteva Agriscience Field Scientist, Greg Wells said the results of the trial underscored Verpixo's efficacy in disease management.

"For the strawberry trial in Wamuran, we conducted a season-long sequence of treatments," Mr Wells said. "A sequence of sixteen treatments were placed on the strawberries, with Verpixo sprayed once or twice in a row to test its control on botrytis and other key diseases.

"The trial indicated Verpixo had excellent disease control at low use rates, resulting in greater yield potential and a reduction in disease incidence."

"We are committed to helping growers navigate the complexity of plant disease and mitigate the effects of emerging or established resistance," Mr Koch said.

"Verpixo® Adavelt® active is designed to meet these needs and offers a cornerstone upon which disease management programs can continue to be strengthened."

Above L-R. Botrytis fruit infection present in strawberries. Corteva employees at the Ashbern Farms strawberry trial site.

Investing in biosecurity preparedness to protect against potential pest incursions

Many in the vegetable industry know too well the threats that the arrival of new plant pests or diseases pose to production systems, farm businesses and the ability to access markets and trade. The responses we take can mitigate the risks.

Above. In December 2023 project partners representing AUSVEG, CEBRA, Hort Innovation, DEECA, DPIRD, Onside, PHA, QDAF and RMCG came together in Melbourne to discuss key priorities for the five year program and develop an annual plan of activities that will be undertaken in the first year of the program.

The 2017 arrival of Tomato Potato Psyllid (TPP; *Bactericera cockerelli*) in Western Australia resulted in trade embargos on a diverse range of horticultural produce from the affected areas, even though TPP only directly affects Solanaceous crops such as potatoes, capsicums and eggplant. This was in part due to the lack of a valid host list.

Reflecting on past plant pest responses also offers examples of the benefits of an industry that is prepared for the arrival of new pests. Early RD&E investment (*RD&E program for control, eradication and preparedness for vegetable leafminer* MT16004) meant that a range of resources, including updated host lists and contingency plans were available when Serpentine leaf miner (*Liriomyza huidobrensis*; SLM) was reported in Australia a few years later.

With a diversity of crops, and exotic pest threats that could have severe impacts if introduced to Australia, the vegetable industry needs strong biosecurity and contingency planning with a focus on business continuity and the agility to adapt as pest threats arise and evolve.

To ensure that the Australian vegetable industry and biosecurity agencies are better prepared and able to respond more effectively and efficiently in the event that a new pest arrives, Hort Innovation, on behalf of vegetable growers, is investing $10 million in a five-year program to develop tools and establish a national framework to enable earlier detection and identification of high priority exotic plant pests and an evidence-based return to business continuity for growers.

The *Vegetable Industry Biosecurity and Business Continuity Strategy* (VG22004), led nationally by AUSVEG, is a partnership that brings together scientific and biosecurity expertise and technology from Plant Health Australia (PHA), state and territory biosecurity and research agencies (Department of Primary Industries and Regional Development (DPIRD), Department of Energy, Environment and Climate Action (DEECA – Victoria), Queensland Department of Agriculture and Fisheries (QDAF)), Centre for Biosecurity Risk Analysis (CEBRA), RM Consulting Group and Onside Intelligence. This collaboration is critical as it allows the work to be undertaken as a program to build a national framework, rather than discrete projects.

This project is to ensure that the vegetable industry and farming businesses are equipped to respond to new pest and disease incursions, are supported by a robust and responsive biosecurity network that detects pests early, and that contingency plans are in place for key biosecurity threats as a guideline to responding to new incursions and support a return to farm business activities.

The program is built around three themes:

1. ***Surveillance and Diagnostics*** **led by DEECA and QDAF**
2. ***Data and Informed Decision Making*** **led by DPIRD and**
3. ***Business Resilience and Continuity*** **led by PHA and includes:**

- updating the Vegetable Industry Biosecurity Plan including a review of the high priority pest list and development of contingency guidelines,
- development of a diagnostic, surveillance and data collection and management system that supports early detection and responsiveness to plant pests,
- a data and decision-making framework that supports movement of produce and the swift reinstatement of market access based on risk,
- support for the implementation of robust on-farm biosecurity practices by growers and other industry participants,
- a contingency fund for industry responsiveness to pests, providing an adaptable, flexible approach to preparing for high-priority exotic pests.

The program works in tandem with existing vegetable industry biosecurity initiatives, such as the AUSVEG-PHA Farm Biosecurity Program, funded through grower's biosecurity levies to support on-farm preparedness and training for growers and agronomists and provides the industry with additional capacity to stand up support in a flexible, and rapid way in the event of a pest incursion that impacts vegetable crops.

Keep an eye out for updates through AUSVEG communications.
If you would like further information please contact AUSVEG: (03) 9882 0277.

The *Vegetable Industry Biosecurity and Business Continuity Strategy* (VG22004) has been funded by Hort Innovation using the Vegetable Industry research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not for profit research and development corporation for Australian Horticulture.
Project Number: VG22004

Understanding how your levy works

It is Hort Innovation's job to work with industry to invest the vegetable, potato and onion R&D levies and Australian Government contributions into initiatives to help growers be as productive and profitable as possible, through the Hort Innovation Levy Funds.

Research and development (R&D) levies are payable on potatoes, vegetables and onions that are produced in Australia. These levies are collected by the Australian Government and then entrusted to Hort Innovation. It is then Hort Innovation's responsibility to work with industry to invest the levies – together with Australian Government funds into strategic R&D initiatives.

How are levy investment decisions made?

Investments specific to Hort Innovation are guided by the industry's Strategic Investment Plan (SIP) and Annual Investment Plan (AIP).

SIPs provide an overarching roadmap for industry to follow, and AIPs detail how levy dollars will be spent each year to achieve industry goals.

What is the Strategic Investment Plan?

The SIP is the roadmap that helps guide Hort Innovation's oversight and management of investment programs.

The SIP lays the foundation for decision making in levy investments and represents the balanced interests of the industry. The most important function of the SIP is to make sure that levy investment decisions align with industry priorities. In 2021, SIPs were refreshed to reflect the current needs of the respective industries. The refresh involved close consultation with growers, industry participants and the wider research community in each relevant sector.

The SIP details the industry's strategic goals centred around four outcome areas:

- industry supply, productivity and sustainability;
- demand creation;
- extension and capability;
- business insights.

Under each of those outcomes, there are industry specific strategies and key performance indicators that provide guidance on how industry will work towards achieving the outcomes.

Where a previous SIP is available, a performance report has been developed to demonstrate how investments delivered generated impact for growers.

The reports provide an overview of key achievements delivered through each levy investment, and how they relate to the industry's SIP outcomes and strategies. **While this performance report provides a five-year review of the vegetable SIP 2017-2021, going forward an annual performance report will be provided for the vegetable SIP 2022-2026.**

R&D LEVY RATES

Potatoes

48 cents PER TONNE

Unprocessed Potatoes

Vegetables

0.485%

of the gross sale value at the first point of sale

Onions R&D AT

$2.90 PER TONNE

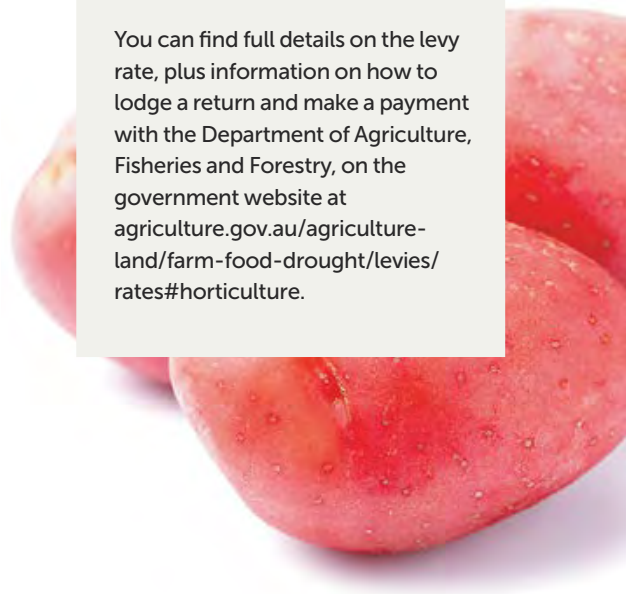
marketing at $1.00 per tonne

Hort Innovation POTATO – FRESH FUND

Hort Innovation VEGETABLE FUND

Hort Innovation ONION FUND

You can find full details on the levy rate, plus information on how to lodge a return and make a payment with the Department of Agriculture, Fisheries and Forestry, on the government website at agriculture.gov.au/agriculture-land/farm-food-drought/levies/rates#horticulture.



LEVY-FUNDED COMMUNICATIONS PROGRAMS

Australian potato industry communication and extension project (PT20000); *PotatoLink. National vegetable industry communications program* (VG22000)
Accelerating the adoption of best management practices for the Australian onion industry (VN21000)

	OUTCOME 1	OUTCOME 2	OUTCOME 3	OUTCOME 4
	Extension and capability	**Industry supply, productivity & sustainability**	**Demand Creation**	**Business Insights**
	To manage knowledge, relationships, systems and processes required to communicate effectively with internal and external stakeholders	To accelerate the application of production practices that optimise returns and reduce risk to growers	To maintain and strengthen consumer demand as the foundation for sustainable expansion of production and consumption in domestic and international markets	To deliver data and insights that is foundational to achieving success in the other three outcome areas of demand creation – supply, productivity and sustainability as well as extension and capability
POTATOES 	A change in knowledge, attitude, skills, aspiration (KASA) and practice for grower/industry profitability and sustainability through use of best practice and innovation. • Growers, value chain, media and governments being well informed on industry initiatives and achievements as a vital part of regional communities and networks. • Increased on-farm use of R&D outputs which will build a more resilient industry in addition to improved networks and cross-industry collaboration. • Proactive strategic and evidence-based decision making in businesses and for industry on investment, priorities and risk management.	Accelerating widespread use of existing and new R&D findings and proven management practices that will help growers to reduce the costs and impacts associated with pests, weeds and diseases. • Advances in productivity and biosecurity through a proactive and prepared industry. • New knowledge and understanding of sustainable production systems for Australian potato growers including precision inputs, management of salinity, enhanced soil health and improved water and nutrient use efficiency. • Proactively monitoring potential crop protection regulatory threats and having access to a broader suite of effective, socially acceptable and environmentally sound crop protection solutions.	Support product positioning with consistent quality, evidence of beneficial product nutrition attributes and responsible industry production practices. • Identify and prioritise export and domestic market niches where there is demand and growth potential for competitive supply of quality Australian fresh potatoes.	Achieving the outcome will involve reliable baseline data and analysis to provide insights and understand current and emerging trends. Key investments will support the provision of consumer knowledge and tracking, trade data and independent reviews to enable better decision-making process at industry level and individual businesses.
VEGETABLES 	A change in knowledge, attitude, skill, aspiration and practice for grower/industry profitability and sustainability through use of best practice and innovation • Maintaining and improving industry cohesiveness, with the majority of businesses and the industry supply chain actively engaged in implementation of this strategy; • Growers, supply chain, media and governments being well-informed on industry initiatives and achievements as a vital part of regional communities and networks; • Increased on-farm use of R&D outcomes that will build a stronger, more resilient industry – in addition to improved networks and cross-industry collaboration; • Proactive strategic and evidence-based decision making in businesses and for industry on investment, priorities and risk management.	New knowledge and understanding of sustainable production systems for Australian vegetable growers including enhanced soil health, improved water and nutrient use efficiency, precision inputs and labour use efficiency; • Responding to environmental change and climate variability; • Advances in biosecurity and the management of pests and diseases through a proactive and prepared industry; • Optimising the supply chain to improve quality and traceability, as well as reduce wastage and improve sustainability of vegetable production systems; • Improvements in protected cropping and intensive production technologies; • Proactively monitoring potential crop protection regulatory threats and having access to a broader suite of effective, socially acceptable and environmentally sound crop protection solution.	Grow the value of Australian vegetable exports by supporting industry to market premium products, targeting higher value market segments; • Articulate the value proposition for Australian vegetables and pursue more targeted market and channel growth opportunities; • Develop strong relationships across the supply chain with a shared goal to grow the category; • Enhance opportunities for value-adding and packaging; • Improve stakeholder engagement with the foodservice sector and the education of health benefits to consumers.	Achieving the outcome will involve reliable baseline data and analysis to provide insights and understanding of current and emerging trends. Key investments will support the provision of consumer knowledge and tracking, access to trade data, production statistics, forecasting and independent reviews to enable better decision making process at industry level and individual businesses.

	OUTCOME 1	OUTCOME 2	OUTCOME 3	OUTCOME 4
	Extension and capability	**Industry supply, productivity & sustainability**	**Demand Creation**	**Business Insights**
ONIONS 	Increasing knowledge, attitude, skills, aspiration (KASA) and practice for grower and industry profitability and sustainability through use of best practices and innovation • Maintaining and improving industry cohesiveness, with most businesses and the industry supply chain actively engaged • Growers, value chain, media and governments being well informed on industry initiatives and achievements as a vital part of regional communities and networks • Increased on-farm use of R&D outcomes which will build a stronger, more resilient industry, in addition to improved networks and cross-industry collaboration • Proactive strategic and evidence-based decision-making in businesses and for industry on investment, priorities and risk management.	Developing fit-for-purpose sustainable pest and disease management strategies • Biosecurity awareness and preparedness • Continuous improvement in soil health • Improved input management that reduces costs while maintaining yield and quality • Proactively monitoring potential crop protection regulatory threats and having access to a broader suite of effective, socially acceptable and environmentally sound crop protection solutions.	Broaden consumer awareness so that onions are more top of mind and purchased more frequently • Develop strong relationships across the supply chain with a shared goal to grow the category • Identify and prioritise domestic and international market niches (market segmentation) where there is demand and growth potential for competitive supply of quality Australian onions.	Achieving the outcome will involve reliable baseline data and analysis to provide insights and understand current and emerging trends. Key investments will support the provision of consumer knowledge and tracking, trade data, production statistics, and forecasting, benchmarking and independent reviews to enable better decision-making process at industry level and individual businesses.

What is the Annual Investment Plan?

While a SIP provides an oversight of investment over the next five years, the AIP explains how levy funds are going to be invested over a 12 month period.

AIPs are developed each year by Hort Innovation, informed by the SIP and industry consultation, and then discussed with the industry SIAP for feedback and prioritisation. 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 provides detailed information on:

- Funding availability
- How the industry is investing against their SIP outcomes
- Details on current investments across R&D.

Where do investment ideas come from?

There are many avenues that investment ideas come through – such as growers, delivery partners, previous projects, research networks, industry bodies, regional extension plans, and extension personnel. Before any ideas are progressed, Hort Innovation will investigate whether investment aligns with the SIP and whether investment is needed in this area.

How are investments prioritised?

To gain industry insights for strategic levy investments, Hort Innovation consults with growers through the industry Strategic Investment Advisory Panel (SIAP).

Hort Innovation develops draft investment recommendations based on investment ideas that are aligned to the SIP. Each recommendation includes high-level information on the aims of the project, outcomes, deliverables and budget.

The recommendations are then taken to the relevant advisory panel for feedback and prioritisation based on potential impact and available funding. Details of projects that will be progressing are then featured in the AIP. The SIAP consists of supply-chain stakeholders from the relevant industries, most of whom are levy-paying growers. Panels also include industry representative body representation and, where applicable, a lead agency representative from within the National Horticulture Research Network. The SIAP is in place to discuss investment ideas, in order to provide advice to Hort Innovation on potential levy investments. The advice they give is guided by the industry SIP. The SIAP provides a vital link between meeting the priorities of industry and helping Hort Innovation to make decisions on how, where and when investments need to be made.

How are investments progressed?

After the investment has been prioritised, it's then up to Hort Innovation to get the project up and running. This involves a tender process where the best delivery partner is chosen to undertake the project. Each delivery partner needs to submit regular milestones that report on their progress and at the end of each investment, a final report is produced that is made available to industry on what the project has achieved.

How to keep track of investments

Investments in the Hort Innovation Fresh Potato; Onion Fund and Vegetable Fund are detailed in the Your Investments page of Hort Innovation's website. Resources that are produced by the projects – such as fact sheets and guides – are also available through the Research reports and more page. Hort Innovation also sends alerts about project updates to its members.

Paying a levy doesn't automatically make you a Hort Innovation member, but signing up is free. The levy-funded communications programs, also provides regular information on levy-funded activity.

Minor Use Permits

The below minor use permits were recently issued by the Australian Pesticides and Veterinary Medicines Authority (APVMA). This information is circulated as part of Hort Innovation's Growing Innovation e-newsletter, which members and interested horticulture participants receive monthly. **Sign up at horticulture.com.au/growers/become-a-member.**

Permit ID	Description	Date Issued	Expiry Date	Permit Holder
PER14352 Version 4	Apron Xl 350 Es fungicide seed treatment (metalaxyl-m) / Broccoli (seed treatment) / Damping-off	28 Jan 2014	30 Nov 2028	Hort Innovation
PER14584 Version 4	Imidacloprid / Brassica leafy vegetables / Aphids, whitefly and thrips	1 Apr 2014	31 Oct 2028	Hort Innovation
PER81702 Version 4	Alpha-cypermethrin / Various vegetables / Various insect pests	24 Mar 2016	30 Nov 2028	Hort Innovation
PER82551 Version 4	Diazinon / Various onions and herbs, and cauliflower / Onion maggot, onion fly and thrips	20 May 2016	30 Nov 2025	Hort Innovation
PER88170 Version 2	Etoxazole / Sweetcorn / Two-spotted mite	30 Nov 2023	30 Nov 2028	Hort Innovation
PER93815 Version 1	Avatar eVo Insecticide (Indoxacarb) / Sweet corn / Fall armyworm	05 Dec 2023	31 Dec 2028	Hort Innovation
PER93850 Version 1	Benevia insecticide (cyantraniliprole) / Celery / Leaf miners	12 Dec 2023	31 Dec 2026	Hort Innovation
PER94009 Version 1	Difenoconazole, cyprodinil and fludioxonil / Avocado / Anthracnose	28 Nov 2023	30 Nov 2025	Hort Innovation

All efforts have been made to provide the most current, complete and accurate information on these permits, however you should always confirm all details on the APVMA **website at: portal.apvma.gov.au/permits.** Details of the conditions of use associated with these permits can also be found on the APVMA site.

You can also access the Non-Performance Reporting Form for Horticultural Pesticides at **horticulture.com.au.** This form should be completed when an adverse experience occurs as a result of using a permit. A 'non-performance' is an unintended or unexpected effect on plants, plant products, animals, human beings or the environment, including injury, sensitivity reactions or lack of efficacy associated with the use of an agricultural chemical product(s) when used according to label (or permit) directions.

Users are advised that while the pesticide can be applied legally under the APVMA minor use permit, there can be a significant delay until the MRL gazetted by the APVMA is adopted in the Australia New Zealand Food Standards Code. Until this occurs the MRL may not be recognised and a zero tolerance may be imposed for residues of the pesticide resulting from its use according to the APVMA permit.

Please be aware that in the absence of an MRL in the Food Standards Code, the use of the pesticide according to the permit may result in the suspension of the produce in the marketplace. Please check the FSANZ website or the **Australian Government ComLaw website:legislation.gov.au/Series/F2015L00468)** to confirm if there are MRL established by the Australia New Zealand Food Standards Code.

Current Projects

HORT INNOVATION VEGETABLE FUND

Hort Innovation conducts a number of R&D projects funded by grower levies. Here is a list of some of the projects currently underway.

Nuffield Scholarships VG14065

NUFFIELD AUSTRALIA FARMING SCHOLARS

What's it all about?

This project provides funding to support Nuffield Scholars in the vegetable industry, with one Hort Innovation scholarship being awarded each year of the project's life from 2016 onwards.

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.

Application opportunities are advertised in industry channels each year.

Internal fruit rot of capsicum VG17012

APPLIED HORTICULTURAL RESEARCH

What's it all about?

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.

Internal fruit rot can be a significant issue for capsicum growers, as although infection occurs during flowering, the disease can remain latent in the fruit until it starts to ripen. Once capsicums are harvested, development can accelerate, with fungal growth spreading into the seed and the edible flesh. As the disease cannot be detected externally, infected fruit can be sent to market resulting in waste and loss of consumer confidence. Several different fungi can cause the disease, including species of *Fusarium* and *Alternaria*, however it is unclear which are the primary organisms that are responsible for this disease in Australia.

Management strategy for serpentine leafminer, *Liriomyza huidobrensis* MT20005

QLD DEPARTMENT OF AGRICULTURE AND FISHERIES

What's it all about?

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 & assess the risk of serpentine leafminer
- Delivering an industry communication program
- Developing an industry management plan, grower guides and industry focused workshops.

National Bee Pest Surveillance Program: Transition Program MT21008

PLANT HEALTH AUSTRALIA LTD

What's it all about?

This investment is delivering a national coordinated bee-pest surveillance program to help safeguard honey-bee and pollinator-dependent industries in Australia. The National Bee Surveillance Program was established in 2012, supported by the previous *National Bee Pest Surveillance Program* (MT12011) and *Enhanced National Bee Pest Surveillance Program* (MT16005).

The program will conduct surveillance for 13 pests that impact honey bees (mites and beetles), and pest bees that could either carry hitchhiking parasites or could themselves cause detrimental impacts to honeybees. The program activities include upgrading sentinel hive arrays, strengthening relationships with surveillance operators and more. The surveillance is designed to enable the early detection of high-priority pest incursions that can impact on honey bees, providing the best opportunity for successful pest eradication.

Several levy industries are contributors to the work, and the program is part of the Hort Frontiers Pollination Fund. Hort Frontiers is Hort Innovation's strategic partnership initiative, with more information available at **hortfrontiers.com.au.**

VegNET 3.0 VG21000

AUSVEG

What is it all about?

This investment is tasked with keeping Australian vegetable growers informed about current R&D activities, results and resources – supporting the adoption of industry best practice and bolstering vegetable productivity and profitability in key growing areas across the country.

The program is nationally coordinated by AUSVEG and delivered 'on-the ground' by regional development officers (RDOs) in key vegetable-growing regions who are responsible for developing and executing regional extension plans. This includes identifying each region's key priority issues and key regional resources and links - a critical step in ensuring growers receive assistance and information that meets their needs and will help them grow better crops and operate more efficient and profitable businesses.

Consumer behavioural data program MT21004

NIELSEN

What is it all about?

This multi-industry investment is tasked with providing regular consumer behaviour data and insight reporting to a range of industries, through the Harvest to Home platform (**harvesttohome.net.au**).

The platform has a dedicated dashboard for each commodity, making data and

Current Projects

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reporting easily accessible for industry participants.

The information is intended to assist growers and supply chain partners in decision-making for their businesses and, for the wider industry, the data and insights will be available to support strategic activities.

Annual Vegetable Industry Seminar
VG21003

AUSVEG

What is it all about?
This project is delivering the Annual Vegetable Industry Seminars from 2022 to 2024 through a combination of in-person events, online webinars and video resources. All activities will be used to highlight outcomes from vegetable grower's levy investments.

As with previous investments, the in-person seminar will be run concurrently with Hort Connections while also providing access for those unable to attend in-person through digital platforms. This ensures the outputs from the project will cater to growers from around the country and from all backgrounds. The seminars and webinars will ultimately assist growers in increasing their profitability and efficiency by highlighting the latest global technology and innovations.

Multi-industry export program Vegetables, Onions and Melons
MT21009

AUSVEG

What's it all about?
This investment provides international trade development support for Australian vegetable, onion and melon growers. The project is working to develop export markets, maintain viable export pathways, develop industry capability and achieve sustained export growth. This cross-industry collaboration is a first for the horticulture sector and will leverage the progress made under the *Vegetable industry export program* (VG16061).

The program focuses on building export capability and capacity in the vegetable, onion and melon industries, collating international market information for decision making as well as business development functions to uplift the ability of exporting growers to service a wider range of markets and channels and expand international trade opportunities in the future.

The export program comprises the following activities:

- Export skills & capability development
- Market planning and market entry
- Market engagement & trade facilitation
- Market intelligence & trade expansion
- Trade policy, protocol and risk management
- Communication & industry engagement.
- Assistance, advice & resource development
- Export strategy implementation.

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With differing export maturity of businesses across and within the vegetable, onion and melon industries, tailored approaches and pathways will be implemented.

National Fruit Fly Council - Phase 4 FF20000

KEY RESEARCH PROVIDER: PLANT HEALTH AUSTRALIA

What's it all about?

The National Fruit Fly Council (NFFC) is a strategic body bringing together federal and state governments, growers and research funders to oversee the implementation of the National Fruit Fly Strategy. The NFFC provides advice and leadership on delivering a cost-effective and sustainable approach to managing fruit flies across Australia.

The project's objectives are to provide a national strategic direction for the management of fruit fly in Australia, prioritise RD&E for fruit fly in Australia, and inform a national approach to the application of fruit fly management to meet industry needs for domestic and international trade. The project will continue funding the NFFC, building on a considerable platform of work in recent years that has increased national engagement and identified priorities to strengthen the national fruit fly system and Australia's trade position. The NFFC is also uniquely positioned to provide an independent and facilitatory role in bringing stakeholders around critical issues requiring national coordination and cooperation to be progressed and resolved.

The project will fund the Council's regular meetings and a small project team within Plant Health Australia. This team will be responsible for developing the Council's agenda, increasing connectivity with trade and research stakeholders, and communicating with fruit fly stakeholders across Australia.

Vegetable industry communications program VG22000

AUSVEG

What's it all about?

This investment is responsible for effectively communicating the findings of levy-funded R&D and other relevant industry news, issues and data to vegetable growers and other industry stakeholders. The goal is to increase awareness of project outcomes and inspire on-farm adoption of new learnings and technologies.

Several regular communication channels continue to be produced and maintained by this project, including but not limited to:

- Weekly e-newsletter *Weekly Update*, sign up at: ausveg.com.au/news-media/weekly-update/
- Quarterly *Australian Grower* magazine, with current and back issues available at: ausveg.com.au/news-media/publications/
- Social media updates in AUSVEG channels
- Media relations for R&D-related news
- Videos and podcasts
- New online hub as a 'one-stop-shop' for vegetable growers to access information on research outcomes, industry news and events, and VegNET-related activities
- Quarterly R&D case study packages that will be used in articles, videos, podcasts, social media, and media releases
- Translate key R&D articles into languages other than English, including Vietnamese, Khmer, Mandarin, and Arabic.

Soil Wealth and Integrated Crop Protection - Phase 3 MT22004

APPLIED HORTICULTURAL RESEARCH

What's it all about?

The Soil Wealth and Integrated Crop Protection program assists melon and vegetable growers to improve the management of their soil and crop health, to drive their productivity, profitability and sustainability on-farm. Building on the success of the previous investment *Soil Wealth and Integrated Crop Protection – Phase 2* (VG16078), the new project will focus on:

- **Soil health, which underpins sustainable farming systems and the production of healthy crops.** Improving soil management practices will assist vegetable growers to have a more productive and resilient natural resource base with a focus on soil care, increasing organic material and improving grower margins.
- **Crop health, driven by improved soil health and crop protection measures.** Improving crop protection management practices will assist vegetable growers to produce healthier and more profitable crops through managing insects, diseases and weeds to maintain healthy plants.
- **Optimising inputs for healthy soils and crops, and profitable vegetable businesses.** Increasing skills in the effective use of nutrients, water, chemicals and other resources (e.g. plastic to minimise waste) will assist vegetable growers to maintain market advantage and demonstrate sustainability.

Carbon and climate. The climate influences what, when and how soil and crop health can be managed, including associated input use. Increasing awareness of changes in climate, both in extremes and longer-term averages, will be important for adapting production systems. Understanding the role of carbon will assist vegetable growers to remain profitable and sustainable into the future.

Capturing the real and potential benefits and costs of on-farm biosecurity measures MT22008

RMCG

What is it all about?

This investment quantifies the everyday benefits of on-farm biosecurity practices so that recommendations can be made on how to incentivise vegetable and melon growers to adopt appropriate biosecurity measures.

The first phase of the research will involve a comprehensive review of the literature drawing on research and case studies from Australian and international horticultural/agricultural industries on the costs/benefits of adopting on-farm biosecurity practices.

The second phase will capture information on the implementation of farm biosecurity in the target industries, the preparedness, knowledge, experiences and perceptions of growers, and the costs/benefits of practices through face-to-face interviews, exploration of farm management and relevant financial records for two scenarios: 'no incursion' and 'incursion'.

The researchers will use this information to develop an economic tool to assess the financial benefits and costs of adopting on-farm biosecurity practices.



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Government, levy-paying growers and industry extension officers (such as VegNET RDOs) will be able to use the findings from the project to support the increased adoption of sound on-farm biosecurity practices.

The increased adoption of biosecurity practices will result in decreases in the establishment and spread of endemic and exotic pests between and on vegetable and melon farms, minimise the need for pesticide inputs, improve compliance with quality assurance programs and market access requirements, and increase long-term profits for growers, due to pest control and business continuity under an incursion scenario.

National vegetable and onion benchmarking program MT22009

PLANFARM

What is it all about?

This project is providing vegetable and onion growers with the ability to compare their businesses against national and regional benchmarking data. This will enable growers to track their own performance against industry averages and 'best in class' performance, providing the opportunity for positive practice change and farm business growth.

Each participating grower will directly have access to farm management consultants to discuss their performance, and industry as a whole will have access to five years of rigorous industry benchmark data.

Pre-harvest sanitisation of leafy green vegetables VG22008

UNIVERSITY OF TASMANIA

What's it all about?

This project is conducting a literature-based review of potential management options for pre-harvest contamination of leafy green vegetables and other salad products.

Post-harvest sanitisation cannot be relied on to fully eliminate pathogenic micro-organisms such as Salmonella spp. and *Listeria monocytogenes*. Therefore, the first risk reduction step in the supply chain from farm to consumer is preventing crop contamination by removing contamination sources.

The literature review will use the extensive database and international literature on leafy vegetable crop food safety and sanitation expertise at the Food Safety and Innovation Centre of the University of Tasmania. It will consider all pre-harvest treatments relevant to Australian leafy green vegetable production systems that may be applied on farm, in addition to irrigation water.

The review will evaluate existing evidence that pre-harvest water treatment and sanitation via irrigation water can effectively minimise or eliminate microbial pathogens in leafy green vegetable crops. It will consider the current information on the effectiveness, timing, application rates and costs of treating irrigation water and using it with added food-permitted antimicrobials to treat crops pre-harvest. It will also cover the available information on potential environmental and legislative issues for the field application of antimicrobials.

The research team will provide recommendations for any further R&D investment needed in this area and how treatment options could be used in an Australian context. Additionally, industry fact sheets will be prepared on the project findings and recommendations, considering the perceived benefits of adding additional pre-harvest microbial management activities to existing microbial management practices.

Evidence-based education program to support increased vegetable consumption in children VG22005

NUTRITION AUSTRALIA

What's it all about?

This project is increasing children's vegetable consumption through delivering health and nutrition-based information to health professionals and professionals working in child-based settings. A range of activities and resources will be produced by the program, aimed at equipping the target audience with the information they need to promote increased vegetable intake to their networks.

Activities will include but are not limited to:

- Conducting baseline research to provide an understanding of the target audiences' current knowledge related to how to increase vegetable intake.
- Filming more than 100 bite-sized videos promoting vegetables, such as a trip to the farm hosted by vegetable grower Catherine Velisha.
- Hosting a launch event at Velisha Farms with a group of influencers involving a farm tour, videos, cooking demonstrations and more.
- Developing fact sheets and info-graphics with practical strategies for increasing vegetable consumption in children.
- Hosting Facebook live sessions to demonstrate quick and easy recipe ideas for children.
- Developing articles for relevant e-newsletters.
- Attending relevant health and child-related professional conferences.
- Securing media coverage through a national PR campaign targeting TV, radio and print.

Identifying and managing the sources and routes of microbial contamination in leafy vegetables VG22002

NSW DEPARTMENT OF PRIMARY INDUSTRIES

What's it all about?

This program is assisting leafy vegetable growers improve their food safety systems by identifying and managing the sources and routes of microbial contamination.

Researchers will work closely with leafy vegetable growers and processors to gain deeper insights into sources and routes of contamination and identify ways to disrupt the transmission of these pathogens into the supply chain.

Known as 'Safe Leafy Veg', the initiative is founded on an innovative research, development and adoption model that has already proven effective in other Australian horticulture industries, such as melons.

The program employs a multi-pronged approach that involves engaging growers, benchmarking industry practices, identifying gaps in food safety management and promoting the adoption of best management practices to address any risks proactively.

Knowing the potential sources and routes of contamination is the first step towards any risks. The project will provide an independent review of current industry practices and monitor the critical food safety practices during production and postharvest processing. An understanding of 'the most critical gaps' in industry practice and implementation of 'the most effective measures' will ensure food safety risks are managed effectively.

Selecting the Right Metal Detector for Product Inspection

Metal detectors are an integral part of any production process in the food and healthcare industries. Growing demand, driven by evolving regulatory requirements, social awareness and stricter industry standards, have increased emphasis on the importance of efficient and effective food safety systems and processes.

However, merely introducing metal detectors into your product inspection process won't be enough to safeguard your products from metal contaminants. Performance, sensitivity, and useful life of metal detectors are dependent on many factors, including maintenance, and proper operation to name a few. This is why selecting the right metal detectors will create confidence around eliminating potential metal contamination.

First time metal detector purchasers often produce a list of ideal features and then go from brand to brand comparing prices without truly understanding how metal detectors work. Sadly, simply deploying a metal detector that falls within the budget doesn't guarantee precise detection.

Most modern metal detectors come with a long list of features, but these capabilities may not actually improve a production line's overall effectiveness, nor suit the product you are looking to inspect.

A common assumption about metal detectors is that the more sensitive the brochure spec, the better it will be. But choosing the right one for your specific products demands a more nuanced approach that delves beyond features and price. Other factors that should be considered when considering if metal detection technology is the best fit for your product/packaging type are:

Product Testing
Before committing to any inspection system, it is essential to arrange testing of your product to establish realistic detection levels. This ensures a good understanding of the level of detection that can be achieved and any potential problems or limitations.

All products can behave differently depending on many factors. A phenomenon known as "product effect" can sometimes lead to false alarms, hindering production and potentially compromising product quality.

Product effect arises from inherent properties of some products that influence a Metal Detector's electromagnetic field. Moisture, salt, temperature, or even the type of packaging used; all these characteristics affect the metal detector, triggering responses similar to those caused by actual metal contaminants. For example, wet products like meat or poultry can act as conductors, interfering with the detector's signal and potentially show a false positive.

Stability
Established and proven brands are the best bet when it comes to Metal detection. The best detector units will be able to operate steadily without excessive erratic detections in real plant conditions. Constant adjustments – especially when attached to an automatic reject device – shouldn't be a constant requirement.

User-friendliness
Complex set-up procedures often lead to incorrect parameter adjustments. The easier the initial set up with local support, the better the experience and results.

Automated Monitoring
Metal detection systems that come with remote access/monitoring capability, improve uptime and production efficiency by reducing the need for scheduled testing. This allows users to stay on top of potential issues, allowing implementation of preventive measures instead of relying on reactive maintenance.

Protection against the Environment
For industries with perishable products such as meat, poultry, and dairy, adhering to hygiene standards is a number one priority. Ensure your choice of detection system matches your cleaning, food safety and washdown requirements.

Simplified Service and Validation
Just like any other equipment, inspection systems need care and maintenance to function efficiently and effectively. Around the world, A&D Inspection installations inspect over 50 million units of product per day – that's a lot of potential wear and tear.

A&D Australasia has a dedicated team of factory trained service technicians to provide QA validation, calibration, legal verification, repair and on-site service for many brands of weighing and inspection systems.

Choosing the right inspection solution for your business can be tough, especially with all the options out there. Contact A&D Inspection to get an expert to test your product and confirm the correct inspection equipment for your facility.

FOR MORE INFORMATION
Contact Julian Horsley, Systems Manager - A&D Inspection
0401 709 828 or support@andaustralasia.com.au

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Industry-led microbial surveillance will be undertaken as part of the risk management activities. The primary purpose of surveillance is to empower the growers to lead and manage their food safety by providing timely, data-based evidence and scientific support. This process will also allow the identification of hotspots for microbial contamination in the production and supply chain. These hotspots will become the target of best practice interventions. Other industries (such as melons) have successfully used microbial surveillance to verify and monitor the effectiveness of preventative food safety controls.

Management of foliar bacterial diseases in vegetables VG22001

NSW DEPARTMENT OF PRIMARY INDUSTRIES

What's it all about?

This project is supporting vegetable growers to manage foliar bacterial diseases by providing them with ways to detect pathogens quickly and then treat them effectively. The research works collaboratively with the vegetable industry's levy-funded communication and extension programs such as VegNET to share the findings with the industry. Outputs such as factsheets, presentations at grower workshops and webinar covering different stages of the trials will be used so that growers can see how to use and apply the products and see the results in progress. This project will be in undertaken two phases:

Phase 1: Develop effective early warning tools for major bacterial diseases before it becomes a large production issue. The project builds on key learnings from previous research to expand current understanding of the survivability and infection risks of bacterial diseases posed by infected plant debris, weeds, and alternate hosts. In addition, the project will develop proof-of-concept targeted eDNA methods for the detection of key bacterial pathogens in water, soil, and plant debris.

Phase 2: Design a biology-informed holistic treatment approach for promoting plant health and develop new guidelines for the timing and dosage of currently available commercial and novel antibacterial treatments. The research team will use high-throughput screening to identify effective bioprotectant bacteria and fungi among products currently available commercially and novel bacterial and endophytic fungal isolates in culture. Specifically, the research will assess whether the bioprotectants are effective at suppressing bacterial pathogens in the absence of a plant.

National fall armyworm innovation system for the Australian vegetable industry VG22006

QLD DEPARTMENT OF AGRICULTURE AND FISHERIES

What's it all about?

This investment delivers a nationally coordinated program to reduce fall armyworms' impact on the vegetable industry by arming growers with tools and knowledge. The program will provide educational opportunities for vegetable growers to learn more about the pest and its management, including on-farm demonstrations, field days and workshops.

The program brings research and experience insights into fall armyworm management from across the globe into on-farm demonstration sites within Australian vegetable-growing regions. It will also provide a mechanism for industry to identify and remedy gaps in knowledge, skills, technology or practices that need to be addressed through further research.

Vegetable industry biosecurity and business continuity strategy VG22004

AUSVEG

What is it all about?

This project will create a biosecurity strategy for the vegetable industry, providing an adaptable, flexible approach to preparing for high-priority exotic pests, responding to the arrival of exotic pests, and assisting with the initial monitoring and management of pests that are still establishing in Australia.

Led by AUSVEG with support from Plant Health Australia and state and territory biosecurity and research agencies, the program will include:

- A contingency fund for industry responsiveness to unanticipated threats, providing an adaptable, flexible approach to preparing for high-priority exotic pests
- Demonstrations of robust, on-farm biosecurity practices by growers to foster reassurance and trust within grower communities and multi-level government and non-government groups
- Developing protocols to facilitate produce movement and the swift reinstatement of market access
- A comprehensive communications and extension program across growers, agronomists and consultants.

With a large diversity of crops and exotic pests that could be a serious issue if introduced to Australia, the vegetable industry needs more than a standard biosecurity plan to help the industry prioritise which pests require more urgent research and development. The vegetable industry needs a biosecurity strategy that clearly establishes which pests will be worked on and what information is needed about those pests to maximise the benefits of being prepared.

Contingency plans need to be developed in collaboration with state and territory biosecurity agencies to ensure that they are usable by those agencies in the event of an incursion, as well as to provide direct benefits to growers.

Revisiting brown etch of pumpkins VG22012

LA TROBE UNIVERSITY

This project seeks to identify the causes of brown etch of pumpkins so that growers can better understand how to manage the condition more effectively.

Brown etch of pumpkin affects the fruit's skin and reduces marketable yields by up to 60 per cent under conducive conditions. Despite several research efforts over many years, a definitive cause of etch has yet to be identified. Previous research has considered the role of fungal pathogens, specific environmental factors, and pumpkin genetics but has not consistently reproduced the symptoms of brown etch.

Using advanced DNA-sequencing technology, the research team will attempt to determine if pumpkins with etch have active or residual fungi, viruses or other pathogens that traditional approaches have not detected. They will also investigate the hypothesis that an overreaction to infection or stress causes the condition (hypersensitivity) by examining the cellular and metabolic changes associated with etching. These two approaches may lead to new management approaches or the identification of suitable DNA makers for future breeding strategies.

VEGETABLES
POTATOES
ONIONS

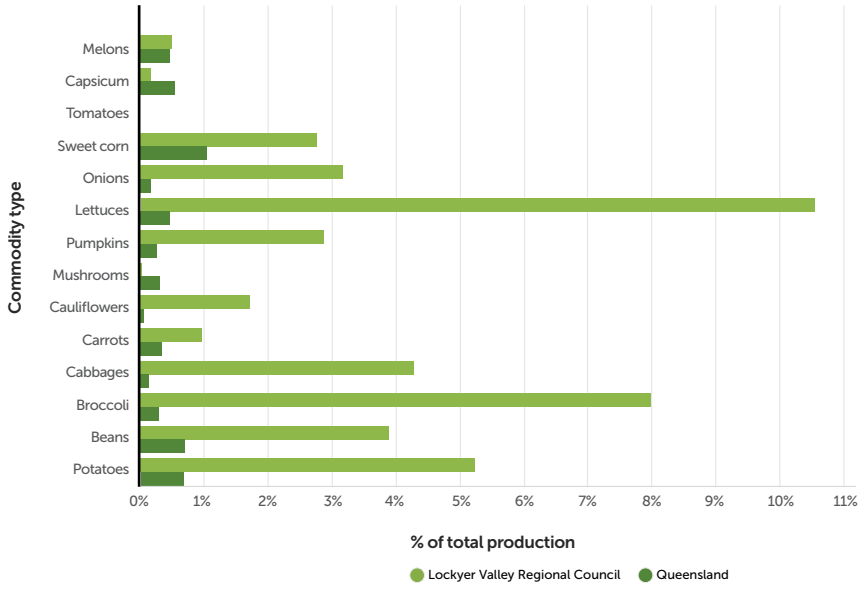
Exploring the Lockyer Valley vegetable diversity



West of Brisbane, the Lockyer Valley is rich in farmland, with some of the most fertile land in Australia, growing a diverse range of fruit and vegetables.

Commodity vs % of total production

TABLE 1: VALUE OF AGRICULTURAL PRODUCTION 2020/21



Source: Australian Bureau of Statistics, Census of Population and Housing, 2021 Compiled and presented in economy.id by .id (informed decisions).

In 2020/21 the total value of agricultural output was $376m, with the **major commodity vegetables representing 44.3% at $166.3m.**

First settled in the mid 1800s, the Lockyer Valley covers an area of 2,200 sq kms – the regional centre of Gatton was settled in 1855.

Bounded by the Great Dividing Range to the west, the main tributary is Lockyer Creek which flows into the Brisbane River. With regular droughts and floods, most water for horticulture is sourced from bore water.

Typically summers are hotter than Brisbane, with annual rainfall on average 780mm, making it one of the drier regions of south east Queensland.

Soils are primarily alkaline, typically pH of 6.5-7.5, on a black alluvial loam.

Agriculture, forestry and fishing is the largest employer in the region at 19% of the total workforce. It is also home to the Gatton campus of the University of Queensland.

Future of ag tech on display

The idea of 'ag tech' to improve farm operations has been around for many years, with many growers adopting changes to improve input usage and harvest techniques. The Gatton AgTech Showcase demonstrated available technology and innovations.

The Gatton AgTech Showcase brought together horticulture growers, agribusinesses, technology companies, consultants, researchers and students for a festival of technology and innovative ideas.

Held at the Gatton Smart Farm in the Lockyer Valley in November 2023, the event attracted around 1,000 registrations from around the country and overseas, with 50 exhibitors as well as live demonstrations of innovative ag equipment.

Launched in 2021 the Gatton Smart Farm aims to accelerate the adoption of agtech by providing a location and facilities for agricultural research and development for in-field, protected cropping and supply chain systems for turf, tree orchards and vegetable growers.

Working with industry, the VegNET regional development officers of Far North Queensland, Wide Bay Burnett and Victoria and the Lockyer Valley Growers' Group, the Gatton Smart Farm team recognised that an event such as the Showcase would give horticulture a much-needed boost after the devastating floods in the region in 2022.

Ian Layden, Director for Vegetables, Systems and Supply Chains with the Queensland Department of Agriculture and Fisheries, said that the involvement of groups such as the VegNET team and the Lockyer Valley Growers Group gave the event a higher level of success.

"The idea of the Showcase was to have a mix of technologies, to show growers that agtech is not just fully autonomous systems, but that there are options that can introduce growers to the concepts and possibilities that technology can offer agriculture."

"The interest was strong from the start, as a second day was needed to meet the demand from growers and industry. More than 200 growers from across Australia attended the Gatton AgTech Showcase."

Above. Einbock row guard precision guided cultivator: precision inter-row weeder.
Inset. Ian Layden, heads up the team at Gatton Smart Farm, host for the Gatton AgTech Showcase.
Image courtesy of Queensland Department of Agriculture & Fisheries.

L-R. Robotti Autonomous implement carrier. Flux Robotics Precision Sprayer.

On display, the Gatton AgTech Showcase live demonstrations included:

- **Flux Robotics Precision Sprayer:** uses computer vision software to identify weeds for spraying, drawn by a tractor
- **Stout 'Smart Cultivator' with AI Vision:** design to cultivate and weed using mechanical blades, drawn by a tractor
- **Robotti Autonomous implement carrier:** autonomous tool carrier for field operations
- **Einbock row guard precision guided cultivator:** precision inter-row weeder
- **FarmDroid autonomous seeding and weeding:** solar powered for seeding and weeding via GPS
- **SwarmFarm robotics autonomous spot sprayer:** detects and sprays individual weeds.

In addition, researchers brought visitors up to date on the latest research findings on Fall Armyworm, Serpentine Leaf Miner and the use of cover crops for soil health.

"It is a chance to get people onto the Smart Farm to see new ideas, machinery and to engage with colleagues and suppliers to discuss what can be possible, and to see equipment dealing with local conditions firsthand," said Ian.

"Working with our partners to make sure we had the right mix of displays and exhibitors was invaluable – the feedback we had from growers and exhibitors was phenomenal.

"On the day, you could see the excitement as growers saw the possibilities – it is more than a YouTube clip or a glossy magazine ad from overseas. It is here, it is now, and it is possible to do it."

From an exhibitor perspective the opportunity to show machinery in action, was challenging but proved invaluable in terms of connecting with growers and developing relationships. For some, it was the first time that the machinery had been demonstrated in Australia, indicating that overseas suppliers are taking note that the Australian market is ready to take the next step in AgTech.

Michael Sippel, president of the Lockyer Valley Growers Group, said that as industry grapples with increasing costs, growers need to be more profitable to survive the coming years.

"It makes sense to be more innovative, to break the cycle of business as usual. We live in an age of innovation where digital tech provides solutions to problems before we have even realised it," he said.

AUSVEG and OnSide provide a bio-secure event

AUSVEG and Onside team up for biosecurity

At the Gatton AgTech Showcase 2023, AUSVEG partnered with Onside to demonstrate the ease of adopting best biosecurity practices. The AUSVEG Biosecurity team encouraged attendees to follow on-farm biosecurity best practices using boot scrubbers and walking through footbaths.

"Field days are great events for people to come together and learn about the latest industry innovations. However, they also attract many people from different regions, which increases the risk of introducing new pests, weeds, and diseases. Moreover, it could also increase the risk of unwanted hitch-hikers being taken back to other regions and farms," said Shakira Johnson, Biosecurity Coordinator, AUSVEG.

Attendees were asked to check in using Onside, which recorded all visitors to the site. During the QDAF event, AUSVEG and Onside registered over 500 people on the platform as they walked through footbaths at the event's entrance. By using the app, attendees participated in the event and actively contributed to protecting the region from the potential spread of pests and diseases by adopting best biosecurity practices.

Above. AUSVEG and OnSide teamed up to provide sign-in protocols for enhanced biosecurity for Gatton AgTech.

FEEDBACK

Visitors were asked three questions around agtech while visiting the Showcase:

1. **What were the top three tech they were interested in and why?**
2. **Do you have plans to implement AgTech?**
3. **Is there anything that's limiting you implementing AgTech**

"Definitely the weeding technology. FarmDroid is one of the ones that we're specifically looking at..... seeing the Stout here and then seeing some of the drone technology that's out there...
We want to implement as much as we can. Drone spraying is one of the ones that we are pretty much getting started with straightaway. And as soon as the technology for the weeding is economically viable, that's one of the ones we'll be putting in as soon as possible." **VEG GROWER, VICTORIA**

"All of the seeding and weeding technology, we're pretty familiar with it, but it's really good for them to get it live here in the fields. We look around the world and this field day's as good, if not better than anything we've been to so far. So congratulations to the state government...
We are doing some of it now and we'll continue to do it...
To create an autonomous agricultural system, which is good for Australia because it means we can compete in export markets. It just takes a little bit more access to capital which means we've got to think outside of the normal farming and banking system. So this is where the government's stepped in like today and they've put a bit of effort in first.. So thank you. Well done." **VEG GROWER QUEENSLAND**

"I was particularly interested in the weeding tech, so looking at the farmdroid and its ability to plant and weed; quite interested in some of the inter rowing, so particularly the Einbock machine and the Stout machine as well...
It's key to our business and other ag in veg to move forward, so it's going to be absolutely critical. So be taking home information from today and implementing it quickly.
Some standardisation of widths and sizes still needs to be resolved. We grow multiple crops that operate on different widths and bed systems, so that's one issue. Another issue is that we use multiple pieces of equipment so it's hard for us to standardise. Sometimes it's cost as well, but payback for a lot of these things can be significant too." **VEG GROWER TASMANIA**

The Gatton Smart Farm initiative, *'AS20007 Driving adoption of AgTech across Australia'*, is funded by the Hort Frontiers Advanced Production Systems fund. This is part of the Hort Frontiers strategic partnership initiative developed by Hort Innovation, with co-investment from the Queensland Government and contributions from the Australian Government.
The Gatton Smart Farm AgTech Showcase is also supported by funding from the Australian Government Department of Agriculture, Fisheries and Forestry as part of its Support Regional Trade Events Program

Haifa quality now in micronutrients

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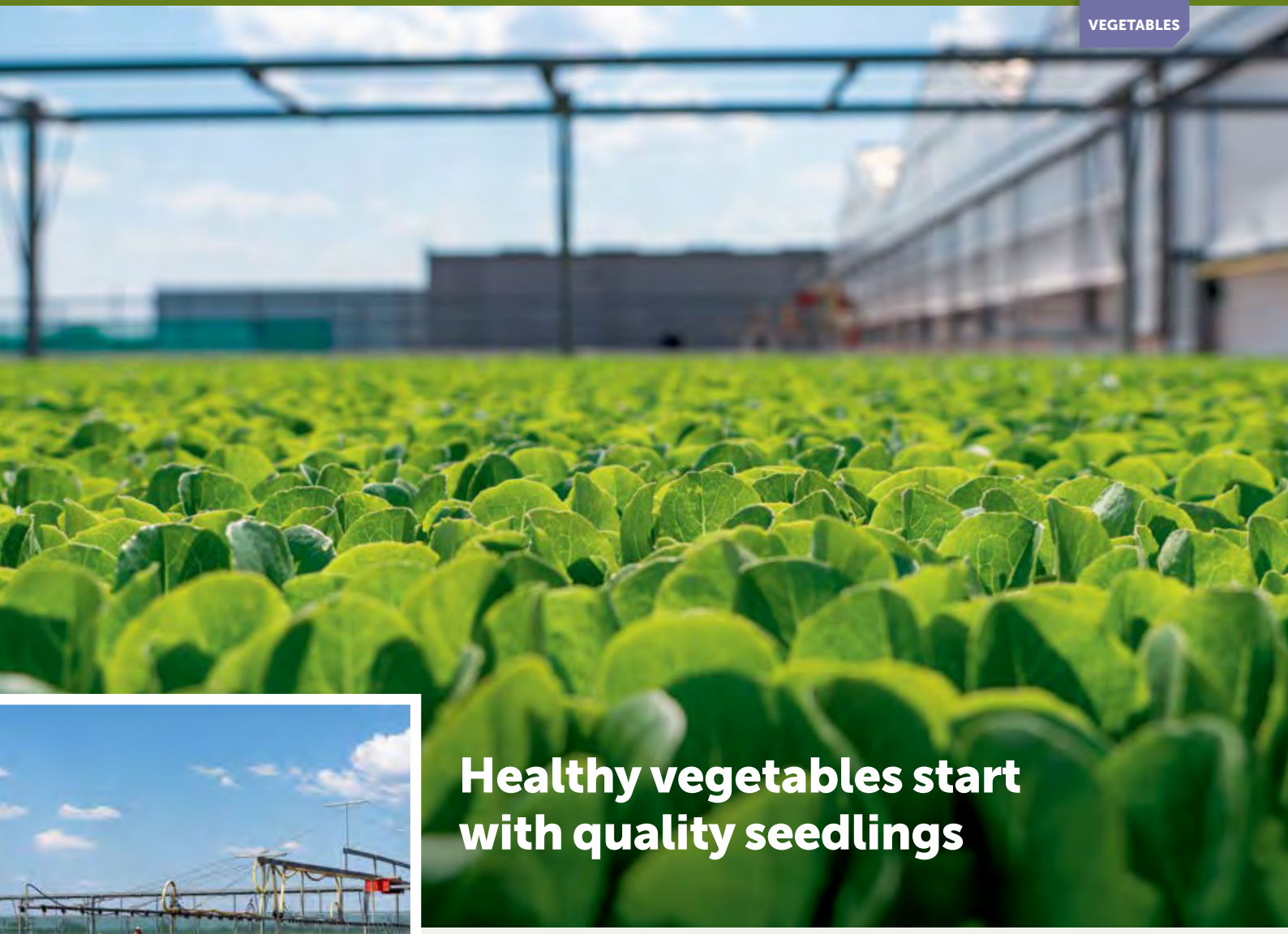


Healthy vegetables start with quality seedlings

Quality seedlings, customer service and consistency are at the heart of Boomaroo Southbrook's mission

Boomaroo Nurseries is one of the largest vegetable seedling suppliers in Australia. Boomaroo established themselves at Lara, Victoria in 1989 and more recently built a state-of-the-art facility at Southbrook, Queensland.

Construction of the Queensland site began in 2017 with the first tray put across the sowing line in July 2019. The Southbrook nursery was established to service the key vegetable growing areas including the Lockyer Valley, Granite Belt, Southern Downs and Wide Bay regions.

Several factors were considered when choosing the location of the new nursery at Southbrook. Temperature, water source, humidity, wind patterns, frost risk and isolation from key growing areas were all important in the decision-making process. Through several decades of growing at Lara and multiple trips to Europe to explore automated growing systems, Boomaroo established the nursery based on Dutch and Italian hardware/software. The nursery is currently operated by a small team of 14 full time employees and casual staff where required.

Whilst the seedlings grown are season dependent, the major categories grown are iceberg lettuce, cos lettuce, broccoli, cabbage, cauliflower, celery, shallots, wombok, capsicums and tomatoes. The seedlings are grown on a rolling bench system that is waist height to allow for air flow underneath the tray. All run-off from rain and watering is collected on-site where it can be pulled back through a reverse osmosis (RO) unit and utilised again for nursery watering. The RO unit means that the nursery is now drought-tolerant.

The nursery also boasts a protected cropping system utilising the Canadian Cravo technology, which allows optimal growing conditions for plants just out of the germination room. The Cravo has a retractable roof system, solar screen technology and heated zones to manipulate growing conditions throughout the year. Plants spend most of their life outside to give acclimatising to transplant conditions on farm, and to reach grower specifications. In the event of severe weather, the seedlings can be moved back into the Cravo for protection.

Overhead booms are used for watering, fertilising and spraying. Whilst the nursery is highly automated, Boomaroo made a conscious decision not to automate the watering process and have a highly skilled team of growers who are constantly assessing the moisture levels of seedlings to determine the timing and amount of water and nutrient required. For example, on a hot windy day, the requirement for water is much higher than normal, so assessments are made and watering increased accordingly. Lines such as celery and shallots are trimmed regularly to encourage a more robust plant, ensuring greater success rates in the paddock.

Boomaroo puts a large focus on their integrated pest management strategy, utilising softer chemical options (thus leaving harder options open for growers to use), constant monitoring of pests and maintaining a healthy population of beneficial insects. They also work with innovative companies with a view to further reducing reliance on chemicals where possible.

This approach supports the organic accreditation at both the Southbrook and Lara sites, to give conventional and organic vegetable growers seedlings that will meet and exceed their accreditation requirements.

"Our aim is to have high quality, forward moving plants that allow growers to plant efficiently as possible," said Ben Choice, Queensland Sales Manager. "Each grower has their own specification that they would like us to grow to, but we also need to ensure that the seedlings are as robust as possible and have every chance of getting a great start in the paddock."

Boomaroo have plans to expand the Southbrook site to meet the growing demand for quality seedlings in key Queensland and northern NSW growing areas, as well as looking at alternative production horticulture systems that complement and increase their offer into other market sectors.

These plans, as well as their growing market presence, ensure they will be supporting and supplying Australian vegetable growers and the broader horticulture industry for many years to come.

VEGETABLES
POTATOES
ONIONS

Quality processing has served CJZ Farms well
for the processor and ready meal markets

A multi-generational farm, CJZ Farms started out with potatoes and cattle at Brightview in the Lockyer Valley region. Now, the business supplies potatoes for the processor market and a range of vegetables for the ready meal sector sourced from the Lockyer Valley and contract growers around the country.

Delivery day in and day out to the ready meal manufacturer adds a complexity above that of traditional supply to wholesale markets.

Every week, CJZ Farms supplies vegetables based on weight to the manufacturer, requiring the vegetables to be harvested where waste is minimised, and yield is maximised. The produce is washed, graded and cut into portions ready for use in the commercial kitchens.

From the Lockyer Valley, the farm supplies broccoli, cauliflower, lettuce and cabbage. Additional vegetable requirements are met with contract growers based in Bairnsdale, Davenport, Stanthorpe and the Atherton Tablelands to give year round supply. CJZ Farms use their own transport to ensure on time delivery for daily meal preparation.

Each meal has a certain weight per ingredient, for example 30gms of broccoli in a stir fry. Extrapolate that out to 10,000 meals with 30gms of broccoli and the logistics become a lot more precise and complex.

For broccoli and cauliflower, the florets are used in ready meals, while second grade product and stalks are used in products such as purees and soups. Waste byproducts such as the leaves are then sold to the stockfeed industry or as an ingredient into pet food.

Potato and onion production is principally for chip processing in Brisbane.

Above. CJZ Farm based in the Lockyer Valley. **Inset.** Calvin Zischke, director of CJZ Farms with tractor and potato harvester.

Kubota unveils new SE9000 series agricultural mulcher range

Kubota Australia has launched its new range of folding agricultural mulchers, perfect for contractors and professional farmers. The Kubota SE9000 Series is ideal for a wide range of large-scale operations including the regeneration of grassland, maize and sunflower stubbles, sorghum and set-aside land.

The SE9560 and SE9640 models are available in two working widths of 5.6m and 6.4m, while the hydraulic folding feature with automatic locking keeps road transport safe at a width of 2.5m.

The SE9000 Series' central gearbox is rated up to 260 PTO HP and is equipped with an integrated freewheel to deliver a smooth and shock free drive. The five belts, combined with an automatic tensioner, guarantee a maintenance free operation.

With a focus on an efficient power transmission, the mulcher delivers the lowest possible fuel consumption and operating costs to keep you going for longer. The new series rotors can be equipped with universal or hammer blades providing versatility to operations. Their unique design ensures the lifting of crop residues even in wet conditions.

A rotor speed of more than 2000 rpm ensures premium cutting performance including at higher driving speeds. An oscillating lower link and a split upper link ensure ground contours are precisely followed.

The frames of the chopping units are designed with a rounded profile for maximum torsional rigidity and most efficient crop flow. The rear cover can be adjusted depending on the quantity of chopped material for greater machine flexibility, while the wider openings provide generous clearance for when your crop volumes are high.

High cutting chambers deliver an advanced performance even in difficult working conditions making the reliability second to none. In addition, a special dividing plate is mounted between the two sections to avoid uncut strips remaining in the field.

The Kubota SE9000 Series is equipped with four rear depth wheels that pivot for turning on headlands and controlling a consistent cutting height.

Both the SE9560 and SE9640 come standard with bolted double skin, second counter knife and road transport lighting to meet Australian road regulations.

For professional farmers and contractors looking for a mulcher with unique features and guaranteed high performance, look no further than Kubota's new SE9000 Series. Stock of the SE9000 Series will be arriving in Australia from April 2024,

SE9560 - $59,950 rrp incl gst.
SE9640– $64,900 rrp incl gst.

Contact your closest Kubota dealer to find out more.

In 2022, CJZ Farms were awarded a Rural Economic Development (RED) grant to increase production capabilities for packing and processing which would bring an increase in employment to the region.

Since then, an increase in the contract for potatoes for processing has changed that focus, such that CJZ Farms have expanded the capabilities in potatoes with a harvester, washer and tractor.

"The increase in potato tonnage will still mean an increase in staff but will also give us more capacity for other veggies," said Calvin Zischke, director of CJZ Farms.

"So for the short term, we will concentrate on the potatoes and vegetables, then expand the processing for veggies for the ready meals next year."

Fertile soils, water and rotation

The Lockyer Valley is based on rich alluvial loam with a deep water table, which most farms access via bores. The flood events in the area in the past couple of years have helped replenish the water table – Calvin said that in 2022 the bore depth increased 25m with flood waters. Water quality is an important factor for the ready meal customer, as it needs to be free of contaminates and minerals for the vegetable washing line. The wash line water is recycled to irrigation and wash down of equipment.

CJZ Farms are fortunate to be in a position where crop rotations were incorporated into farm management in the early years reducing the need for insecticides and fertilisers.

Cover crops include forage sorghum and lucerne. The first cut is baled and sold; the second stage growth is then chopped back into the soil.

Brassicas such as broccoli and cauliflower are also used to improve soil health, based on the natural soil fumigant that brassicas offer.

Insecticide usage is low as a result of the cover crops and rotations, resulting in low levels of problematic pests such as diamondback moth and caterpillars.

"Managing the growth of the veggies to ensure a large, consistent head on broccoli and cauliflower, during summer compared to winter brings a few challenges," said Calvin.

"During the summer the cauli will be around 700-800gm, with 400gm of leaf and waste, while in winter it is around 1.4kg, but still the same amount of waste.

"Which means you need to take that into consideration if cauli's are supplied based on per head or for broccoli based on weight. With vegetables like zucchini, they can only grow to a certain size diameter for consistency in making the meals and for the customer to reheat."

Calvin and the team plan for plantings twice a week to cover the demand, but also build in additional capacity should there be issues with contract growers, or should the customer require extra product at short notice. Any excess is put through the wholesale markets.

The down turn in the market this year has meant that excess product has not been harvested as it has not been financially viable, instead it has been chopped back in.

Quality in processing

Quality control of vegetables into the ready meal customer is a vital component of supply for CJZ Farms.

Each shipment is photographed and reported, and a 'harvest diary' is maintained to record all produce and processing.

Next year, once the potato and onion processing line is embedded, the vegetable washer, coolroom and packaging equipment will be revisited. The vegetables will be supplied in 10kg lots, chilled and cryovac. For potatoes and onions, the peeled product will be dipped to prevent it going black.

Supply from contract growers is also provided to set specifications in terms size, weight and in the case of cauliflower, colour which can brown.

"We have been supplying the ready meal market for many years now, and the quality and consistency of supply is something that is appreciated, and has enabled us to maintain our contract, even when times get tough from the weather or the market price.

"We are a family business, and proud of what we have achieved."

onion fund update

This project has been funded by Hort Innovation using the onion research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

Hort Innovation ONION FUND

VEGETABLES
POTATOES
ONIONS

The Reck Farms tech pathway

Three years ago, AUSVEG profiled Reck Farms and found the emphasis was to invest in technology that enabled the business to remain sustainable and viable. The market has evolved, but technology remains a constant for everyday management.

The Reck Family started farming in the Lockyer Valley back in the 1960s, and now spans a number of properties producing more than 10 lines of vegetable commodities including potatoes, onions, pumpkins, beetroot, brassicas and lettuce.

During the winter months, Reck farms grows leafy vegetables, while in the spring and summer it is hard vegetable crops such as onions and brassicas. During the 1980s, the first lettuces were grown – the Reck family have been growing it for around 40 years.

Much of the produce is sold fresh in bulk, but a recent foray into prepack equipment has enabled the farm to diversify into prepacks of 1, 2 and soon 5kg packs for hard vegetables such as onions under their Rabbit brand.

The majority of the potatoes are Atlantic, which go to processing. The preference is to grow three or four varieties of potatoes, as well as trialling new varieties for the years ahead. In November, demand for crisping potatoes was down, forcing many potato growers to chop a large tonnage back into the ground.

Onions are hand-picked into baskets before going into bins for processing and packing. The cost of labour is significant for onions, while blight is the biggest risk for diseases. With plantings of onions across 70-80 acres on a business that covers 1,100 acres, the Reck family are fortunate that rotation of onions can occur every 5-7 years to minimise pest and disease pressure.

Above. Shakira Johnson, AUSVEG learns the fine art of hand onion harvesting.
Left. Hand harvested onions at Reck Farms.

Potatoes tend not to be stored as they are sold fresh to the processing sector. Seed tubers are held at 2°C, however the farm tends to procure seed potatoes from down south in preference to creating their own.

Craig Mildren, of Reck Farms says that weeds are not a significant concern, but they are vigilant to use the right herbicides and fungicides only as needed.

The use of farm management apps has made those decisions simpler. Knowing when to spray based on weather conditions, and the resultant withholding times is an important aspect of the QA systems, which is also performed electronically.

From a marketing perspective, the farm management apps can also give historical and forecasting insights into procurement of inputs, labour and sales figures which in turn drives planting and harvesting schedules.

"With that kind of technology, we don't need to monitor every minute of the day, so our efficiency has increased," says operations manager, Pat Salter.

"We can also give limited access to the apps to our shed staff and team leaders to take some of the load off management. It also means there is a degree of ownership by those staff members to ensure that the data is correct."

The next step into technology is the prepack facility which will give market diversity for the farm for hard vegetables such as potatoes and onions.

The team have taken a gentle approach to the amount of equipment used for the prepack facility to make sure market acceptance is viable and to give staff the necessary training for the processing line.

"We currently have 80 acres of onions – 16 acres are red onions. Once the prepack line is fully up and running, we may look to expand. With only a handful of prepackers in the Valley, we see it as a good opportunity," says Pat.

The cost of production and the floods of 2022 mean that a lot of growers in the Valley are pulling back on capital expenditure.

For Reck Farms it means that the next few years will be focused on consolidation – getting systems working correctly and efficiently.

"We have looked at the tech pathway and we are content to sit back for a while and see what works. We want to look at an onion harvester, expansion of the prepack processing line and a drying shed, but we have had to pare it back to a manageable level and prioritise the urgent investments.

"People management is also part of our primary focus – we want a safe and fair workspace and to train them properly in the systems we have. That way we will retain our staff, who are comfortable at work and good at what they do. Now is the time to become better and more efficient at what we do before adding more complexity," says Craig.

Below. Reck Farms pack shed.

Farm to fork experience among health and culinary professionals

Promoting onions from humble to hero to foodservice and health industries involves farm visits and recipe inspiration to allow professionals to fully appreciate the versatility of the onion.

The Hort Innovation *Onion nutrition education program for health professionals and the foodservice industry* (VN20002) has continued building momentum over the last six months. Designed to improve the awareness, knowledge and attitude of professionals regarding the nutrition and health benefits of onions, and increase culinary usage, the program encourages recommendation of onions as part of a healthy and nutritious diet, ultimately helping increase onion consumption amongst patients, clients and patrons.

The program is in its third year and continues to strengthen connections with health and foodservice professionals.

The third onion 'paddock to plate farm tour' curated by *Straight To The Source* held a bespoke tour experience in November to Qualipac Produce in College View, Queensland, for a group of leading foodservice and health professionals. The objective of the day was to inspire the influencers by presenting new research on the key health and nutritional benefits of onions and provide culinary inspiration on ways to showcase onions as a key recipe ingredient, and to promote onions from humble to hero.

Qualipac is a family-owned business that specialises in growing, packing and supplying quality onions throughout Australia. The Qualischefski family have been farming vegetables since the early 1940s.

Their team showed us firsthand how onions are grown and exactly what it takes to get this humble hero from farm to fork – harvested, graded, packed and delivered fresh to retailers.

Above. Culinary and Health Influencers on tour at Qualipac. **Inset.** Tawnya Bahr, Penny Eustace, Lucy Allon, Teri Lichtenstein and Head Chef Martin Boetz from Shortgrain .

The group then visited the second farm location to see onions in the ground. Unfortunately, due to a freak hailstorm in the Lockyer Valley on the Friday prior, the onion crop had been obliterated. Qualipac lost over $1 million dollars' worth of crops due to hail damage. This presented the opportunity for a discussion with guests around how consumers don't understand the challenges farmers face.

During the farm tour our guests were served a warm Aussie onion tart created by Sprout Artisan Bakery made especially for the day. Straight To The Source also served a French Onion Dip made by Chef Tom Hitchcock, Australian Chef of the year 2023, as a snack while travelling back to Brisbane.

The group were then treated to an exclusive private dining experience at Brisbane's hottest new restaurant, Short Grain, with owner and executive chef Martin Boetz demonstrating culinary creativity with onions, along with discussion of key nutritional messages with accredited dietician, Teri Lichtenstein.

Above. Bespoke onion tarts created by Sprout Artisan Bakery.

The Aussie onion-focused dishes and techniques showcased in the culinary demonstration included:

- Roasted onion Thai dressing
- Onion Bhajis canapes with onion dressing.

Lunch, curated and prepared by Martin Boetz, featured:

- Fish salad with roasted onion Thai dressing
- White master stock chicken
- Khao Sai of Beef with onions and stir-fried veggies
- Yellow bean pudding with caramelised onions.

Our farm tour guests took home information on the latest scientific evidence and a raft of educational and culinary resources, Qualipac onions, a Straight To The Source recipe card and a box of Olsson's Sea Salt flakes.

The team learned how to enjoy 75 grams (one serve) of onion every day with a range of creative and innovative usage ideas. Catch some inspiration and insights in our video from the day on our digital hub at: **australianonions.com.au/food-service/news-and-events/farm-tours**

FEEDBACK

Every guest reported that the event was engaging, educational and impactful, saying they learnt from the experience and were keen to share the insights with their audiences, team and customers.

The post-event questionnaire demonstrated a 100% increase in knowledge and understanding of onions in supporting overall health, in the context of a healthy diet.

Social media engagement was extremely positive, with information shared by our guests' reaching an audience of 150,000 people.

Here is an inspirational example showcasing onion as the humble hero from our farm to fork experience.

Below. Example of the health and nutrition messages amplification on the social platforms.

FIND OUT MORE
For more information on the program visit australianonions.com.au/health-professionals or contact Bite Communications Program Manager, Penny Eustace, via penny@bitecom.com.au.

This project has been funded by Hort Innovation, using the onion research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.
Project: VN20002

INTERNATIONAL TRADE

Australian onion exports performance overview

From January to December 2023, Australia's onion exports increased by 48 per cent in value, from AUD$29.6 million to AUD$44 million and total export volume increased by 21 per cent from 33,902 tonnes to 41,185 tonnes. The top five export destinations for onions are Thailand, United Arab Emirates, Malaysia, Taiwan, and Spain.

Thailand was the top Australian fresh onion export destination, with an increase in export value by 12 per cent, from AUD$7.4 million to AUD$8.3 million and a decline in export volume by 8 per cent, from 11,337 tonnes to 10,472 tonnes. Onion exports to United Arab Emirates had strong growth of 241 per cent, from AUD$1.2 million to AUD$4.3 million, and increased in volume by 206 per cent, from 1,349 tonnes to 4,122 tonnes. Malaysia has recorded a considerable increase in export value by 431 per cent, from AUD$805,028 to AUD$4.3 million and increase in export volume by 379 per cent from 883 tonnes to 4,233 tonnes.

India has implemented an export ban of onions in late 2023 after the domestic price of onions more than doubled in three months following a decline in local production. As the world's largest onion exporter, India implemented these export bans to manage domestic food prices. It is anticipated that India's onion export ban will be extended beyond March 2024. The export ban has impacted on the onion supply to United Arab Emirates and Malaysia, who both rely heavily on onions from India.

Change in onion exports by destinations

TABLE 1. JANUARY TO DECEMBER 2022–2023

Trade Partner	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
Total Fresh Onion Exports	**$29,683,794**	**33,902**	**$43,959,130**	**41,185**	**48%**	**21%**
Thailand	$7,396,794	11,337	$8,304,803	10,472	12%	-8%
United Arab Emirates	$1,283,193	1,349	$4,378,606	4,122	241%	206%
Malaysia	$805,028	883	$4,278,379	4,233	431%	379%
Taiwan	$5,128,199	4,949	$4,180,324	4,292	-18%	-13%
Spain	$1,610,768	1,999	$3,501,322	3,382	117%	69%
Netherlands	$912,908	1,239	$3,482,150	2,533	281%	104%
Indonesia	$954,946	1,354	$2,179,086	1,638	128%	21%
Japan	$4,133,803	3,334	$2,115,809	1,494	-49%	-55%
Belgium	$568,956	867	$1,483,348	1,253	161%	45%
Singapore	$1,109,959	925	$1,437,819	1,127	30%	22%

Source. Global Trade Atlas 2024

Current Projects

HORT INNOVATION ONION FUND

Hort Innovation conducts a number of R&D projects funded by grower levies. Here is a list of some of the projects currently underway.

Optimising chemical and cultural control of onion white rot VN20007

ARVENSIS

What's it all about? This investment is developing a more effective integrated disease management strategy for control of onion white rot. Onion white rot is a highly destructive fungal disease of commercial onion crops. This project seeks to improve current control methods for the disease, as well as identify new methods that can be used to combat onion white rot.

The research will incorporate:

- Development of a pre-plant soil DNA test to identify disease risk prior to planting
- Identification and development of natural germination stimulants to reduce disease inoculum levels prior to planting
- Optimisation of spray timing and dose rates of current fungicides
- Identification of new fungicides and biological controls for onion white rot.

The project team will work closely with the onion industry to extend any new findings to onion growers. Regular updates will be provided to industry, as well as trial sites visits later on in the project to demonstrate the integrated onion white rot management program developed.

Epidemiology and management of fusarium basal rot in onions VN20006

THE UNIVERSITY OF ADELAIDE

What's it all about? This investment is developing an integrated pest and disease management (IPDM) strategy to reduce the impact of fusarium basal rot in onions. Infection of bulbs in the field has resulted in substantive losses in storage from this soilborne disease, however the epidemiology of the disease is not well characterised which limits capability to develop an appropriate management strategy.

In order to develop a best practice, cost-effective IPDM strategy, this project will improve understanding of the pathogen & its epidemiology, and evaluate the use of chemical, biological and chemical controls.

Onion nutrition education program for health professionals the food service industry VN20002

BITECOMMUNICATIONS

What's it all about? This investment is delivering evidence-based information about the health benefits of Australian onions to health and food service professionals in Australia. On average, Australian adults consume just three grams of onion per day. In contrast, consumers in the United States and Europe consume twice as many onions as Australians. In order to close this gap, initiatives to educate health professionals and the food service industry are key as they are significant influencers of consumer food behaviour.

This project will extend previous research conducted by levy-funded project *Australian onions nutrition literature review* (VN18002) and the *Onions food service farm tour and education pilot* (VN18000) by communicating the nutritional benefits of onions to health professionals, food service professionals and industry stakeholders.

Accelerating the adoption of best management practices for the Australian onion industry VN21000

AUSVEG

What is it all about? This investment ensures the onion industry is equipped with the information and resources they need to adopt best management practices. Onion growers will be brought into the existing *VegNET 3.0* program for the vegetable industry to support increased awareness and adoption of R&D.

VegNET is a nationally-coordinated, regionally-delivered extension program that increases the industry's awareness of and engagement with best practices in high-priority areas. The program has regional development officers (RDOs) in ten key vegetable-growing regions around Australia.

A vital component of the program is the establishment of five regionally-based onion grower groups in Tasmania, Queensland, New South Wales, Western Australia and South Australia. The relevant RDO will work with each group to identify regionally-specific issues facing onion growers and work with them to host seasonal activities, including demonstration sites, field days, and grower walks.

A range of communications outputs will be delivered to onion growers, including:

- The quarterly *Australian* magazine, with 36 pages of dedicated onion content
- The *AUSVEG Weekly Update* e-newsletter, with onion content
- A range of onion-focused content such as videos, podcast, case studies, factsheets, media releases and social media.
- An annual disease alert poster.

Onion international study tours – inbound and outbound VN22000

AUSVEG

What is it all about? This project provides opportunities for Australian onion growers and supply chain participants to increase their awareness and knowledge of research and innovation in the global horticulture industry by delivering international industry study tours to key onion-growing regions worldwide. The two-year program will deliver two international study tours for up to 18 onion growers and industry supply chain members that align with industry needs.

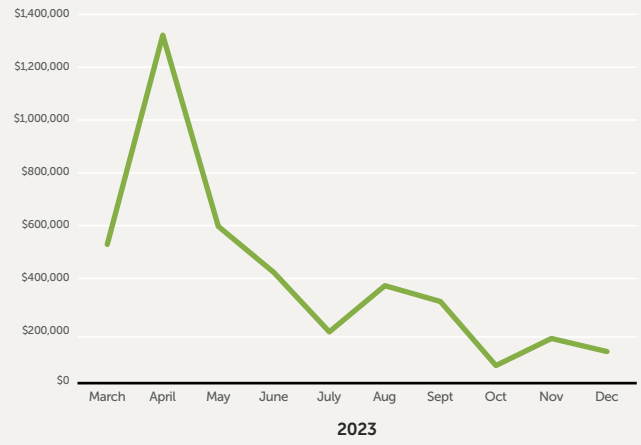
The project will also bring two international researchers to Australia to visit key growing regions and attend industry events to help inject global knowledge related to technology and practices across the Australian industry without requiring every Australian grower to travel abroad.

This project will help ensure that the industry can build the capabilities of the Australian onion-growing community through increased networking, knowledge sharing and collaboration among levy-paying growers and supply chain members, which will improve the productivity, profitability and competitiveness of the industry

Fresh onion exports*

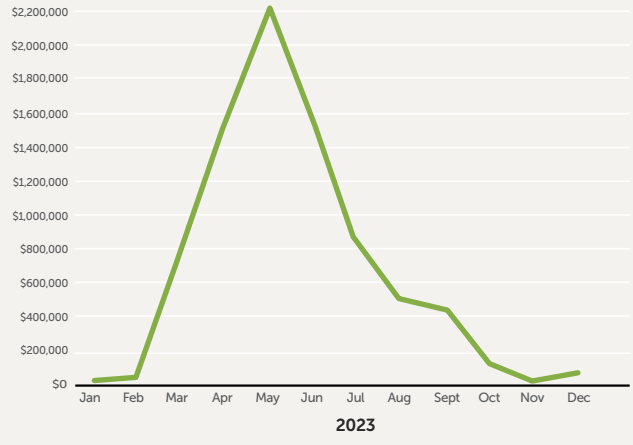
Taiwan

FIGURE 1. MARCH TO DECEMBER 2023



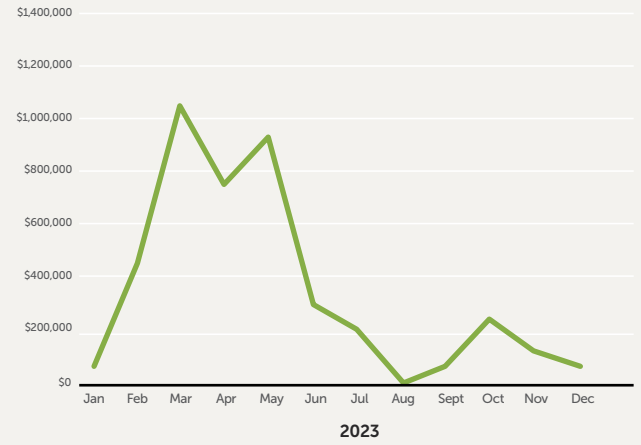
Thailand

FIGURE 2. JANUARY TO DECEMBER 2023



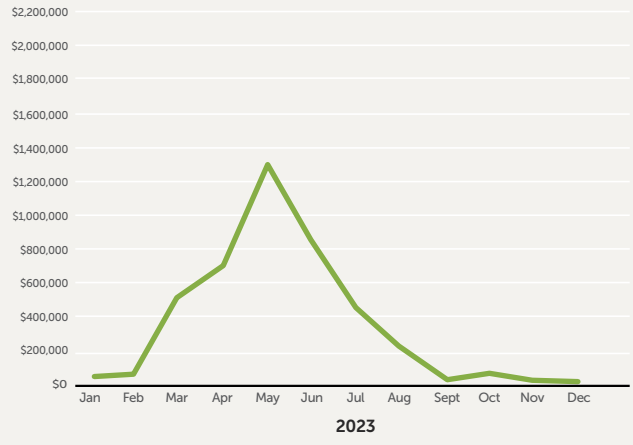
United Arab Emirates

FIGURE 3. JANUARY TO DECEMBER 2023



Malaysia

FIGURE 4. JANUARY TO DECEMBER 2023



*Based on Global Trade Atlas: Australian fresh onion exports.

Onion imports overview

According to the data from Global Trade Atlas, there was a 27 per cent decrease in semi-processed onion import value from January to December 2023, from $8 million to $5.8 million and a 9 per cent increase in import volume from 6,334 tonnes to 5,762 tonnes.

Semi-processed commodities are restricted to chilled, peeled, and washed onion bulbs. The semi-processed onions are imported through the fresh Allium spp. for human consumption as listed under the Australian Biosecurity Import Conditions (BICON).

China, Netherlands, and the United States are the top three markets for semi-processed onion imports. Semi-processed onion imports from China recorded an increase of 12 per cent, from $4.2 million to $4.8 million; import volume increased by 16 per cent, from 4,497 tonnes to 5,236 tonnes *(refer to Table 1)*.

Change in semi-processed onion imports by top 3 destinations

TABLE 1. JANUARY TO DECEMBER 2022-2023

Trade Partner	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
World	**$8,039,430**	**6,334**	**$5,846,705**	**5,762**	**-27%**	**-9%**
China	$4,273,940	4,497	$4,804,713	5,236	12%	16%
Netherlands	$1,495,812	695	$855,520	427	-43%	-39%
United States	$2,193,544	1,048	$181,442	98	-92%	-91%

Source. Global Trade Atlas 2024

edp Australia Technical Service & Support Team

edp Australia is consistently strengthening its skilled service and support team. The recent addition of Shaun Esam, who brings an impressive 29 years of experience in fault-finding, breakdown maintenance, installation, and plant commissioning, enhances the team. Damien Atkins, edp's packaging machinery service manager, adds to the expertise with 19 years of experience in high-speed machinery.

Moreover, edp has two in-house electricians on standby, ready to support their service team whenever needed. This decision reflects edp's commitment to offering quality assistance to their valued customers and reinforces edp's position as a leader in the manufacturing industry.

edp Australia understands the importance of excellent customer support in building strong relationships, which is why they have taken steps to expand their technical service and support staff. edp aims to respond to customer inquiries efficiently and resolve issues faster. The investment in additional staff ensures that edp's customers receive personalized and efficient support, leading to greater trust and satisfaction.

edp Australia also provides telephone assistance to all their customers, particularly during those urgent moments when a customer may experience a breakdown requiring a swift resolution. edp's service technicians will be visiting various regions to introduce themselves and establish strong connections with customers.

In addition, edp's technical service team members are ready to provide on-site support, allowing edp to address customer issues directly and promptly. To stay ahead in the industry, edp has also invested in training their technical support staff with the expertise of overseas suppliers like Giro. This international training equips the edp service & support team with the latest knowledge, newest software, and best practices, keeping edp at the forefront of industry advancements and ensuring that edp can provide the best possible support to their customers.

Additionally, edp has backup support from highly experienced technicians at Giro & IPLA, based in Spain, available to provide any necessary additional technical assistance.

edp Australia is revolutionising the way they store and keep track of stock.

With the goal of digitizing their inventory management and job costing, edp has implemented 1 machine capable of accommodating 500m^2 of shelving pick face. With a footprint of 15m^2, this translates to an impressive 97% improvement in floor space.

Customers that are being serviced by our staff can rely on the warehouse team to quickly pick and despatch needed parts for onsite maintenance.

RESULTS

The implementation of this new technology at edp has yielded remarkable results.

The key outcomes observed include:

- 97% floor space saving.
- Accelerated delivery of orders to the service crew.
- Enhanced order accuracy attributable to the new automated system.
- Expansion in manufacturing operations owing to optimized floor space utilization.
- Improved control over small picked items in the inventory.

edp Australia pride themselves on providing comprehensive manufacturing capabilities, specifically customized to suit their customers distinct requirements.

edp excels in delivering a comprehensive approach to your needs. Their expert team specialises in innovative design, creating cutting-edge and efficient solutions to maximize your yield. Through precision manufacturing, they utilize state-of-the-art facilities to guarantee the production of durable and reliable equipment that stands the test of time, ensuring a lasting investment. Edp takes care of the entire process seamlessly, from the factory to the field, providing a hassle-free and turnkey experience. You can trust them to handle every aspect, offering peace of mind and optimal operational efficiency.

FOR MORE INFORMATION
Email sales@edp.com.au | Phone 03 5820 5337 | **edp.com.au**

Hort Innovation
Horticulture Statistics Handbook 2022/23

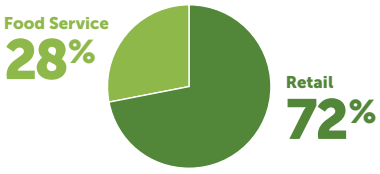
The latest edition of the Handbook was released in February 2024,unpacking the onion sector's performance during the financial year of 2022/23.

Hort Innovation works with industry to invest the onion levy and Australian Government contributions into initiatives to help growers be as productive and profitable as possible, through the Hort Innovation Onion Fund.

Fresh Onions Overview

Year ending June	2021	2022		2023	
	VALUE	VALUE	VALUE % YOY	VALUE	% YOY
Production (t)	271,383	272,604	<1%	255,159	-6%
Production ($m)	$202.7	$253.4	+25%	$332.7	+31%
Fresh Supply (t)	206,538	206,548	<1%	203,844	-1%
Fresh Supply wholesale value ($m)	$209.6	$263.2	+26%	$362.5	+38%
Supply per capita (kg)	8.02	7.96	>-1%	7.76	-3%
Retail supply (t)	149,449	148,169	>-1%	146,189	-1%
Retail supply wholesale value ($m)	$151.7	$188.8	+24%	$260.0	+38%
Food service supply (t)	57,089	58,379	+2%	57,655	-1%
Food service wholesale value ($m)	$57.9	$74.4	+28%	$102.5	+38%

Retail vs food service



The wholesale value of the fresh supply was **$362.5M**, with **$260M** distributed into retail and **$102.5M** into food service.

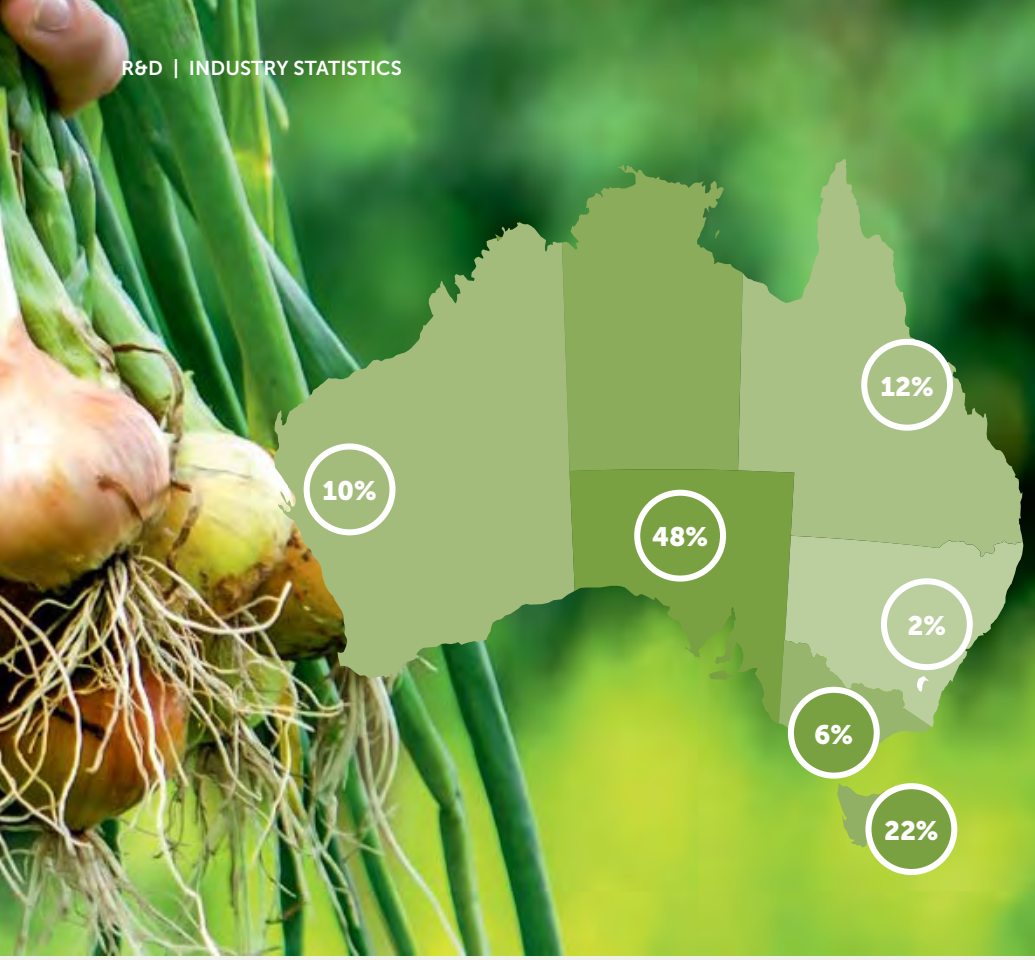
Consumer metrics

74% of Australian households purchased onions, buying an average of **672g** per shopping trip.

Per capita consumption

in 2022/23 based on the volume supplied.

Source. ABS; AC; CFVIWA; GTA; OA; MP & DD (Freshlogic Analysis).



Onions are grown across most states of Australia, with the majority of production occurring in South Australia and Tasmania. Processed onions are typically dried and preserved.

Source: OA

Fresh onions by state - 2022/23

State	Volume (t)	Value ($m)	% of production
South Australia	121,476	$158.4	48%
Tasmania	56,831	$74.1	22%
Queensland	31,237	$40.7	12%
Western Australia	24,421	$31.8	10%
Victoria	15,969	$20.8	6%
New South Wales	5,225	$6.8	2%

Main onion variety production

Variety	Volume (t)	% production
Brown	184,369	79%
Red	44,575	19%
White	2,223	1%
Shallots/spring onions	1,120	<1%

FIND OUT MORE

To access Hort Innovation's Australian Horticulture Statistics Handbook, please visit horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/australian-horticulture-statistics-handbook/

The Handbook's interactive dashboard is suitable for viewing on desktop computers and mobile phones.

Australian Horticulture Statistics Handbook 2021-22 to 2023-24 is a whole-of-horticulture project that has been funded by Hort Innovation using industry levies and contributions from the Australian Government.

Project Number: MT21006

Hort Innovation

Andrew Muir, Greg Linsdell (GM Operations) and Will Gordon.

E.E. Muir & Sons leveraging innovation, sustainability as it resets for long-term growth

One of Australia's best-established family-owned agribusinesses, E.E. Muir & Sons is modernising its distribution and agronomy services to support Australian vegetable growers nationally.

Fourth generation family member, CEO and Managing Director Andrew Muir says that while company history is important, his focus is on meeting farmers' needs now and for the next generation.

He is clear that the best way to do this is to make a deliberate and innovative shift towards sustainable products and practices.

"Whether it's being driven by regulation, consumer requirements or environmental considerations, it is a strategic issue for growers, as well as for us and our suppliers.

"That's why we have a sustainability mindset at the centre of our business strategy, along with the innovation, expertise and service needed to drive it forward."

EE Muir and Sons' Sustainability Commitment released a year ago is a clear statement to guide business decisions and support staff conversations with growers on sustainability. The focus is on grower profitability and practices, industry opportunity and future proofing.

"We have products and solutions from pre-plant, growing and protecting the crop, harvesting, through to post-harvest and packaging.

"As we continue to modernise as a business, we are constantly renewing our range of products and services to make sure we are ahead of market needs and ready for the future".

Integrated innovation approach

In addition to its close relationships with large global R&D companies, the business looks for partner opportunities, to further develop and distribute innovative products for Australian growers.

This has resulted in the vertical integration of some business units as well as new entities that support E.E Muir & Sons distribution services.

Will Gordon, National Sales, Marketing and Portfolio Manager, says there are several areas of innovation the company is invested in.

"We have the Agreva portfolio of sustainable products as well as an organic portfolio via Sustainable Farming Solutions. Natural Solutions provides beneficial insects and mites, and Campbells Fertilisers Australasia has developed a unique and highly sustainable nutrition portfolio.

He says understanding farming programs and how all the components come together is key.

"It requires technical expertise to deliver these integrated programs to our vegetable customers and that training has always been a critical investment for us.

"For example, we are partnering with drone tech service providers to release beneficial bugs within an IPM strategy, to develop solutions that work well for the grower.

"In our fertiliser portfolio, we are developing products with new coatings, enzymes and other additives that significantly improve the efficiency of nutrient use by the crop, while also delivering application benefits. Essentially, the grower can use less and achieve the same result, sometimes with fewer applications."

Other emerging technologies are under development and continually being adopted, such as predictor testing to assesses soil pathogen levels, an important consideration for potato and onion markets and increasingly other sectors.

"It means the grower can make better decisions around what to plant, where and when. They can better understand the risk of disease and can manage their crop accordingly to reduce the potential of a negative outcome.

"It's critical for their profitability that they're not wasting money on unnecessary inputs. It's a huge advantage to have these kinds of tools and information when making decisions."

Increasing expectations

Andrew says increased domestic and global expectations for the safety and sustainability of fresh produce is something the company is very aware of.

"More and more of our vegetable growers are starting to export crops. The expectation that comes with that, particularly if you go into high value markets, is that quality and safety is paramount. And the domestic market is also differentiated like this.

"Addressing concepts such as zero residue is an area of expertise for us. We're considering what future expectations will be, so we can best support producers to participate in those high value markets."

He also says there are ways growers can utilise the E.E Muir & Sons portfolio to better position themselves regarding their carbon footprint.

"One of our major customers recently said they are being questioned by their main customers about carbon footprints and sustainable practices.

"They are being asked 'what are you doing', so it was great that we could say we're already taking steps, working with biological soil inputs and beneficial insects to improve biodiversity, and high efficiency compounds, enzymes and other innovations to reduce fertiliser applications.

"Adopting a sustainable approach now, will help growers be better set up for whatever comes down the pipeline in the coming years."

FOR MORE INFORMATION
eem.com.au

Onion growers gathered in Murray Bridge for the Onion Lunch for knowledge sharing and networking.

Food for thought at Onion Lunch

In late November 2023, some 30 onion growers met in Murray Bridge to learn about research into onion diseases in the US, and to see firsthand the effects of ryegrass herbicide resistance.

As part of extension for the *Accelerating the adoption of best management practices for the Australian onion industry project* (VN21000), the Onion Lunch, was designed to bring growers closer to researchers to gain practical, hands-on knowledge and experience that can be translated back onto farm.

Guest presenter for the event was leading US plant pathologist researcher Lindsey du Toit.

Lindsey's specialist knowledge in vegetable diseases includes onions, and Australian growers had an opportunity to learn of her research earlier in the year during the 10th International Spinach Conference, held in Melbourne. And more recently during the Australasian plant pathology conference.

Stop the Rot, is Lindsey's current project which brings together scientists from diverse disciplines across the US to research the systems of bacterial diseases in onions.

The aim, is to develop practical, economically sound strategies for pathogen detection and management to improve onion production.

The US onion production is significant with 10,000 hectares of storage onion production, most of which is direct-seeded in semi-arid regions. Most crops are irrigated with centre pivots or drip irrigation and fumigants are common prior to planting.

Backed by the USDA specialty crops research initiative, Lindsey said that the $4m project will run for four years, to characterise onion bacterial disease, and to develop a management plan that can be applied on farm.

"The reason for the project is that these bacteria are everywhere in onions and we don't have really good detection methods to determine if they are pathogenic, or along for the ride," said Lindsey.

As expected, the bacteria and the ideal conditions for bacterial disease differ in different climates and production systems.

One of the findings to arise from the research is that copper resistance genes are common in onion isolates of the bacteria, *pantoea*. A study of grower production systems revealed that many apply copper on a range of crops including potatoes, carrots, peas and beans, so it was not surprising to Lindsey's team that a tolerance has been established.

To investigate bacterial bulb rot, the team have done everything possible, including inoculation of the bacteria to create an environment for disease development – flying in the face of what good growing conditions should be for marketable yields.

Irrigation in terms of frequency, timing, drip versus pivot and the amount of water were done in the worst possible way. Once nearing ready for harvest, bulbs were studied for marketable yield.

Results showed that management of irrigation was a factor in bulb rot.

The other surprise was the height of cutting the neck, and the methodology used. In Georgia, the onions are harvested top green.

"You would think manual harvest would create less disease, the assumption is that there is less likelihood of mechanical damage, but that was counter to what we were expecting," she said.

"We realised that manually harvested onion bulbs had very short necks. If it still has moisture and it is cut short, it creates a wound leaving it open to bacteria.

"A longer top means that the cut wound is further from the bulb and more chance for it to dry and cure, reducing the risk of bacteria getting into the bulb."

Finally, from an economic perspective, the Stop the Rot project aims to develop a program to assess risk of bacterial diseases, that will give growers a tool for decision-making through the season based on factors such as environmental conditions, soil fertility, weed pressure that may mean harvest and market is a better option than storage.

FOR MORE INFORMATION
Visit alliumnet.com/stop-the-rot

▸ CONTINUED ON PAGE 76

Above L-R. Lindsey duToit spoke at the Onion Lunch about a US research project Stop the Rot. Peter Boutsalis and Sam Kleeman gave a hands-on presentation on ryegrass herbicide resistance.

Managing herbicide resistance in ryegrass

From a local perspective, Peter Boutsalis and Sam Kleeman gave the onion growers first hand representation of the problems the industry is seeing with ryegrass herbicide resistance. You can read about this topic in more detail on page 77.

The onion industry is limited in the number of herbicides that can be used with any real efficacy.

Peter and Sam demonstrated quite clearly the effects or lack of, different groups of herbicides such as fusillade, clethodim, glyphosate, paraquat and Sakura.

Observations within the broadacre sector suggest that there are opportunities for onion growers to apply different management techniques for cover crop application, or the small window between the cereal cover crop, knock down and planting of the onion crop.

By changing how we approach ryegrass management, it is possible to get on top of the problem within a few years.

Lindsey, Peter and Sam stressed that testing is the surest way to determine what bacteria it is present, or whether you have herbicide resistance.

The benefit of events such as the Onion Lunch is that is not just the growers who gain knowledge and have an opportunity to speak with their peers.

Lindsey and Peter both agreed that one-on-one conversations they have in social settings after presentations at events like the Onion Lunch can provide additional insights.

Researchers gain greater insight into production systems at a local level, but in Lindsey's case the similarities between the South Australian onion growers and the semi-arid growing regions of the US lend themselves to comparative analysis.

FIND OUT MORE
Hear more about the Onion industry in our Vegalogue podcast: **ausveg.com.au/infoveg/infoveg-radio/**

The Accelerating the adoption of best management practices for the Australian onion industry project is funded by Hort Innovation using the onion levy and contributions from the Australian Government.
Project: VN21000

Dr. Peter Boutsalis and Dr. Sam Kleeman

Managing herbicide resistance in onions

The list of available herbicides that can be used within onion crops is limited, and with herbicide resistance increasing in ryegrass, control of the weed is challenging for growers.

The Onion Lunch held late 2023, was an opportunity to showcase to onion growers the widespread herbicide resistant ryegrass issues and how herbicide resistance can be managed.

Presented by Dr Peter Boutsalis and Dr Sam Kleemann of Plant Science Consulting, the presentation focused on pot samples showing the efficacy – and sometimes lack of – herbicides on ryegrass.

Annual ryegrass is the most problematic weed for the broadacre sector, and many of the management learnings can be drawn from that industry.

Herbicides are classified on how they kill plants – the mode of action. The most common mode of action herbicide group used to control ryegrass is the ACC Inhibitors (Group 1) class of herbicides. ACC herbicides target an enzyme in the plant (ACCase for short), with these herbicides divided into two chemical classes, abbreviated to FOPs and DIMs. Cross resistance to multiple chemistries (herbicides) within ACC herbicides is common in ryegrass.

"Ryegrass has a huge level of resistance to several different modes of action," said Sam.

"There are a couple of reasons why. Firstly, ryegrass is an obligate out-crosser, which means it is pollinated by its neighbour. If the neighbour carries resistance, the next generation will also be resistant.

"Annual ryegrass has been planted for decades for livestock production, which means it is spread across the country and has a huge genetic diversity, which in turn means that the chances of mutation or resistance mechanisms being present is quite high."

As a highly competitive grass, ryegrass will compete strongly against onion crops, and can produce thousands of seeds. Crop rotation is recommended between 5-7 years between onion crops. Fortunately, ryegrass has a relatively short seed bank duration of around three years.

With appropriate management between onion crops, ryegrass pressure can be significantly reduced by running down the ryegrass seed bank to a manageable level.

"Initial studies identified that 1: 500,000 plants within a susceptible ryegrass population can contain a herbicide resistant ACCase mutation conferring resistance to a Group 1 FOP herbicide such as Fusilade. Repeated use of a Group A herbicide can rapidly enrich resistant plants making the whole field is resistant."

"Comparing treated [ryegrass] with untreated [ryegrass] using Fusilade, a Group 1 herbicide, it can work effectively, however experience from the broadacre guys, says that over reliance on Fusilade means it has lost its efficacy." *(Figure 1)*

Products such as Fusilade target specific enzymes to inhibit plant growth. A resistant ACCase enzyme can render Fusilade ineffective. Increasing the spray rate rarely results in any additional control.

Random weed surveys funded by the GRDC in all the southern states have detected ryegrass highly resistant to the FOP herbicides. Small pockets of the Mallee are still able to use this Group,

FIGURE 1. FUSILADE ON RYEGRASS. LEFT POT IS TREATED.

but it is likely that these herbicides have not been used extensively in the region.

The temptation to increase the rate of Group 1 herbicides could be deemed as a way to improve control but this is rare and usually results in no additional control and increases the risk of damaging the onion crop.

In broadacre, the shift from FOPs to DIMs has created a situation where resistance is now occurring at a high level and the industry is running out of options to control ryegrass. *(Figure 2)*

Planning to control ryegrass

The recommendation for rotation of onions is 5-7 years. Taking advantage of this window says Sam, holds a key to getting ryegrass under control, by knocking down the ryegrass seed bank.

Using herbicides that are still effective on ryegrass, away from an onion crop will minimise the weed pressure and selection pressure on Group 1 herbicides.

FIGURE 2. CLETHODIM IS A GROUP 1 HERBICIDE IN THE 'DIM' FAMILY.

FIGURE 3. BOXER GOLD IS A PRE-EMERGENT RESIDUAL HERBICIDE THAT STILL CAN BE EFFECTIVE WITH RYEGRASS.

"A good tactic to employ that is promising in the broadacre space is the use of residual pre-emergent herbicides, such as Boxer Gold and Sakura," says Sam.

"You can see in the pot trial that Boxer Gold is extremely effective and can be a useful option in cereals such as wheat and barley. *(Figure 3)*

"Under a centre pivot, the herbicide can be washed to give effective control. Sakura is another herbicide that is also proving to be effective pre-emergent tactic." *(Figure 4)*

According to Sam, other herbicides that can also be used to tackle Group 1 and 2 resistant ryegrass include Mateno Complete, Luximax, Overwatch and Ultro.

Efficacy in the use of residual herbicides relies on solubility to reach the seed bank. Turning the soil to plant onions, means that the seed bank is distributed through a much greater soil layer, such that residual herbicides may not reach the ryegrass seeds. Ryegrass seeds nearer to the surface may incur the full potency of the herbicide, however, seeds as deep as 10cm, will have an opportunity to develop resistance. This is where an effective post emergent herbicide is required to control the ryegrass once it has germinated; this is the missing link- the lack of effective crop selective post-emergent herbicides.

FIGURE 5. RYEGRASS IS BEGINNING TO SHOW SIGNS OF RESISTANCE TO GLYPHOSATE AND PARAQUAT.

FIGURE 6. PARAQUAT

Rotating between the many pre-emergent herbicides will help avoid the development of resistance to any one pre-emergent herbicides.

Glyphosate and paraquat on the edge

Testing by Peter and Sam has shown that glyphosate resistance is on the rise with 16% of paddocks surveyed in 2020 containing glyphosate resistant ryegrass. Often glyphosate resistant ryegrass is affected, but eventually reshoots.

"Ryegrass surviving a field application of glyphosate is not always due to resistance. Often other factors such as growth stage, stressed weeds, application and even poor quality glyphosate products can affect control. The only way to be certain is to have the weeds tested by a lab. Often, increasing the rate can provide complete control."

In broadacre a move away from glyphosate to paraquat for ryegrass control has produced the odd case of resistance to paraquat (and often cross resistance to glyphosate too). Resistance to both is a significant issue due to the lack of alternative knockdown herbicides *(Figure 5 & 6)*.

"For onions, we would recommend a strong knock-down strategy (glyphosate followed by paraquat within five days) just prior sowing an onion crop."

"With so many chemistries not available in the onion space, it would be more effective to utilise these alternative mode of action herbicides in competitive rotational crops to significantly reduce the ryegrass seed bank."

"It is also important to identify any resistance that is expressed in your ryegrass – ryegrass testing is the only way that this can be done with any certainty. Knowing what resistance is present – or not, will give you a clearer idea of what you can and can't use."

"Plant Science Consulting provides a service to test for ryegrass seeds or plants growing in the field, with more information found at plantscienceconsulting.com.au"

Rotate your chemistries, know what you can and can't use, and look to knock down the seed bank away from your onion crop.

FOR MORE INFORMATION
Contact Peter and Sam go to plantscienceconsulting.com.au

An opportunity to pre-pack onions has led to a niche business model

Pre-pack of citrus in net bags has been common for decades, but when an opportunity arose to pre-pack hard produce – onions – it gave Just Onions an opportunity to branch into a new line that has evolved into a fully developed business that continues to grow.

Oranges were the life blood of the Thierry business during the 70s with after school for Alan Thierry and his siblings spent in the packing shed.

An opportunity to purchase a wholesale distribution business in the 1980s gave Just Onions a pathway to supply pre-packed onions into independent supermarkets.

A business that started as a backyard packing operation now moves hundreds of tonnes each year of brown, red and white onions into the independent supermarket sector.

Onions are sourced from exclusive growers and the Melbourne wholesale market and packed into 1kg, 2kg, 5kg and 20kg bulk formats. The season starts with onions from the Swan Hill region, through to the Riverina and southern Queensland. The South Australian and Tasmanian onion supply rounds out the availability for fresh onions.

"The Swan Hill region are short shelf life varieties, so once they are ready for harvest we have to move them," says Just Onions CEO Paul Williamson.

"We are seeing that the season out of South Australia is starting earlier, and extending later and has the capacity to be stored.

With better than normal growing conditions in the past couple of years in South Australia, it means we have had a bit of a glut of longer shelf life produce.

"For growers that means that the returns have reduced, which also impacts on the supply chain. It also means that the demand for imports is lower, as food service are happy to use local, lower grade product for processing.

"The challenge for the supply chain is to find markets for our growers to keep product moving. Export opportunities have been somewhat lower than pre covid levels and present as a significant opportunity for growers when local supply outstrips demand.

"With the weather events in southern Queensland in previous years, it has meant a greater reliance on South Australia, Tasmania and Swan Hill for our markets. Pleasingly our Queensland growers had a successful growing season in 2022, but unfortunately they faced lower than expected returns."

Above L-R. Paul Williamson, CEO and Chair of Just Onions. Sorting brown onions in the Geelong warehouse, sourced from local growers **Inset.** The Just Onions brand LUV is using card cartons to be more sustainable.

Over the years, Just Onions has incorporated several business efficiencies including packing and grading automation systems. This has enabled the company to turn around product in 24 hours from receipt to delivery if required, across three levels of grading.

Working toward a more sustainable business model, Just Onions has introduced recyclable cardboard cartons for smaller volume packaging – around six onions per pack – that are retail ready.

Paul estimated that the business used well over two million kilograms of plastic each year and the shift to cardboard will significantly reduce the reliance on plastic. A change in the packing line equipment has now been achieved, and the initial response from retail is positive.

Not only are the card packs easier to transport on a pallet, but also present well on the retail shelf and afford a longer shelf life than the traditional plastic packaging.

"We have spent a lot of energy on talking with our customers about the cardboard carton, to ensure that demand back through the traders occurs. So far, I would estimate that we have seen a significant increase in sales.

"A lot of retailers are aware of the need to reduce plastic usage by 2030, so this becomes another easy win for them.

"For us, we have branded the produce under LUV Produce. The possibilities that this packing format opens up extends beyond just onions – any of the hard vegetables could be done, such as potatoes, beetroot and avocado. Often with potatoes for example, the bag can begin to sweat, but these cartons breathe, allowing the product to be dry and stable.

"Contract packing, branded cartons, they all represent an opportunity for business diversification."

Just Onions prides itself on quality produce and all the onions are fully traceable back to the grower. While it is near impossible to trace an individual onion, onions are batched and identified from grower receival through to the retail ready carton.

If the quality of the onions held in storage develops issues, such as basal rot, it can be traced back to the grower, and other customers who have received those onions can be informed, to check their own supplies.

"The Just Onions business, and the LUV Produce brand for the carton produce continues to evolve as we see opportunity. Working with the independent supermarkets means we have a little more flexibility to try new things – it works for us."

potato update

This project has been funded by Hort Innovation using the potato - fresh and processing research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

Hort Innovation POTATO – FRESH FUND

Hort Innovation POTATO – PROCESSING FUND

Getting the most out of production comes down to knowledge and planning

With intensive production of many vegetables including potatoes and onions in the Lockyer Valley, Elders agronomist Greg Teske knows that understanding the soils, weather and markets goes a long way to ensuring that the quality and yield of a crop is the best it can be.

Beans, leafy veg, brassicas, potatoes, sweetcorn, carrots and allium are the mainstay vegetables grown in the Lockyer Valley, and with year round production rotation, the need to understand what is happening at ground level is vital.

The use of farming software apps such as farm mapping, GoCanvas, Agworld and Livefarmer are all part of the technology kit that most growers utilise to keep track of weather, soil conditions, inputs and yields, however the value of a one-on-one conversation with an agronomist gives growers a further degree of confidence.

Greg Teske has been an agronomist in the Lockyer Valley for many years, and said that while each grower does much the same thing year in, year out, knowing changes in the weather, soil conditions and what the market forecast looks like enables him to help growers plan growing seasons a week to a year in advance.

"If a grower is looking to do 250 acres of broccoli and 300 acres of potatoes in the next seasons, we can start to plan ahead particularly for inputs such as fertilisers where the lead time for delivery has become quite long," says Greg.

"At a more immediate level, if the weather forecast looks like it might rain next week, getting fungicides in ahead of time, may mitigate many diseases."

Soil testing has been conducted for years, usually to understand nutrition in the soil. However, the need to understand soil health – pathogens and nematodes – is becoming increasingly important to growers.

As a consequence, soil DNA testing is now underway to understand what is actually in the soil. Knowing that the soil has phytophora instead of pythium can make a difference on how that crop and field is treated.

Improving soil health is also part of the conversation. In the past, growers might use a cover crop of forage sorghum or biomulch without really understanding if there is any benefit. Greg says that there are trials underway to study the affects that a cover crop comprised of mustards, vetch and brassicas will have on the soil pathogens and microbes. The use of soil DNA testing will be vital to that study.

"Most growers wouldn't consider these apps and soil tests as technology, but they now form an integral part of farm management, for me and the grower. I can input the data and recommendations for the grower to review, but a discussion about which day to apply the fungicide before a potato row closure and a rain event is just as valuable."

Inset. Elders agronomist Greg Teske. *Photo courtesy of The Independent, Gatton newspaper.*

Growing onions and potatoes the Lockyer way

The bulk of the onion and potato production in Australia is in Tasmania and South Australia, with South Australia in particular based on sandy soils.

The soil, pH and conditions of the Lockyer Valley are vastly different. With a pH typically in the 7s, making it quite alkaline, plus a clay content that holds moisture, onion harvest is mostly picked by hand.

In South Australia, harvesting is mechanical, with infield curing and ground storage. With the high humidity and wet soils, onion bulbs remain soft in the ground such that the skin does not dry and cure, with a far higher risk of mechanical damage from harvesters. The high summer temperatures mean that it can become too hot for the soft bulbs for ground storage.

Humidity is a problem for shed storage – as a result, onions are harvested, allowed to settle for a day or two and sold directly off-farm. Onion drying facilities are a technology that many growers are considering to extend the time between harvest and markets.

Brown onions would easily make 80 per cent of overall onion production, with about 18 per cent red and a few acres of white, says Greg.

"Early season onions are risky – most growers will plant around the beginning of May and harvest late October to November. Some varieties of early onions do ok, but it is risky. Trials are underway to find onion varieties that are more tolerant of downy mildew, and can take advantage of the short winter day lengths while maintaining yields.

"Most of the markets want a uniform size of onion, but occasionally for processing, the demand is for larger bulbs for slicing and dicing. Most growers plant at about a 4" spacing. I am aware that some growers use a smaller spacing, then if the demand is there for smaller onions, they are covered, and take some out, leaving space to grow the larger bulb which inevitably happens without much notice.

"Some growers are using mechanical harvesting, going forward they will be looking at a more appropriate onion variety to give a more successful harvest. It will become increasingly important against the cost and availability of labour compared to hand harvesting."

Once onions reach the four leaf stage, Greg works with the growers to get the fungicide program underway, particularly for shallots, where it is important that the entire leaf is protected to pass QA and market specification.

Thrips pose the biggest pest problem, while broad leaf weeds such as thistles, fat hen, amaranth, wild turnips and mustards are a constant challenge. Trials have shown that getting control of the weeds before the tap root is established makes it easier to manage.

Alternaria solani

For potatoes the greatest threat is *Alternaria solani.* (target spot) and more recently phytophora (late blight). The soil DNA testing for other vegetables will be invaluable for the potato and onion fields to check for pathogens.

Control of whitefly and aphids is done in-farrow rather than as a foliar spray as it gives better control early on for any infestations, says Greg.

For Lockyer Valley potatoes, half is for the fresh washed market, the other to the processing sector for crisps and fries to PepsiCo and Snack Brands.

In the past, both companies preferred to use PBR varieties, but more recently PepsiCo are trialling Elders PBR varieties. Many growers continue to grow Atlantic, which has been grown in the region for more than 30 years, as it is a tried and true for yield and specification. Another well loved variety, Sebago is still grown however new varieties based on Sebago genetics will likely takes its place.

For the washed fresh market, Greg says there are number of varieties although variety selection is important to give less disease issues. There are growers who are licensed to grow Kestrel, and increasing demand for more niche potatoes such as reds and purples is seeing more growers plant varieties such as Merlot.

Seed potatoes are mostly sourced from down south, however some of the crisping growers will keep a portion of yield to set aside for seed. The crisping potatoes can achieve two plantings a year – usually in February/March and again in May-June. Gen 4 is the preference for each planting. Greg says the loss of genetic vigour in Gen 5 is quite noticeable, and that it has run its course.

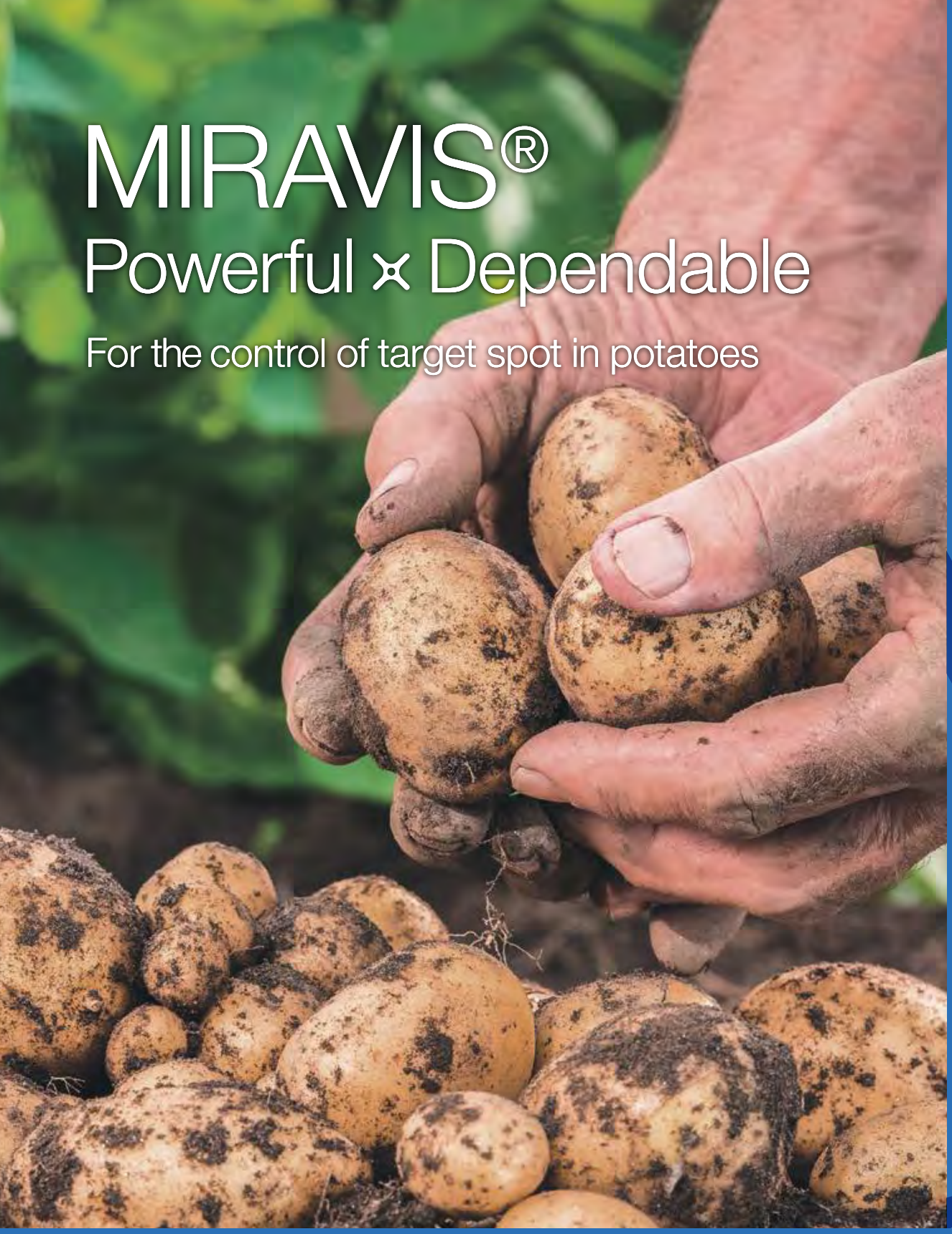
Future of technology in the Lockyer

"Most growers are pretty up to speed with apps, sprayers for inputs and irrigation and the like," says Greg.

"Soil knowledge while not a fancy machine is now becoming a part of conversation with crop rotations and cover crops part of the overall farm management. Cool storage and monitoring, and onion drying technology will become a vital part of ag here in the Valley."

"Events such as the Gatton AgTech, while it didn't provide a solution to mechanical onion harvest and drying which is a pressing need, it did give growers some ideas for weeders and sprayers.

"What it did give growers is the confidence that they are on the right track for farm management, but conversations with an agronomist will continue to be an integral part of every day farming."



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AUSVEG and potato advocate Geoff Moar hangs up the Director's hat

The vegetable and potato industries have had a strong advocate for decades in Geoff Moar. After 20 years of being a Director on the AUSVEG Board, it is time to head back to the farm.

The journey for Geoff Moar from a small potato farmer in the 1960s through to Chair of the AUSVEG Board has seen many changes, and many challenges.

Based in the Riverina region of New South Wales, Geoff and his brother started a small potato farm on six acres but soon progressed to greater acreage. The farm initially supplied the fresh potato market, but now also supplies the fry and crisping processors and a small amount of export.

At the time, the Riverina Potato Growers Association invited Geoff to sit on the Board to represent around 40 potato farms in the region. Issues of the day, that continue today, are around water security in the Murray Darling Basin and biosecurity.

Joining forces with like-minded farmers locally and interstate with organisations such as the Tasmanian Farmers and Graziers Association, gave an opportunity to advocate for potato growers on a broader scale.

"In the early days, our executive officers were part time or volunteer, but we were able to work together to address some of the issues of the day for the potato industry, and bring strength in numbers to our voice.

"We introduced the potato levy to fund research and development, which later became the model used for the vegetable industry as a whole for R&D. The system put in place meant that the funds were accountable, and could only be used for R&D."

Joining forces with NSW farmers groups, and later other state based groups, led to the Australian Vegetable and Potato Growers group, giving rise to AUSVEG in its current form in 2004, with Geoff as one of the first to Chair the organisation.

"In those first few years of AUSVEG, we worked to address issues such as biosecurity, pests and diseases, dumping of foreign product and cost of production.

"With Richard Mulcahy as the CEO, we also established the beginnings of what is now Hort Connections to give growers an opportunity to speak directly to industry on a level playing field, whether they were a big operation or a small farmer."

Geoff now sees that it is time for him to step back and enjoy some time between potato harvests to travel. While he is still involved in the Murray Darling Basin organisations, from an AUSVEG perspective it is time to bring in new people with fresh ideas.

Advocacy will continue to be a central part of AUSVEG's commitment to growers, and Geoff sees that input costs and supermarket concerns will be the more immediate issues for the organisation to address.

"Being a Director on the Board has been a rewarding time, and I have had the privilege to work with some fantastic people who have been prepared to give up their time for the industry. It can take a couple of years of plugging away at an issue, but once resolved you know you have achieved something that will benefit all growers.

"When you see what projects AUSVEG are managing, and the funds that are being channeled into research and development on behalf of industry, it's a heck of an achievement.

"AUSVEG has come a long way in the past 20 years, from humble beginnings operating on a shoestring to a professional organisation that provides vegetable and potato growers with a voice for advocacy as well as information on research and development."

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INTERNATIONAL TRADE

Australian potato exports performance overview

From January to December 2023, Australian potato exports increased by 15 per cent in value, from AUD$35 million to AUD$41 million and total export volume declined by 2 per cent from 42,450 tonnes to 41,747 tonnes. The top five export destinations for potatoes are South Korea, Philippines, Taiwan, Singapore, and Malaysia.

South Korea was the top Australian fresh potato export destination, with an increase in export value by 21 per cent, from AUD$12.5 million to AUD$15 million and an increase in export volume by 5 per cent, with an additional 949 tonnes to 20,531 tonnes. Potato exports to the Philippines saw a positive increase of 35 per cent in export value, from AUD$4.3 million to AUD$5.9 million, and increased in volume by 14 per cent, from 7,722 tonnes to 8,779 tonnes. Taiwan has recorded a significant increase in export value by 94 per cent, from AUD$2.7 million to AUD$5.3 million and increase in export volume by 50 per cent from 2,324 tonnes to 3,496 tonnes.

Change in fresh potato exports by destinations

TABLE 1. JANUARY TO DECEMBER 2022–2023

Trade Partner	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
Total Fresh Potato Exports	**$35,462,713**	**42,450**	**$40,725,310**	**41,747**	**15%**	**-2%**
South Korea	$12,578,309	19,402	$15,279,851	20,351	21%	5%
Philippines	$4,396,569	7,722	$5,935,110	8,779	35%	14%
Taiwan	$2,724,593	2,324	$5,290,125	3,496	94%	50%
Singapore	$3,992,548	2,564	$3,752,784	2,300	-6%	-10%
Malaysia	$2,914,731	2,233	$2,919,679	2,170	0%	-3%
Hong Kong	$2,843,912	1,829	$2,832,429	1,370	0%	-25%
United Arab Emirates	$1,631,044	1,227	$2,446,004	1,851	50%	51%
New Caledonia	$122,571	69	$529,100	349	332%	406%
Qatar	$217,781	159	$299,449	212	38%	33%
Papua New Guinea	$322,063	36	$282,820	35	-12%	-3%

Source. Global Trade Atlas 2024

Frozen potato imports overview

According to the data from Global Trade Atlas, there was a 94 per cent increase in frozen potato import value from January to December 2023, from $181 million to $352 million. Import volume also increased by 43 per cent, from 124,709 tonnes to 178,427 tonnes.

Change in frozen potato imports by top 10 destinations

TABLE 2. JANUARY TO DECEMBER 2022–2023

Trade Partner	2022		2023		%↑ 2022–2023	
	AUD$	TONNES	AUD$	TONNES	AUD$	TONNES
Total Frozen Potato Imports from the World	**$181,466,721**	**124,709**	**$352,206,068**	**178,427**	**94%**	**43%**
Belgium	$56,925,377	32,224	$167,279,533	74,369	194%	131%
Netherlands	$53,988,989	42,357	$78,108,014	43,600	45%	3%
New Zealand	$33,690,443	31,609	$34,326,818	26,451	2%	-16%
United States	$15,401,526	8,109	$27,183,948	11,971	77%	48%
France	$1,997,494	1,373	$20,826,919	13,443	943%	879%
United Kingdom	$2,200,044	501	$5,957,737	1,551	171%	210%
Canada	$4,131,521	2,537	$5,957,184	2,613	44%	3%
South Africa	$3,746,620	1,318	$3,534,807	1,429	-6%	8%
Germany	$2,606,672	599	$2,914,281	607	12%	1%
China	$1,036,686	352	$2,604,715	1,044	151%	197%

Belgium, Netherlands, New Zealand, United States and France are the top five markets for frozen potato imports. Frozen potato imports from Belgium recorded an increase of 194 per cent, from $57 million to $167 million; import volume grew by 131 per cent, from 32,224 tonnes to 74,369 tonnes. Netherlands has recorded an increase in import value of 45 per cent, from $54 million to $78 million and a 3 per cent increased in import volume from 42,357 tonnes to 43,600 tonnes.

New Zealand import value has increased 2 per cent, from $33.6 million to $34.3 million and import volume has decreased by 16 per cent, from 31,609 tonnes to 26,451 tonnes. United States has recorded an increase of 77 per cent in import value, from $15 million to $27 million and an increase of 48 per cent in import volume from 8,109 tonnes to 11,971 tonnes.

France has seen strong growth in frozen potato exports to Australia, with an increase of 943 per cent from $1.9 million to $21 million and a comparable increase in import value of 879 per cent, from 1,373 tonnes to 13,443 tonnes. Frozen potato imports from United Kingdom have grown by 171 per cent, from $2.2 million to $5.9 million and volume has increased by 210 per cent, from 501 tonnes to 1,551 tonnes *(refer to Table 2)*.

Source. Global Trade Atlas 2024

POTATOES

Hort Innovation
Horticulture Statistics Handbook 2022/23

The latest edition of the Handbook was released in February 2024,unpacking the Potato sector's performance during the financial year of 2022/23.

Hort Innovation works with industry to invest the potato levy and Australian Government contributions into initiatives to help growers be as productive and profitable as possible, through the Hort Innovation Potato Fund.

Fresh Potatoes Overview

Year ending June	2021	2022		2023	
	VALUE	VALUE	% YOY	VALUE	% YOY
Production (t)	1,458,991	1,462,065	<1%	1,462,975	<1%
Production ($m)	$807.3	$830.2	+3%	$1,033.5	+24%
Fresh Supply (t)	446,717	433,705	-3%	429,304	-1%
Fresh Supply wholesale value ($m)	$522.8	$526.3	<1%	$626.6	+19%
Supply per capita (kg)	17.65	17.01	-4%	16.64	-2%
Retail supply (t)	380,185	367,235	-4%	16.64	-2%
Retail supply wholesale value ($m)	$445.0	$445.7	<1%	369,294	<1%
Food service supply (t)	66,532	66,470	>-1%	60,010	-10%
Food service wholesale value ($m)	$77.9	$80.7	=4%	$87.6	+9%

Total production

1,462,975t

produced and valued at **$1,033.5m** with **68%** sent to be processed.

Retail vs food service

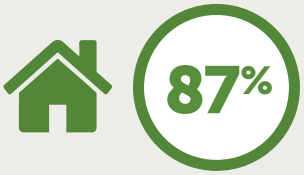
Food Service **14%**

Retail **86%**

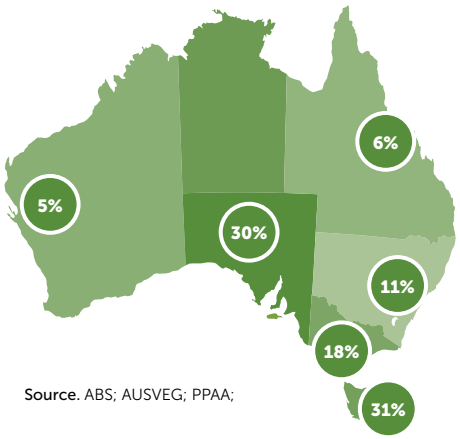
Fresh Potatoes Overview

State	Volume (t)	Value ($m)	% of production
Tasmania	458,280	$323.7	31%
South Australia	433,008	$305.9	30%
Victoria	263,570	$186.2	18%
New South Wales	158,891	$112.2	11%
Queensland	80,960	$57.2	6%
Western Australia	68,267	$48.2	5%

Consumer metrics



87% of Australian households purchased potatoes, buying an average of **1.63kg** per shopping trip.



Source. ABS; AUSVEG; PPAA;

FIND OUT MORE

To access Hort Innovation's Australian Horticulture Statistics Handbook, please visit horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/australian-horticulture-statistics-handbook/

The Handbook's interactive dashboard is suitable for viewing on desktop computers and mobile phones.

Australian Horticulture Statistics Handbook 2021-22 to 2023-24 is a whole-of-horticulture project that has been funded by Hort Innovation using industry levies and contributions from the Australian Government.

Project Number: MT21006

Hort Innovation

Promising potato results with eNpower

Nitrogen loss in potatoes

Deciding on the right amount of nitrogen (N) fertiliser, product type and timing are key decisions for growers, affecting the success of each crop in terms of yield and quality parameters like tuber numbers, size, shape, and specific gravity.

Nitrogen in the nitrate form, whilst easily accessible to plants, is very mobile and can easily escape from the potato root zone from leaching due to over irrigation and/or unplanned rain events.

When nitrification occurs in the soil, that is the conversion of ammonium (NH4+) based fertilisers i.e. MAP, DAP or Gran Am to nitrate (NO3-), the latter can move out of the plant root zone, into water bodies, or diffuse into the atmosphere as nitrous oxide (a potent greenhouse gas). Typically, this can occur within 7-21 days of application. Once this occurs, the N is potentially lost.

How does eNpower help?

eNpower® is a nitrification inhibitor based on the active ingredient dimethyl pyrazole (DMP). DMP works by inhibiting nitrifying bacteria (the key drivers of nitrification) in the soil, slowing down the conversion of ammonium N to nitrate which is prone to losses.

eNpower is not a slow-release product, but simply holds the N form as ammonium for longer, reducing the chance of leaching and denitrification. The N is always available to the plant in the ammonium form until the product wears off and the nitrification process occurs.

In potatoes, up to 60-70% of the required N is applied before the critical growth stage. This creates a risk of nutrient loss before the plant starts to take up N, typically 20 to 60 days after planting (depending on time of year due to soil temperature and emergence). eNpower®, applied to the nitrogen fertiliser by Incitec Pivot prior to dispatch, effectively stabilises N in the soil it ensures its availability to the crop when its needed *(see Figure 2)*. This helps ensure N applied at or prior to planting is available to the crop as crop demand increases, typically around tuber initiation and rapid vegetative growth stages, helping growers achieve better yields and minimise N lost to the environment.

Double Benefit

Enhanced efficiency fertilisers (EEFs) like eNpower® use proven technology to protect the N investment made by a grower and improve crop performance. They also help keep excess N out of the environment, reducing emissions of GHGs like nitrous oxide (N20), and di-nitrogen (N2).

eNpower® reduce denitrification by keeping nitrogen in its stable ammonium form for longer, helping growers use N for longer, while delaying potential losses from nitrate nitrogen as N2O emissions by up to 60%. By choosing eNpower®, potato growers can optimise their crop yields and quality while actively mitigating the environmental impact of potato farming.

Promising results with eNpower

A series of non-replicated demonstrations show the efficacy of eNpower®.

Commercial demonstrations in Langhorne Creek, South Australia in 2022 showed the application of eNpower® led to a 7% increase in crisping potato yield (Variety FL1867). In Koroit, Victoria, another 2022 demonstration in the crisping variety, Crop 77, showed the area treated with eNpower® delivered a yield of 45.8 tonnes/hectare, and an impressive tuber count of 10.07 per plant, compared to the standard N application yielding 42.4 tonnes/hectare and 7.3 tubers per plant – an 8% yield increase thanks to eNpower®.

Before embarking on any fertiliser application program, comprehensive soil testing is key to understanding what you need to apply, and where. This is supported by in crop plant tissue testing to monitor and adjust programs. Blindly applying fertiliser can be a costly process.

FIGURE 3: Potato yield enhancement with eNpower®– Koroit, VIC

eNpower = 8.15kg (av.)
45.8T/ha | 10.07 tubers per plant

Standard = 7.55kg (av.)
42.4T/ha | 7.3 tubers per plant

eNpower yield increase = 3.4/ha (8%)

FOR MORE INFORMATION

Fertiliser programs for potato crops, contact Natalia Gomez – IPF: natalia.gomez@incitecpivot.com.au or +61 427 232 982 or Phil Hoult: phil.hoult@incitecpivot.com.au or +61 457 897 992.

References. Rosen, C.J., and R. Eliason.2005. *Nutrient management for commercial fruit & vegetable crops in Minnesota* (BU-05886). University of Minnesota Extension Service, St. Paul. hdl.handle.net/11299/51272 (accessed 30 August 2023).

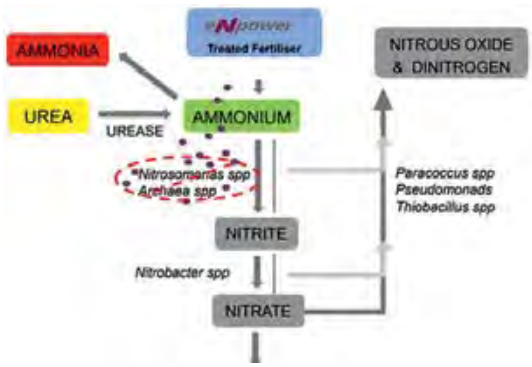


FIGURE 1: How eNpower® works

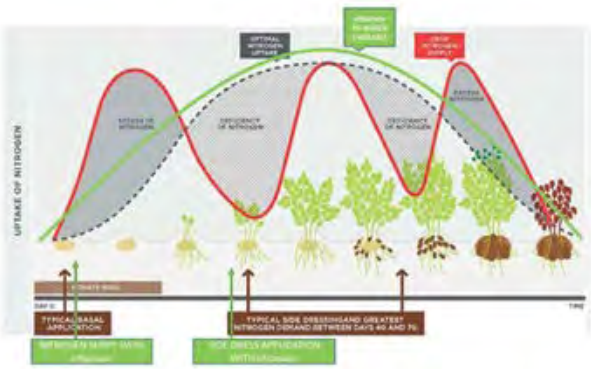


FIGURE 2: Comparing the N Uptake Pattern in Potatoes: eNpower vs. Conventional Nitrogen Supply

Current Projects

HORT INNOVATION POTATO FUND

Hort Innovation conducts a number of R&D projects funded by grower levies. Here is a list of some of the projects currently underway.

Australian potato industry communication and extension project PT20000

APPLIED HORTICULTURAL RESEARCH

What's it all about? Beginning in 2021, this investment is tasked with supporting Australian potato growers in adopting improved practices on-farm and keeping up to date with the latest industry news, information, resources and technologies. The project delivers a nationally coordinated but locally implemented program which employs regional delivery partners who provide specialist skills and knowledge to the industry. The role of the regional delivery partners is a broad one, with all activities geared towards improving the circulation and uptake of information within the industry.

As well as extension activities, the project produces key communication channels for the potato industry, including a hard copy quarterly R&D magazine, online webinars and podcasts, social media, and a dedicated website to host industry resources.

People development strategy for the vegetable, potato, onion, and banana industries MT22002

RMCG

What's it all about? This project is about building a People Development Strategy to guide future investment in building capacity and capability within the vegetable, potato, onion, and banana industries.

Like many industries across Australia and particularly for the horticulture sector, the vegetable, potato, onion and banana industries are facing challenges in attracting, developing and retaining labour, skilled and specialist workers. While there has been investment into training and leadership initiatives, this has often been opportunistic and reactive.

This project engaged with industry to design a coordinated, clear and well-thought through People Development Strategy (Strategy). This will assist in focussing both efforts and funds and ensure industries are able to respond to present challenges and establish future skills for a high functioning and innovative horticulture industry. The development of the Strategy to guide investment in people aligns with the Strategic Investment Plans for the five levied industries of vegetables, fresh potatoes, processed potatoes, onions and bananas. The desired outcomes is improved capability and an innovative culture to maximise investments in productivity and demand.

The project involved a desktop review of national examples of strategies, initiatives and case studies from across horticulture and other industries. This provided the base for engagement with a Project Advisory Group and industry interviews to build the strategy. An advisor from the Global Leadership Foundation provided input into current best practice and contemporary language to create a thorough Strategy for Hort Innovation, industry peak bodies and individual organisations.

The Strategy and Implementation Plan was structured around an overarching Framework that takes into account Industry Context and Enabling factors necessary for successful implementation. From there four key strategies were developed based on the key skill needs identified through the desktop and engagement:

- Core skills and capabilities – maximise opportunities to develop and retain a diverse and collaborative workforce.
- Digital skills and capabilities – leverage information, technology and intelligence systems that enhance productivity and connectivity.
- Interpersonal and leadership skills and capabilities – recognise and develop emotionally healthy people and leaders at every level of industry.
- Collaborate and partner with people at local, regional and national levels to ensure business continuity and success.

Industry preparedness for exotic root knot nematode MT22012

CSIRO

What is it all about? This research will use the latest advancements in molecular screening to provide a better understanding of root-knot nematodes occurring in Australia and develop an identification tool for these nematodes that will be more cost effective than methods presently available.

Background: The recent identification of a new species of highly virulent plant parasite, the Guava Root-Knot Nematode (*Meloidogyne enterolobii*), in Australia means that there is a great need to improve root-knot nematode identification for trade, quarantine, and pest management purposes. Critically, it is not clear if *M. enterolobii* is a recent arrival to Australia, or if the species has been present for some time but has only just been recognised. Historic specimens lodged in Australian collections may hold the key to answering this question, but the information is locked to traditional methods of interrogation. Guava root knot nematode was reported in Australia for the first time in late 2022, from the Darwin area of the Northern Territory. Since this initial discovery, further detections have been made in Queensland. Guava root knot nematode is a devastating plant parasite causing significant crop losses on a global scale. This nematode has a broad host range spanning 30 plant families, including many important food crops. Notably, guava root knot nematode is a resistance-breaking species, causing severe damage to crops with genetic resistance to other root-knot nematode species.

Consequently, this nematode is a significant biosecurity risk for multiple crops in Australia and is rated in the high to extreme risk categories on the biosecurity plans for multiple industries, for example onions, potatoes, sweetpotatoes, and other vegetables. The wide host range and resistance-breaking characteristics of guava root knot nematode facilitates rapid spread, and this species is very difficult to control. Preventing establishment of this species in production areas where it was previously not present is thus critically important.

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GROWER PROFILE

Bronwyn Fox

WORDS BY BRONWYN FOX AND GEORGIA THOMAS

Nestled in the Dandaragan countryside in Western Australia, Arden Fleets is a place where the Fox family have poured their hearts into agriculture. In this article, we take a closer look at this farm's rich history, the people and pets who call it home, and the challenges and rewards of potato farming. We also explore the perspectives of Bronwyn Fox, as she steps into the role of Chairperson for the Potato Growers Association of Western Australia (PGA WA).

The farm

The roots of Arden Fleets run deep, dating back to the early days of WA's settlement. While the farm's previous ownership is a bit of a mystery, it gained notoriety in the 1980s when it was owned by the legendary Australian entrepreneur, Alan Bond. Bond, who also owned neighbouring properties, operating them as one big farm.

Eventually, the property was sold to an international buyer, and it was split into three separate farms—Arden Fleets, Yere Yere, and Velyere. Arden Fleets boasting a nine-stand shearing shed that once served all three properties during Bond's ownership, now doubling as a picturesque venue for weddings and parties.

The Fox family

At the heart of the farm is the Fox family, including grandparents Mick and Delys Fox, with Dave and Bronwyn Fox managing the daily operations. Together, they raise their three children—William, George, and Rosie—who represent the fifth generation of the Fox family farmers. Valued team member Cale calls the accommodation block at the shed home as well.

The farm also hosts several furry residents, including two working dogs, Bob and Jo, and three pet dogs - Charlie, Rusty, and Howie. There are also four cats residing in the two houses on the property.

While Bronwyn may be relatively new to farming, the Fox family's agricultural legacy spans many generations. Bronwyn's father, a doctor, had a deep passion for rural medicine, which led the family to live in various regional areas, including Gingin.

From soil to table

Potatoes are an integral part of the farming mix, and the Fox's dedication to this staple crop is evident in the quality of their produce. Bronwyn describes one of the most rewarding moments as a farmer being the harvest season, where she can often be found on the back of the harvester, singing and sharing stories with the team.

Another cherished tradition is the first taste of freshly dug spuds, usually in April. Dave's family recipe, featuring butter and mint sauce, transforms these early harvest potatoes into a treat that the family eagerly anticipates each year.

Knowledge grows

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"There's so much to love about spuds from so many perspectives," says Bronwyn.

"Potatoes are such a staple in people's diet, and they are so environmentally friendly. For example, they are efficient water users, full of nutrients, filling and versatile."

Bronwyn also enjoys interacting with fellow potato growers, as they are a unique bunch and are super passionate about their produce.

"Having worked in other industries such as mining, you don't find the same enthusiasm for digging up a tonne of ilmenite. It's such a unique thing to grow and produce food to eat for you, your family, the state, and the world. Farmers are so very lucky to do what they do," she said.

The future of potatoes

Bronwyn acknowledges the challenges facing the potato industry in the coming years. The perception that potatoes aren't healthy is a significant concern, and efforts are needed to continue to educate the public on the nutritional benefits of this versatile vegetable.

The industry must also address the issue of attracting younger generations to farming while ensuring profitability and collaboration within the supply chain. Thriving rural communities, fun social activities in regional areas, and the overall economic sustainability of the industry are critical to keeping the sector viable.

Recently appointed as the Chair of the PGA WA Bronwyn has some key goals in mind. First, she aims to respond to the needs of potato growers by actively engaging with them to understand their challenges and offer positive solutions.

"I have regular calls from other farmers, and I love chatting about what's going on in their business and sharing what works and what doesn't," said Bronwyn.

Bronwyn also aims to build on the financial sustainability of the PGA WA, as it plays a vital role in representing the industry to government and other sectors. Lastly, to also highlight the importance of collaboration with other horticulture groups, recognising that many issues affecting various crops have overlapping solutions.

Eating potatoes

When it comes to favourite potato recipes, Bronwyn can't resist a classic roast potato. Seasoned with generous amounts of salt, herbs, and spices, roast spuds are a comforting and flavourful dish that never disappoints.

Among the various potato varieties cultivated in WA, Bronwyn has a soft spot for the relatively new Sifra variety. She also appreciates the versatility of the Maris Piper, a tried-and-true favourite in the world of potatoes.

Bronwyn hopes consumers will gain a deeper appreciation for the incredible effort and knowledge required to produce just one kilogram of potatoes.

"The knowledge that growers have about the plants or animals that they grow is huge – pests and disease, watering, breeding, timing of harvest and more. There's so much more to growing than consumers understand. I'd love to see more people on farms from the city to get the feel for it. It's up to us to tell our story because the media don't understand either," she says.

In summary

To keep the agriculture industry thriving and innovating, Bronwyn believes that it needs storytellers who can share the wisdom and knowledge of older farmers. The industry requires people skilled in social media to bridge the gap between farmers and non-farming communities. Plus, adept business managers who can run efficient and sustainable agricultural operations are crucial for the industry's continued success. Bronwyn also recognises the value of diverse perspectives, including those of women, in driving innovation and progress in agriculture.

Above. Bronwyn Fox, has been appointed as the Chair of the Potato Growers Association of WA. Simon Moltoni, CEO (L) and Morena Perdec, Finance and Admin Manager (R) of PGA WA with Bronwyn. *Images courtesy WA Potatoes.*

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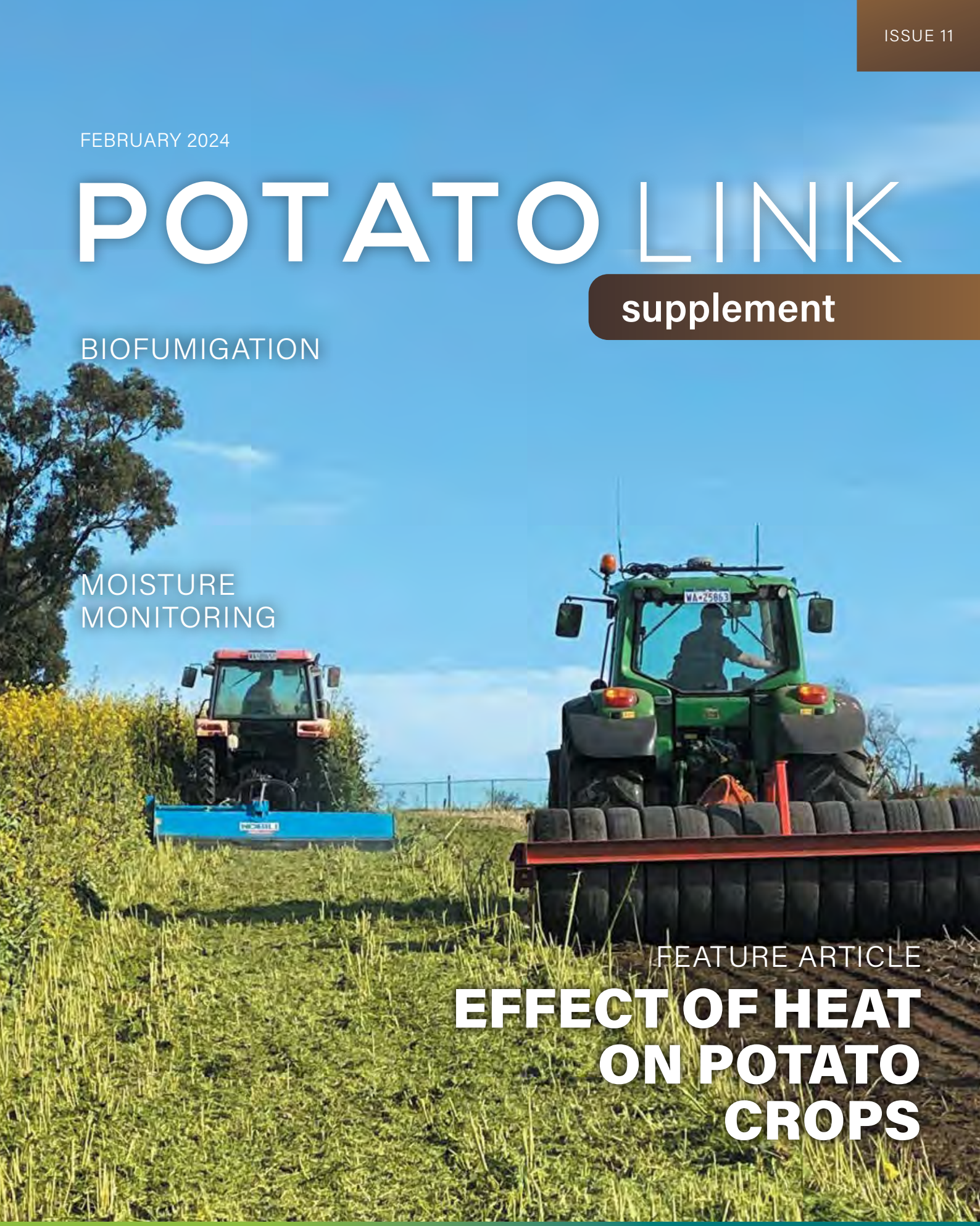
POTATO LINK

supplement

BIOFUMIGATION

MOISTURE MONITORING



FEATURE ARTICLE

EFFECT OF HEAT ON POTATO CROPS

ahr applied horticultural research

Hort Innovation POTATO – FRESH FUND

Hort Innovation POTATO – PROCESSING FUND

POTATO LINK
AUSTRALIAN POTATO INDUSTRY EXTENSION PROJECT

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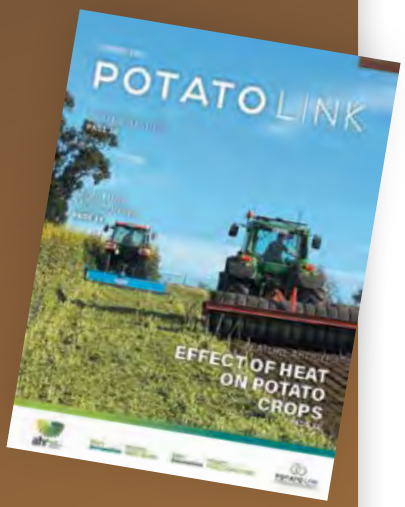

Cover: *Damper Gully Farms, Manjimup WA, PotatoLink archive*

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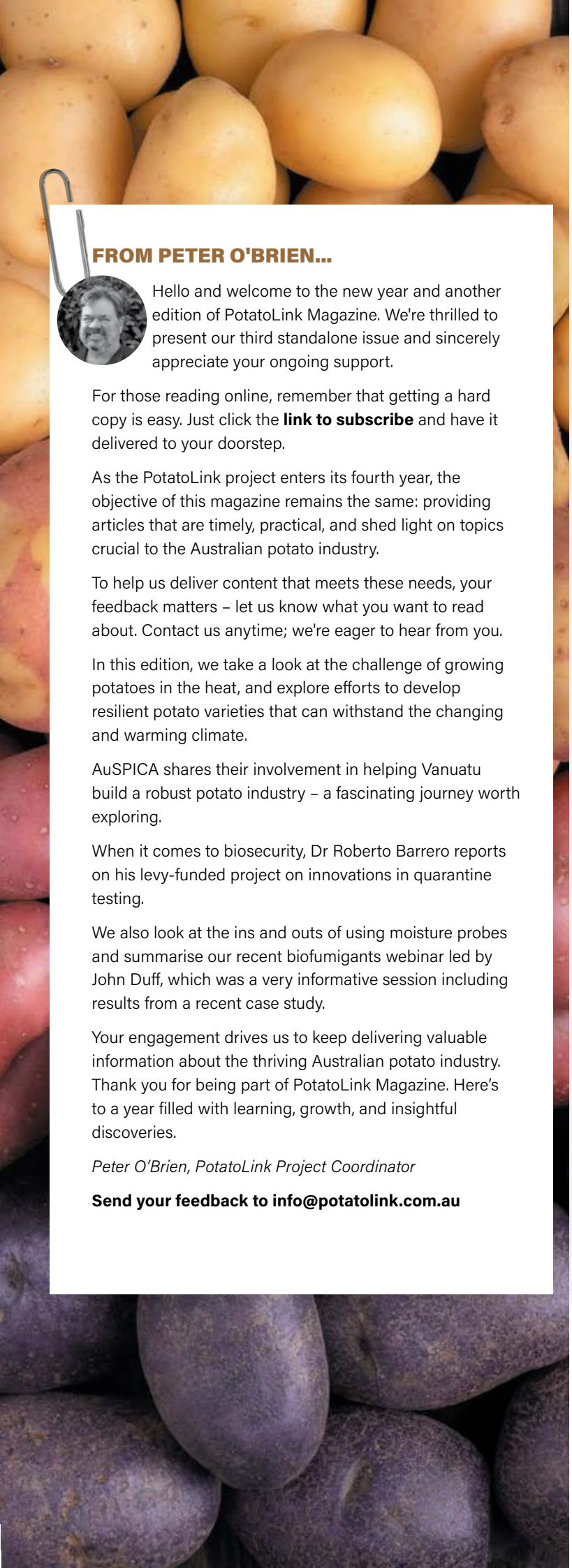

FROM PETER O'BRIEN...

Hello and welcome to the new year and another edition of PotatoLink Magazine. We're thrilled to present our third standalone issue and sincerely appreciate your ongoing support.

For those reading online, remember that getting a hard copy is easy. Just click the **link to subscribe** and have it delivered to your doorstep.

As the PotatoLink project enters its fourth year, the objective of this magazine remains the same: providing articles that are timely, practical, and shed light on topics crucial to the Australian potato industry.

To help us deliver content that meets these needs, your feedback matters – let us know what you want to read about. Contact us anytime; we're eager to hear from you.

In this edition, we take a look at the challenge of growing potatoes in the heat, and explore efforts to develop resilient potato varieties that can withstand the changing and warming climate.

AuSPICA shares their involvement in helping Vanuatu build a robust potato industry – a fascinating journey worth exploring.

When it comes to biosecurity, Dr Roberto Barrero reports on his levy-funded project on innovations in quarantine testing.

We also look at the ins and outs of using moisture probes and summarise our recent biofumigants webinar led by John Duff, which was a very informative session including results from a recent case study.

Your engagement drives us to keep delivering valuable information about the thriving Australian potato industry. Thank you for being part of PotatoLink Magazine. Here's to a year filled with learning, growth, and insightful discoveries.

Peter O'Brien, PotatoLink Project Coordinator

Send your feedback to info@potatolink.com.au

IN THIS SUPPLEMENT

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EFFECT OF HEAT ON POTATO CROPS

What happens when climate change impacts one of the world's most important foods? With a burgeoning global population, food security is one of the most complex problems of our time, and our rapidly warming planet complicates the problem further.

Worldwide, potatoes are the third largest global food crop, cultivated in 158 countries and consumed daily by over a billion people[1]. According to Our World in Data, potatoes produce more food per unit of production area, yet have lower greenhouse gas emissions and use less water per kg, than virtually any other crop.

Potatoes are also low in fat but rich in starch, protein and Vitamin C. As a non-grain food staple, they have an essential role ensuring global food security.

However, potatoes have a key weakness – sensitivity to heat. High temperatures seriously reduce growth and development and can completely stop tuber formation. Heat affects the ability of seed to sprout and the quality and nutritional profile of the tubers formed.

For this reason, Australian exceptionalism aside, most potatoes are cultivated in cooler climes, like Scotland, Ireland, northern America and northern Europe.

However, summer temperature records across the globe are being smashed on a regular basis. As heat is one of the most significant uncontrollable factors affecting potatoes, it is worth examining the impact of climate change and warming on the production, yield and nutritional quality of potatoes.

A COOL CLIMATE PLANT

Potatoes originated in the highlands of the equatorial Andes. Domesticated over 7,000 years ago, they flourished in the cool mountain climate with its constant daylength, strong light intensity and high humidity. Plants reproduced by tubers produced year-round.

One of the keys to cultivating potatoes more widely was adaptation to more variable daylengths. When Andean potatoes were first grown in Europe, they only formed tubers during the last short days of autumn. These were soon followed by freezing temperatures that killed the plants, cutting maturation short and reducing accumulation of nutrients.

Selection of plants that developed tubers under different daylengths has therefore been key to the global success of potatoes. However, as climates warm, potatoes face a new adaptive crisis – becoming more heat tolerant.

Modern European potatoes have a

narrow genetic base. Optimal yield for most commercial potato varieties occurs when average day time temperatures are between 14 to 22˚C. Any hotter and yield falls sharply.

This is largely because the signal to form tubers is highly temperature dependent. Tubers are initiated in response to a protein called SP6A. High temperatures stop production of this protein, so tubers simply don't form, even if the plant is growing well. Current varieties considered 'heat tolerant' likely have either a stronger production of SP6A or are sensitive to low concentrations of this protein.

For example, at 28˚C, yield of Desiree plummets to almost zero and Spunta to ~15%.

This issue is most acute in tropical and sub-tropical zones. In these areas potato production is already constrained by sensitivity to heat. Moreover, cooling through irrigation is not possible in the humid tropics. As a result, climate change is predicted to reduce potato yields by 18 to 32% globally[2].

Heat is not only a problem for local industries growing potatoes for consumption, but for seed growers and exporters. For example, seed maturing at high temperatures is likely to have a reduced period of dormancy. In some varieties heat stress results in strong apical dominance, with only 10-20% of non-apical buds sprouting[3]. For exporters, markets in warmer climates are likely to be impacted as potatoes become more difficult to grow.

Heat stress therefore induces an array of physical, physiological, and biochemical changes that inhibit plant growth and development, ultimately leading to a significant reduction in both yield and quality[4] (Table 1).

Table 1. Summary of heat stress effects on potatoes at different developmental stages. From Singh et al., 2020

Growth stage	Ideal temperature (°C)	Effect of high temperature
Sprouting	16	Increased
Establishment	20 to 25	Early plant growth increased
Shoot growth	Up to 32	Increased vegetative growth
Stolon formation	Up to 25	Reduced at above 25°C
Tuber initiation	15 to 22	Reduced tuber initiation, reduced tuber size
Tuber bulking	14 to 22	Reduced transfer of carbohydrates to tubers, increase secondary tuber formation, increased disorders e.g. russeting, cracking
Harvest	20 to 24	Reduced total yield, size and quality

GROWTH AND DEVELOPMENT

The effects of high temperatures on potato crops depends on variety, development stage, how high and long the heatwave lasts, and whether high temperatures are experienced during the day, night or both.

For example, researchers in South Korea[5] examined the effects of high temperatures at night or during the day, during tuber initiation or tuber bulking (each growth period lasting approximately 3 weeks). Ambient day/night temperatures of approximately 28°C/20°C were increased by approximately 4°C during the day, the night, or around the clock.

Plants appeared unaffected for the first few days, but respiration, photosynthesis and other processes showed significant changes when high temperatures continued for a week or more.

Importantly, the results showed that high temperatures during tuber initiation were the most critical, greatly reducing yield. In contrast, the same conditions

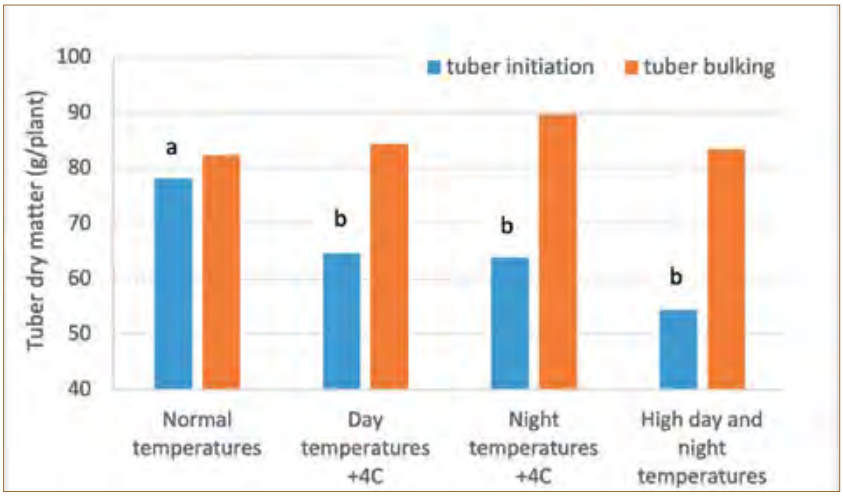

Figure 1. Effect of elevated day temperatures, night temperatures, or both day and night temperatures, occurring during either tuber initiation or tuber bulking, on total yield of potatoes. Derived from Kim and Lee, 2019.

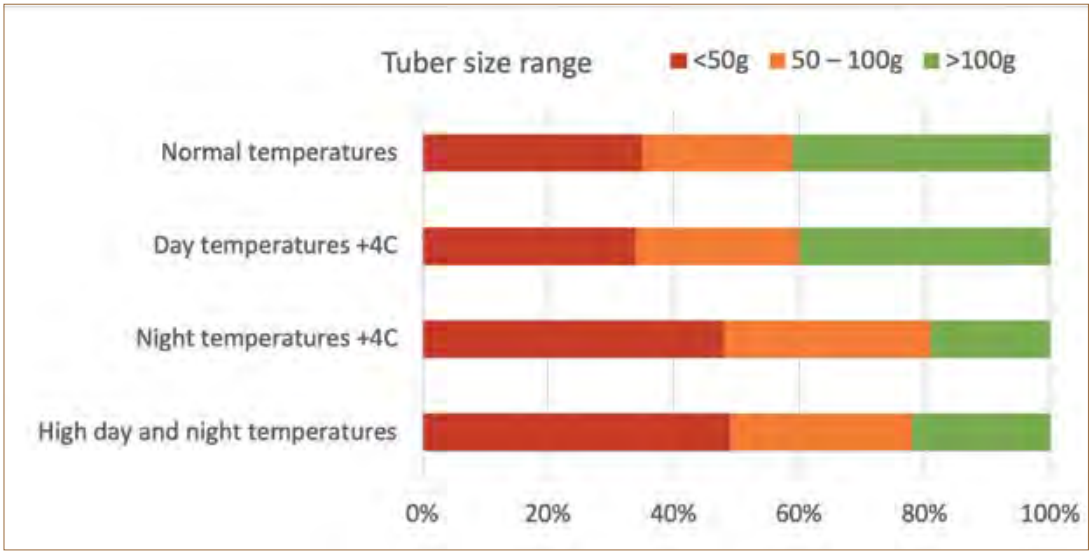

Figure 2. Effect of elevated day temperatures, night temperatures, or both day and night temperatures during tuber initiation on the number of small, medium or large potatoes. Derived from Kim and Lee, 2019.

during tuber bulking had no effect on total yield. (Figure 1).

PHOTOSYNTHESIS

As long as there is adequate soil moisture, day temperatures up to around 30°C actually increase photosynthesis, generating larger leaf canopies.

Unfortunately though, this extra captured carbon does not flow through to the tubers but stays in the foliage[2].

If temperatures go above 30°C photosynthesis also starts to be inhibited. At the same time respiration by the plant increases, effectively sending growth backward[6] .

In the research by Kim and Lee, high night temperatures (up to 24°C) during tuber initiation increased foliage above ground but reduced the number of large size tubers beneath. In this trial, when nights were warm, nearly half of the tubers that developed weighed less than 50g.

As with the effects on yield, high night temperatures had less effect when they occurred during tuber bulking, presumably because the process of filling was already underway.

Considered from the plants point of view, this makes sense. For the potato plant, tubers are a survival mechanism of last resort. Their only purpose is to help the plant survive winter. If the weather is warm and the plant stays healthy, (true) seed is a far more efficient way to guarantee the next generation.

HEAT IN THE ROOT ZONE

While potato plants may be able to cope with a few days of heat stress, longer periods will clearly have greater impact. In part, this is likely to be because of warming of the soil.

Recent (2023) work showed that although exposing the upper parts of the plant to high temperatures reduces tuber size and yield, it is soil temperature which is the most critical[7].

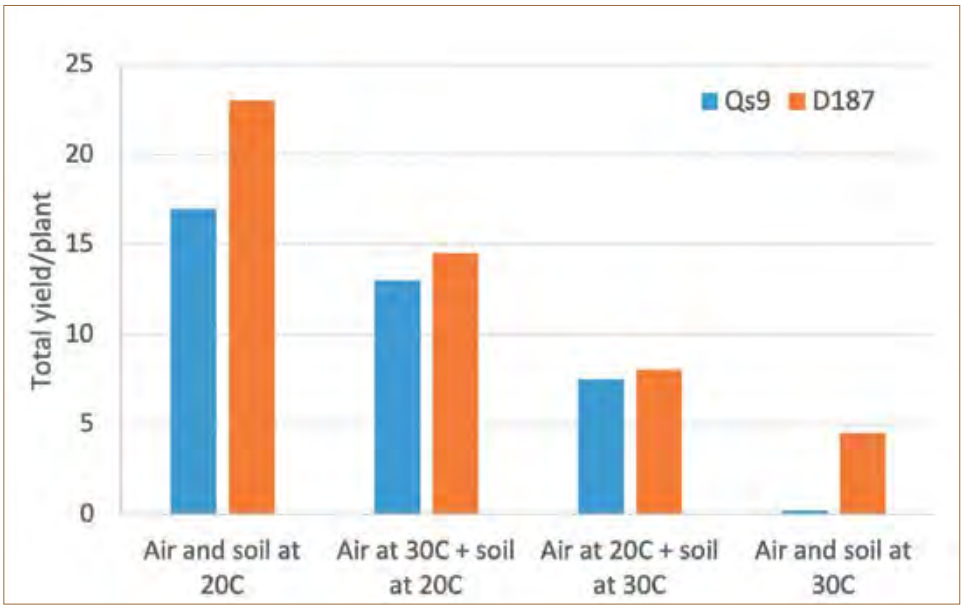

Figure 3. The effects of air and soil temperatures on yield of two different potato varieties (Qs9 and D187). Derived from Kim and Lee, 2019.

Zhou et al investigated plants with air/soil temperature controlled at 20/30°C. Plants still produced reasonable yield if their roots remained at 20°C with air at 30°C. However, when the treatments were reversed, increasing soil temperature to 30°C, the few tubers formed were small and misshapen. If both air and soil were 30°C, yield was minimal or, in the case of one variety, virtually zero (Figure 3).

DISEASES AND DISORDERS

Heat stress induces various physiological disorders in potato tubers, affecting their shape, development, and marketability.

High temperatures close to harvest can induce pre-harvest sprouting, prematurely developing the tuber buds. Skin netting and russeting result from high soil temperatures and affect the appearance and marketability of tubers.

Potatoes exposed to high soil temperatures during development can develop a wide range of physiological disorders, including tuber deformations, translucent end, growth cracks, heat necrosis, internal brown spot, second growth, blackheart, and physiologically old seed tubers[8] .

- Tuber deformations: High temperatures stimulate cell division and reduce the availability of carbohydrates by increasing respiration. Water stress does not in itself cause deformations, but drought exacerbates the deformations caused by high temperatures. The higher the temperatures and the longer the heat wave, the greater the effect.
- Translucent end and jelly end rot: Early-stage high temperatures and water stress may interfere with starch deposition, leading to translucent end / jelly end rot. Pointy bud-end tubers are particularly prone to developing jelly end rot.
- Growth cracks: Rapid shifts from poor to good growing conditions, such as hot, dry weather followed by excessive irrigation or heavy rainfall, can cause growth cracks.
- Heat necrosis: Occurs when slow tuber growth is followed by active growth at high temperatures, resulting in light to dark brown necrotic spots in the vascular tissue. Some varieties are more susceptible than others.
- Internal brown spot: Light brown necrotic spots develop in the tuber flesh during the latter stages of tuber growth due to intense heat or excessive drought. Internal brown spot is associated with an enzymatic disorder and, at times, calcium deficiency.

- Second growth: Temperatures above 30°C prompt increased vegetative growth rather than tuber formation, leading to heat sprouts, chain tubers, or heat runners in susceptible varieties.
- Blackheart: Blackheart occurs when oxygen cannot reach the tuber centre, especially during pre-harvest, transit, or storage. Extended exposure to temperatures above 32°C before harvest is a contributing factor.
- Physiologically old tubers: Heat stress drastically increases physiological age, leading to early sprouting, more stems, and defects in potato formation

NUTRITIONAL QUALITY

Potatoes are a vital source of carbohydrates, vitamins, and minerals. Heat stress can alter the composition of these nutritional elements, affecting the overall nutritive quality of potatoes.

Most studies about heat effects have examined the impact on carbohydrates, which make up about 75% of the potato's dry weight.

Potatoes contain two forms of starch: amylose and amylopectin. Heat stress can not only reduce carbohydrate accumulation by 30% or more, but also affects the balance of different starches. For example, exposure to 35°C reduced the content of amylose in tubers by 36%, but had less impact on amylopectin[1]. Amylose is more resistant to digestion than amylopectin, so heat stressed potatoes could be expected to have higher GI (glycaemic index) values than those grown at normal temperatures.

As carbohydrate metabolism shifts away from starch synthesis, it is replaced by accumulation of sugars, especially at the tuber ends. The result can be undesirable sweetening and, importantly, darkening when fried, a major issue for processed product.

Other effects of heat on nutritional quality are mixed. Potatoes have been bred to have low levels of glykoalkaloids (GA), not exceeding 20mg/100g fresh weight. These are protective compounds produced by the plant, so increase in response to stresses such as drought, insect attack and light exposure.

Research from the 1980s reported elevated GAs in response to high temperatures. However, more recently it was found that soil temperatures of up to 35°C for a week before harvest did not increase GA. This may reflect the extreme low GA values in modern varieties such as Desiree .

In contrast, the anthocyanins that give some varieties their red skin and/or yellow flesh are often reduced by heat stress. Even if warm growing conditions are not severe enough to affect anthocyanin production, red varieties such as Desiree may appear paler than normal. This is due to development of a thicker, rougher skin, which does not allow the anthocyanins to shine through[7] (Figure 4).

Figure 4. Desiree potatoes grown under ambient conditions (left) or with exposure to 33°C soil temperature for one week before harvest (right). From Fogelman et al, 2019.

Growth cracks in tubers (left N. Diplock, right K. Bouchek)

Left to right: Black heart (A. Robinson, NDSU), hollow heart (AHDB), brown centre

Left to right: Secondary growth (AHR), deformed bottle neck (A. Robinson, NDSU), deformed potatoes (A. Robinson, NDSU)

MANAGING HEAT STRESS

Irrigation works as a high temperature mitigation strategy partly because of the power of evaporative cooling, but also because it is the temperature of the roots, not the leaves, which is most important.

As water turns from liquid into gas, it absorbs energy from the environment around it. The more water evaporates, the more heat is pulled from the surface of the leaf or soil.

Of course, if humidity is already high, evaporative cooling can do little to reduce temperature. However, the dry conditions in South Australia make this method highly effective. For example, on a day when it is 35°C and 40% RH, it is theoretically possible to cool plants and soil to 20°C simply through evaporation. Even at 40°C and 45%RH, temperatures can still be kept below the critical limit of 27°C by adding water.

WHERE TO NEXT?

As global climate change intensifies, the issue of heat susceptibility in potato cultivation becomes even more critical. Currently, only a limited number of heat-tolerant potato cultivars are recognised, primarily bred for very specific conditions. This limitation has intensified conventional breeding efforts to find new, tolerant genotypes.

In response to the scarcity of heat-tolerant traits within the cultivated potato gene pool, researchers are exploring the genetics of wild potatoes native to the Americas. These plants are potential sources of valuable resistance genes.

A number of Solanum varieties are known to be heat tolerant, including *S. kurtzianum, S. chacoense, S. stoloniferum and S. demissum* (Figure 5). Genes from *S. demissum* have already been incorporated into modern varieties, providing blight resistance.

Ongoing research in genomics, proteomics, and metabolomics on potato heat response holds promise for enhancing conventional breeding strategies. These molecular approaches provide insights into the genetic and biochemical mechanisms underlying heat tolerance, helping to identify and select desirable traits. *See PotatoLink Issue 10 for more on potato breeding using novel varieties.*

Bioengineering efforts also represent an alternative avenue for developing heat stress-tolerant potatoes. Genetic modification and genome editing technologies (such as CRISPR) may offer targeted solutions by introducing or modifying specific genes associated with heat tolerance.

The combined efforts of conventional breeding, exploration of wild genomes, and advancements in molecular research offer hope for developing heat-tolerant potato varieties.

Potatoes adapted to a changing environment before.

Now, they need to do it again.

Figure 5. Genes from heat tolerant Solanum varieties such as *S. demissum* (top left, image by M. Coleman), and *S. chacoense* (below) and tubers of improved variety (bottom left, images by Cultivariable.com) could help develop new commercial varieties tolerant of heat stress

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EXPLORE THE TOPIC FURTHER

Webinar: Setting up for summer - preparation for potato growers

Internal discolouration and secondary growth (E. Banks)

GROWING POTATOES IN HIGH TEMPERATURES (>32ºC) IN THE SA MALLEE

Conditions in the Soth Australian Mallee can get hot. Around Loxton (a town on the Murray River) temperatures can reach 50°C during summer, with dry soil surface temperatures getting as high as 70°C. It is not unusual to have a five day stretch of 45°C days with warm nights. These warm temperatures can cook roots in the soil, causing significant wilt, and reflectance from the sands can burn the undersides of leaves. Yet, despite these harsh conditions, the Mallee region is a major producer of potatoes.

The key to this is irrigation infrastructure. Applying water to crops and soils helps to cool soils down, create humidity, and reduce reflectance (wet soil, especially sand, reflects less than dry sand).

Applying the right amount of water at the right time can cool soils, raise humidity, and provide the environmental conditions that promote healthy transpiration in plants. The movement of water through the vascular tissue (xylem) removes heat from the plant in a process called evaporative cooling.

However, it is not as simple as flooding a paddock during high heat events and waiting until it blows over. Overwatering can be just as bad as underwatering. Too much water can cause plant stress. If water stays in the soil profile long enough, it can warm up and cause damage to roots. Warm, watery soil is also the perfect environment for fungal and bacterial infections.

Overwatering can also impact the nutrition balance of a plant. Key nutrients such as calcium and magnesium need to balance during these heat events. Just as a person might suffer from cramps due to a lack of magnesium, or nausea from diluting salts in the body when drinking too much water, over watering can dilute nutrients in plants, weakening its defence mechanisms. The use of soil moisture probes is critical to understand the water levels in soil profiles and when irrigation is needed and, importantly, when it is not.

Another major factor to manage during high heat events is plant stress. Heat, wilt, waterlogging, and disease can all impact how a plant will respond. Management prior to and during the high heat events is critical to ensuring plants get through these times. Stressed plants are more susceptible to the negative impacts of high heat events. Forecasting tools can help growers to prepare for the high heat events.

By managing plant stress and nutrition prior to, and during, the high heat event, and applying the right amount of water to encourage transpiration and increase the relative humidity, crops can be successfully managed through these events.

OPTIMISING BIOSECURITY TESTING USING NEXT GENERATION SEQUENCING

In contemporary agriculture, rapid and secure access to new plant genetic stocks is critical for the success and sustainability of primary industries. The ability to quickly adapt to new global market opportunities and access innovative plant varieties is key to remaining competitive.

KEY POINTS

- Rapid access to new and safe plant genetics is vital to keep Australia's local industry competitive.
- Next Generation Sequencing (NGS) adoption promises faster access to new genetic material, cost savings, increased imports, and agile responses to market opportunities in agriculture.
- Current plant import processes are costly and inflexible due to extended quarantine periods.
- NGS offers a faster, versatile, and reliable method for pathogen detection.
- Collaborative research supports NGS as a practical solution for improving quarantine testing.
- Traditional diagnostics have limitations.

Currently, when imported plant material arrives in Australia, it spends up to three years in Post Entry Quarantine (PEQ) facilities, primarily for pathogen testing. This delay not only hampers the industry's flexibility but also adds significant costs.

Traditional pathogen testing methods are often time-consuming, resource-intensive, and can yield ambiguous results. This is where Next Generation Sequencing (NGS) steps in as a game-changer. NGS provides a scalable, robust, accurate, and rapid diagnostic platform, promising to expedite 'plant health' screening and reduce quarantine time.

A collaborative Horticulture Innovation Australia project spanning multiple crops has shown that NGS is a feasible alternative that will reduce time and improve accuracy of quarantine testing.

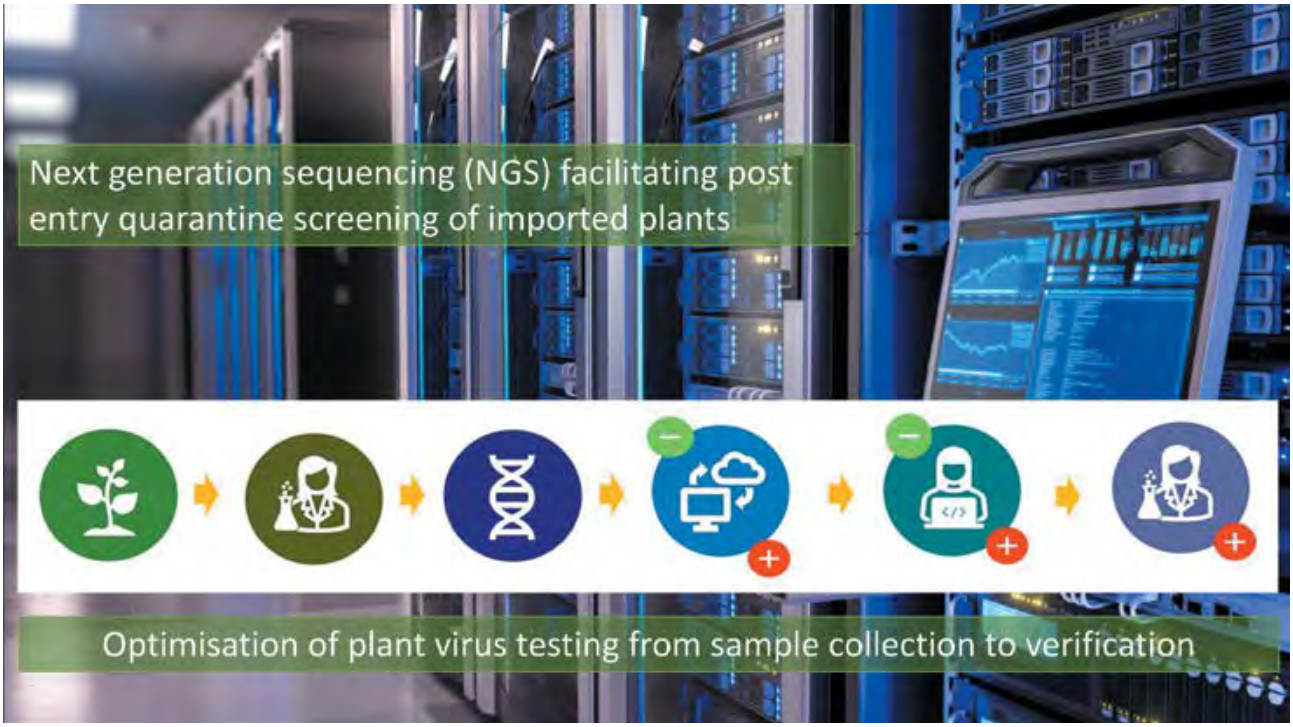
The project *Improving Plant industry access to new genetics through faster and more accurate diagnostics using next-generation sequencing* (MT18005) investigated the application of advance gene technology – known as Next Generation Sequencing (or NGS) to screen imported horticultural plant materials in PEQ.

BIOSECURITY RELEVANCE

Biosecurity measures are primarily designed to prevent the introduction of exotic plant pests. Traditional diagnostic methods, such as tissue (serological) or molecular analyses, rely on prior knowledge of the pathogen's genetic blueprint. However, these methods are often specific to certain pathogens, limiting their versatility.

In contrast, non-specific assays like electron microscopy, woody indexing, or visual inspection do not require prior knowledge but can lead to ambiguous detections. Typically, they provide limited diagnostic certainty, mainly categorising organisms at the broad level, which is not reliable when looking for diseases.

Additionally, most traditional tests cannot detect multiple pests in a single test, causing delays in the quarantine process and hindering the industry's ability to respond promptly to emerging market opportunities.



NGS AND PROJECT OUTCOMES

Plant viruses and viroids are tiny organisms that harm plants and detecting them when a plant is showing no symptoms can be challenging. NGS technology has changed the way we find and identify these hidden pest and diseases. When NGS is combined with computer analysis (bioinformatics), detection of known viruses is quick and accurate. Better still, new threats can be detected.

Large scale side-by-side trials of PEQ and NGS protocols demonstrated the benefits of NGS to detect virus-free plants and plants infected with pesst of biosecurity concern. NGS is informing and guiding the effective use of resources at PEQ to facilitate and optimise quarantine testing and decision making.

Technical advances in NGS diagnostics for plant viruses have led to the adoption of the technology for routine testing in prunus, rubus, strawberries, and ornamental grasses.

The team continues to use the technology for a broad range of plant species including potatoes providing industries the option to opt-in to use NGS along with other existing PEQ testing protocols.

The project team has also made significant progress using NGS to detect and precisely identify bacteria in several crop species, trialling two different approaches to using the technology.

The first approach involved collecting all the genetic information from a sample of the pest – essentially gathering a complete picture of its genetic makeup. The second approach focused on specific regions of genes that are associated with known harmful bacteria.

Their research yielded promising results. When they used the first method (whole genome sequencing), they were able to produce high-quality genetic information. Importantly, this method revealed results that were clouded by interference from genetic material of other organisms.

The targeted capture approach was successful in detecting bacteria that are challenging to cultivate in a laboratory.

Based on these findings, they have developed a draft policy paper to promote the use of NGS technology to test bacterial pests in PEQ facilities. However, it will likely take a few years for NGS to become routine in testing for bacteria. Currently, NGS is only used for detecting plant viruses and viroids.

The project, carried out in close partnership with the Department of Agriculture, Fisheries, and Forestry, has successfully facilitated the policy acceptance and operationalisation of NGS for routine quarantine testing of plant viruses at PEQ facilities. This achievement is expected to enhance Australia's biosecurity system, safeguarding domestic plant industries from exotic pests.

Moreover, it will enable plant industries to gain accelerated access to new plant genetics, ultimately providing them with improved opportunities in high-value markets. This transformative capability promises to revolutionise biosecurity, ensuring the protection of domestic plant industries while opening access to global opportunities.

GOOD NEWS FOR GROWERS

NGS has already been successfully employed for the detection and identification of numerous plant viral and bacterial diseases. This technology even leverages the innate plant immune response to detect and reliably assemble viral genomes, further enhancing its efficacy in PEQ facilities.

The implementation of NGS in plant quarantine and biosecurity procedures brings a host of benefits to growers and the agriculture industry including:

1. **Faster access to new genetics:** with NGS, the industry gains rapid access to new plant genetic stocks, allowing for quicker incorporation of innovative plant varieties.
2. **Lower costs for quarantine testing:** NGS streamlines the testing process, reducing resource and time requirements, thus lowering overall quarantine costs.
3. **Option to import a larger volume of plants:** the efficiency of NGS enables the importation of a larger volume of plants, expanding the possibilities for growers and agribusinesses.
4. **Ability to respond to emerging market opportunities:** NGS empowers the industry to quickly adapt to emerging market opportunities, ensuring a competitive edge in the global market.

NGS technology relies on the use of super computers to process the large amount of genetic data collected from imported plant species.

All plant industries importing new genetic material through PEQ can opt-in to use the NGS technology along with other existing quarantine testing procedures.

A further advantage of the NGS is its ability to detect pests that may be endemic, enabling industries to make an informed decision on building a business portfolio around new genetic imported material.

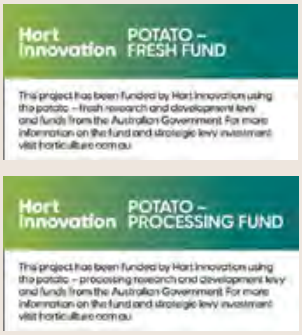
WHAT'S NEXT

As the project progresses, further R&D is underway to improve the use of the NGS technology for the diagnosis of plant pests, particularly for challenging commodities such as imported seeds.

The team is now developing molecular techniques to facilitate the generation of virus-free plants when high value plants are imported to Australia, but these may be infected with one or more viruses of biosecurity concern.

FURTHER READING

The final report is available to download from the Hort Innovation website.



Funding statement: *Improving plant industry access to new genetics through faster and more accurate diagnostics using next generation sequencing (MT18005)* is a strategic levy investment under the Hort Innovation Citrus, Nursery, Potato - Fresh, Potato - Processing, Raspberry and Blackberry and Table Grape research and development levies and contributions from the Australian Government.

Project Number: MT18005

MOISTURE MONITORING

A demonstration by PotatoLink

Beyond providing soil moisture data at a given time and soil depth, can soil moisture probes help in making future irrigation decisions? The potential of moisture probes to serve a dual role was the subject of a PotatoLink demonstration trial.

Moisture probes act as a kind of yardstick, helping farmers align their field observations with real moisture data. They can also help optimise irrigation practices.

Using moisture data, farmers can time irrigation to match the actual water needs of their crops. This precise approach has the potential to boost crop yields significantly – essentially aligning human judgment with data-driven precision to get the best results from the field.

ARE MOISTURE PROBES IMPORTANT?

The use of moisture probes plays a crucial role in smart agriculture for several important reasons. While not used in every paddock due to their cost, even a couple of probes in key locations can serve as valuable tools for improving irrigation practices.

One primary function of these probes is to help farmers align their visual observations in the field with what's happening beneath the ground. This calibration ensures more accurate decision-making regarding irrigation – nobody wants to under or over water.

Overwatering can lead to issues such as nitrogen leaching, while underwatering during critical crop phases, like tuber bulking, can deplete subsoil water reserves, making proper irrigation management essential.

Probes are also useful after rainfall events, providing growers with information on the impact of rainfall on soil moisture, potential nutrition movement and when to resume irrigation.

THE DEMONSTRATION

At the demonstration site, two Wildeye moisture units were installed, each unit with two probes at different depths: at 20cm, where most of the plant roots are located, and another at 40cm to monitor water movement through the soil profile.

The locations represented two different soil types, with lighter sandier soils in northeast (NE) and heavier soils in the southwest (SW).

The data output from these probes shows fluctuations in soil moisture levels, as shown in Figure 1.

The green line, representing the 40cm depth, provides insights into subsoil conditions, while the blue line at 20cm oscillates based on irrigation, rainfall event and crop water usage (clearly showing more usage during the day and low usage at night).

The examples in this trial show the distinct differences in moisture retention in different soil types and therefore varying success of irrigation. As shown in Figure 1, the lighter soils in the NE of the paddock suffered from underwatering compared to the heavier soils in the SW, particularly during the tuber bulking stage.

KEY TERMS

Understanding parameters like the 'full point' (maximum soil water capacity) and 're-fill point' (the level at which irrigation is triggered) is critical and can be adjusted during different crop growth stages.

Full point: Generally, if you've had heavy rainfall, the full point is once the field has been able to drain for a day. It is the most water the soil can hold.

Re-fill point: There is a bit of an art and science to set this at the right level. This is the soil moisture level that you are prepared to let the crop dry down to before irrigating. It is a dynamic number will change as the roots grow into new soil. For example, it is common to change the refill point during sensitive parts of the crop growth curve, especially tuber bulking

In the NE, the moisture levels at 40cm depth fluctuate a lot as the water moves through the profile. When the soil is waterlogged (i.e. persistently in the blue shaded zone), it is difficult for the roots to grow. Additionally, overwatering leads to nitrogen leaching. Following the blue line (20cm depth), the NE section was overwatered during the early vegetative and maturation stages and underwatered during the tuber bulking stage.

PAIRING AND INTERPRETING THE DATA

Pairing data from moisture probes with information from tools like IrriSAT is a smart strategy. It involves combining soil moisture data with real-time insights into what the crop is doing. IrriSAT, for instance, generates a growth curve for the crop, indicating its various stages of development. This curve is valuable because it helps growers understand when the crop's water demand is likely to increase.

For example, when a crop transitions from having limited leaf area to achieving full row closure, its water requirements rise significantly. IrriSAT can track this leaf area growth and provide a growth curve to guide irrigation decisions.

Data collected from the probes can be used to examine how moisture levels change over time, then correlate these changes with rainfall and irrigation.

If the crop is overwatered, topsoil moisturewill increase rapidly immediately following an irrigation event. The key question is whether this excess moisture swiftly reaches the probe below. Sometimes, water can move rapidly through the topsoil and drain below 40cm, effectively stripping away the excess moisture from the upper layers.

It is therefore important to focus on how the subsoil behaves over time to make informed irrigation decisions.

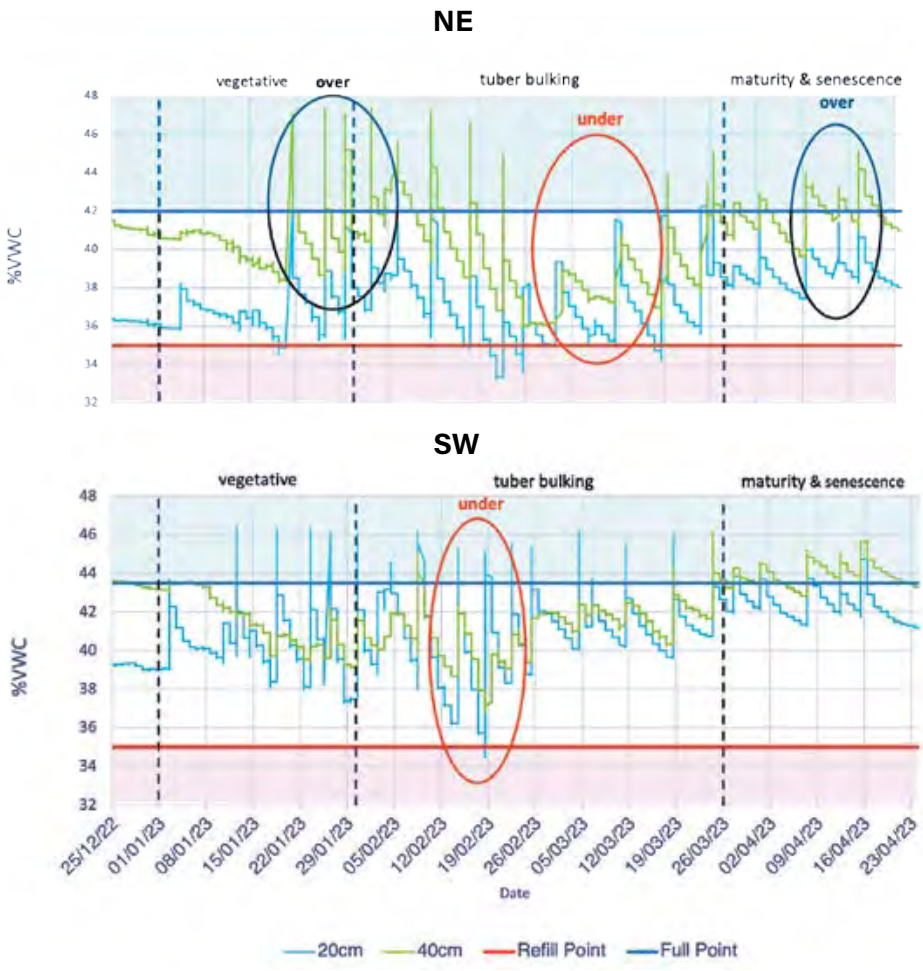


Figure 1. Results showing the fluctuations in moisture levels across the four main stages of development. Shaded red = refill point; shaded blue = full point; green line = moisture levels at 40cm; blue line = moisture levels at 20cm

At the demonstration site, the two distinct areas, SW and NE, show how using the same irrigation management technique for the whole paddock doesn't align with requirements of the crop grown under different soil textures.

The NE section with the lighter soil texture and lower water-holding capacity, was initially over-irrigated. Then later, during tuber bulking, it experienced a period of under-irrigation.

In contrast, the SW area was irrigated well. This difference highlights the challenge of managing irrigation across various soil textures and the importance of using moisture probes to save time and optimise decisions.

When comparing the SW and NE areas, it becomes clear that irrigation was better aligned with the SW area soil type. In contrast, the NE was challenged by both over and under-irrigation.

This underscores the difficulty of managing irrigation when dealing with diverse soil conditions.

EVAPOTRANSPIRATION

Evapotranspiration, or the loss of water through plant transpiration and soil evaporation, is a key factor to consider.

During the early stages of crop growth, when there is limited leaf area, most water loss is due to soil surface evaporation. As the crop develops and leaf area increases, the plant begins to draw more water from the soil, leading to higher water demands.

Evapotranspiration rates can jump significantly, from 2mm per day in the early growth stages to 8-10mm per day when the crop reaches peak leaf area and row closure. Matching this demand with irrigation can be challenging, and if the irrigation system cannot keep up, reliance on soil moisture reserves becomes essential, potentially leading to under-irrigation.

For growers, moisture probes can be valuable learning tools. While traditional methods like spade and visual inspection are useful, moisture probes can help validate what growers observe visually and calibrate their decision-making processes. They also offer growers with a prompt to check irrigation when they are time poor and struggling to get to the field to check soil moisture.

Effective calibration and integration of moisture probe data can lead to more precise and efficient irrigation practices, ultimately enhancing crop yields and water use.

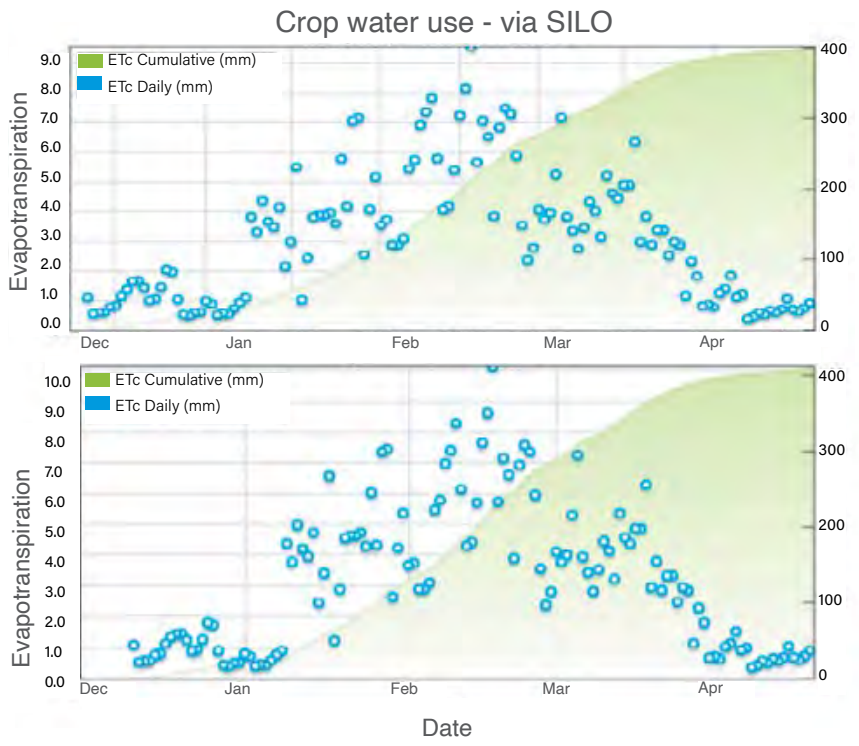


Figure 2. Evapotranspiration rates for the NE (top) and SW (bottom) sites

WILDEYE PROBES

The Wildeye probes used in this demonstration are equipped with a communications box, which is a key feature. Standard moisture sensors are found in various equipment, but the addition of the communications box allows data to be transmitted to phones or computers.

Wildeye probes measure soil moisture at 30-minute intervals, uploading the data to the web daily to reduce battery consumption. The ability to initiate an upload in the paddock is also quite useful, as are the daily notifications provided by the system.

More information about different probe types can be found in the factsheet here (https://bitly.ws/38nBb)

FURTHER RESOURCES:

PotatoLink webinar *Getting your irrigation ready for the summer*

PotatoLink factsheet *Matching irrigation to crop growth*

Soil Wealth ICP webinar *Tools to manage irrigation in potatoes*

Soil Wealth ICP case studies in potatoes
Part 1: Practical use of Irrisat and soil moisture sensors

Soil Wealth ICP case studies in potatoes
Part 2: Practical use of satellite information

SEEDING SUCCESS IN VANUATU

DEVELOPING SEED PRODUCTION IN VANUATU TO ADDRESS FOOD SECURITY

Mia Novakovic and Dr Nigel Crump
Corresponding author Mia.novakovic@toolangielite.org.au

AuSPICA

AuSPICA is collaborating with an Australian charity to bring sustainable potato seed production to Vanuatu and address some of the key UN sustainability goals in the region.

Vanuatu Prevention of Blindness Project Inc (VPBPI) is a compassionate Australian charity, led by Don and Meg MacRaild who are based near Sale, Victoria. The project was initially dedicated to providing access to prescription glasses for the people of Vanuatu. Evolving from its origins, VPBPI has expanded its mission to encompass annual pop-up medical clinics (with doctors flying in from Australia), the shipping of donated goods, and advocacy efforts for the Ni-Vanuatuans residing in Australia.

The journey of VPBPI into extensive medical and optometry initiatives revealed a pressing need for enhanced nutrition and food security among the population. Recognising the potential of potatoes as an ideal staple crop, VPBPI aimed to diminish dependence on imported white rice, simultaneously fostering improved overall health, and contributing to economic growth in the region.

In recent years, the Australian Seed Potato Industry Certification Authority (AuSPICA) has joined forces with VPBPI to collaboratively develop a sustainable and viable potato production system in Vanuatu. In October 2023, both teams visited Vanuatu to conduct workshops and training programs to advance potato production, marking another milestone in this collaborative effort.

This joint initiative aligns with the United Nations' 17 Sustainability Goals, symbolising a shared commitment to making meaningful strides towards a more sustainable and secure future for all. AuSPICA is dedicated to playing a crucial role in leveraging Australia's expertise to support the development of nations in our region, with a particular focus on addressing food security and alleviating poverty through impactful collaborations.

The significance of forging partnerships and collaborations to combat poverty and food insecurity, gained formal recognition in the Declaration of Dublin: Fostering Potato Partnerships for Food Security, published by the World Potato Congress Inc. Proudly, AuSPICA actively engages in fostering collaborations and partnerships within the region, contributing expertise and know-how to support developing nations like Vanuatu.

POTATO COLLABORATION: ADVANCING SUSTAINABILITY AND THE UN'S 17 GOALS

The strategic partnership between VPBPI and AuSPICA on potato initiatives signifies a concerted effort to contribute to the United Nations' 17 Sustainable Development Goals (SDGs). This collaborative endeavour serves as a multifaceted approach, addressing several key aspects of sustainable development, including:

- No poverty
- Zero hunger
- Good health and well-being
- Gender equality
- Decent work and economic growth
- Responsible production and consumption

Photo credit (including top banner): Vanuatu Prevention of Blindness Project

POTATOES PROVIDE NUTRITION AND A RELIABLE FOOD SOURCE

The VPBPI medical teams have identified iron deficiency, birth defects and a high rate of diabetes as concerning health issues.

Although fresh produce is accessible during periods of favourable weather, many key nutrients are lacking from the Vanuatuan diet. This is worsened during periods of cyclone damage and recovery. Potatoes in the diet could be a key factor in reducing some illnesses, as they are an easily accessible and low GI source of key vitamins and minerals.

Many of the nutrients in potatoes are readily absorbed by the body – most notably iron and zinc. Potatoes have a high bioavailability of iron and zinc when compared to other plant-based foods. This is due to high rates of vitamin C (which aids iron absorption) and low rates of phytates (which inhibit absorption of iron and zinc).

The International Potato Centre (CIP) based in Peru is leading a program which aims to selectively breed new potato varieties with a higher content of iron and zinc. AuSPICA is developing a partnership with CIP to access these biofortified potato varieties for future trial and evaluation in Vanuatu and other countries with the Oceania region. The use of such potatoes varieties will advance the dietary nutrition and, in doing so, will address concerns of birth defects and anaemia resulting from poor nutrition.

Mia Novakovic is leading this collaboration with CIP and has identified that there is a major benefit to establishing a genetic resource bank in Australia that could provide high plant health material to the Oceania region. There is potential to achieve major social and economic benefits in the region through the availability of high yielding and suitable potato varieties including those that have been biofortified. AuSPICA is currently exploring linkages with other countries within the Oceania region that may be interested in enhancing local potato production with the production of good quality seed potatoes.

POTATOES PROVIDE FOOD SECURITY

Currently in Vanuatu, there is interest in growing potatoes as a potential staple crop. However, up until now the local farmers have been unable to do so due to the lack of a reliable source of high-quality, affordable seed of suitable varieties for the local conditions.

Potatoes are mainly grown in Vanuatu for the fresh market, with many farmers buying new seed each year. There have been previous attempts to save part of each crop as seed, however, immediate food shortages during cyclone recovery have forced this method to be abandoned. Certified seed potatoes have been imported into Vanuatu on several occasions, but this is expensive and there have been problems associated with shipping conditions. In one case a consignment of 10 tonnes of seed was inadvertently frozen and made non-viable.

It was proposed that the importation of G0 seed was more affordable and carried less of a biosecurity risk. By importing seed at G0, and then multiplying in-field, the initial import cost is lower than certified seed and the potato supply chain within Vanuatu is extended, creating more employment and prosperity. For the past few years, AuSPICA, through the business Toolangi Elite, has provided minitubers of various varieties to trial in Vanuatu. This has been successful and shown that varieties such as Sebago, White Star, and Toolangi Delight can be grown in Vanuatu.

Generally, one minituber planted can produce four tonnes of potatoes after only five crops. In Vanuatu, it is possible to have at least two potato crops per year, so within a couple of years there is the ability to produce a significant food supply using potatoes. The recently formed Tanna Potato Growers Association is well on the way to realising the potential for potato production in Vanuatu. They have planted G1 seed grown from last year's minitubers (to be harvested G2) and planted G0 minitubers, to be harvested G1.

The farmers on Tanna are leading the development of a local seed

Photo credit: Vanuatu Prevention of Blindness Project

production supply for Vanuatu. During the recent trip, AuSPICA worked with the Tanna Potato Growers Association to develop a short guide to promote the production of high-quality seed potatoes. The guide was translated into Bislama - a widely used official language of Vanuatu. The guide provides documentation for the development of an informal seed scheme, the primary goal being to ensure a consistent supply of seed potatoes to meet the demands of the market and, in addition, ensure that pest and disease issues are addressed and effectively managed.

POTATOES PROVIDE ECONOMIC GROWTH

A seed potato industry in Vanuatu has the potential to provide a significant economic opportunity for local farmers and communities.

Potatoes can be grown on many of the 83 Vanuatuan islands. While not all are suitable for potato production, many regions do have the right conditions. Potatoes can be grown to supply food to local communities, to markets including local wholesale markets, or to support commercial tourism operations including hotels, etc. In discussion with grower groups, the AuSPICA team were consistently reminded that potato production could be a reliable cash crop for local farmers.

The island of Tanna was identified as a potential seed potato growing region. Rich, volcanic soil and year-round warm weather give the island an advantage in terms of productivity, allowing for two growing seasons per year. Potatoes are considered by locals to be less labour intensive than other root crops, such as manioc, which can be heavy and difficult to harvest.

DELIVERING EDUCATION AND TRAINING TO ENHANCE LOCAL POTATO PRODUCTION

During the visit to Vanuatu, AuSPICA's Mia Novakovic and Dr Nigel Crump provided educational forums on seed potatoes, explaining the following concepts:

- Nutritional value of potatoes as a food source
- Background information on tissue culture and the production of G0 minitubers
- The production of seed generations to maintain high seed quality
- The importance of record keeping in producing seed potatoes
- Costs and profits of seed potatoes
- Ways to minimise the risk of potato diseases
- Seed potato storage conditions

The forums were complemented with practical advice and information from Mr Allan Condron, an experienced potato and vegetable producer from Stratford Victoria. Allan Condron provided technical advice on land management, machinery, and general farming practices.

Attending each of the forums were members of the recently formed Tanna seed growers' association and fresh market growers, as well as members of the wider community who were interested in learning about seed potatoes.

In addition to the educational forums, a practical training day was held, featuring a demonstration of minituber planting – focusing on correct depth in relation to tuber size. Community members, including children, were invited to join in and have a go at planting three varieties of potato minitubers, supplied by Toolangi Elite, Sebago, White star, and Toolangi Delight.

KEEPING THE MOMENTUM

Long term success is dependent on continued dialogue and support to build capacity and capability.

Overcoming connectivity challenges:

Maintaining contact is difficult as internet access is limited on Tanna, which proves to be a challenge in maintaining contact through more formal means such as email. However as many people still use Facebook when they can connect, AuSPICA has managed to offer specialised guidance efficiently and successfully to the growers in Tanna.

High-level collaborations:

During the recent visit to Vanuatu, a fortuitous meeting with the Finance Minister unfolded, providing an opportunity to delve into discussions about the future of potato production and the critical importance of food security. Key topics included the potential development of tissue culture in Vanuatu and the imperative for heightened collaboration, particularly with government institutions. The high-level engagement reinforces the commitment to weaving potato production into the fabric of Vanuatu's broader agricultural strategy.

"It was exciting to see firsthand the passion and interest of farmers to grow potatoes in Vanuatu. There is a significant need for Vanuatu to enhance food security and address human health issues caused through diet. It is wonderful to witness the success the Tanna growers are having in producing quality potato seed that will be the foundation for widespread potato production in Vanuatu."

- Mia Novakovic

CONTROLLING SOILBORNE DISEASES AND PESTS WITH BIOFUMIGANTS

The soil ecosystem directly impacts crop yield and quality. In recent years, there has been growing interest in sustainable farming practices that improve soil's biological, chemical and physical characteristics. Biofumigation is one of these sustainable practices.

UNDERSTANDING BIOFUMIGANTS

The emerging tool of biofumigation can help reduce reliance on chemical fumigants. Biofumigation involves the cultivation of specialised cover crops. Brassica biofumigant crops release naturally occurring sulphur compounds, especially as they break down. These are harmful to various soilborne pathogens.

Some of these pathogens can persist in soil for extended periods, even when a suitable host is absent. Biofumigation therefore offers a natural method for managing soilborne pathogens as well as some pests and weeds

The problem with soilborne diseases

Dormant stages of some soilborne pathogens can remain inactive in the soil for many years. It is only when conditions become favourable that they multiply and cause symptoms in plants. For example, the onion disease white rot (*Sclerotium cepivorum* pathogen), can endure in the soil for over 20 years, while the potato disease Verticillium wilt (*Verticillium dahliae*) can survive in the soil for up to seven years.

The primary challenge in disease management is to reduce pathogen loads in the soil while preserving or enhancing soil health. Good soil health is the first step in bolstering crop resilience. An integrated approach that incorporates biofumigant cover crops can provide an effective way to manage soilborne diseases.

Which species are useful as biofumigants?

Brassica species, such as mustard, radish, and rocket, have demonstrated their capability to suppress soilborne diseases like basal rot (*Sclerotium rolfsii*), onion white rot (*Sclerotium cepivorum*), charcoal rot (*Macrophomina phaseolina*), and white mould (*Sclerotinia sclerotiorum*).

Common varieties of biofumigants available in Australia include:

- *Brassica juncea* (Indian mustards)
- *Brassica carintata* (Ethiopian mustards)
- *Brassica napus*
- White (*Sinapis alba*) and black mustards (*Brassica nigra*)
- Radish (*Raphanus sativus*), which has the added bonus of producing large roots, up to 80cm-100cm, improving the physical characteristics and providing water channels
- Rocket *(Eruca Sativa*)

Brassica juncea (Source: Hakgala, Sri Lanka. ID:1295029 Not Kew Copyright. Only licensed for display purposes in POWO)

Brassica napus (Source: Wikipedia)

Sinapsis alba (Source: Wikipedia)

SELECTING AND GROWING BIOFUMIGANT CROPS

Choose targeted and locally suited biofumigants[1]

The choice of biofumigant crops plays a pivotal role in the success of integrating them into potato crop rotations. Mustards, radishes, and other brassica species are common selections, each with its unique advantages.

Identifying which soilborne diseases are present at concerning levels is the first critical step. Once they have been identified, biofumigant cover crops can be selected that target that disease, and are suitable for local conditions.

Grow and treat as a cash crop

Proper planting and cultivation practices are essential to maximise biofumigant potential, including timely seeding, appropriate spacing, and careful management. Biofumigant cover crops should be managed like a cash crop, as that is really what they are.

The growth stage at which biofumigant crops are incorporated into the soil influences their effectiveness, emphasising the critical importance of timing for achieving desired results.

When brassica biofumigant crops are pulverised they release two essential chemical groups; glucosinolates and myrosinases. These compounds react to form isothiocyanates (ITCs). The result is production of a gas that effectively suppresses soilborne diseases.

As ITCs are highly volatile, swift and thorough incorporation of the biofumigant material into the soil is crucial. Otherwise, their effectiveness rapidly declines. Faster incorporation therefore yields better outcomes in disease control and soil health improvement.

IMPORTANT STEPS

1. Grow to 25% flowering
2. Mulch into small fragments
3. Incorporate
4. Irrigate or roll to seal biofumigant gases

BENEFITS FOR POTATO GROWERS

Potato growers can reap numerous benefits from incorporating biofumigants. As well as helping manage soilborne diseases, the addition of significant volumes of organic matter can improve soil health. This enhances microbial activity and nutrient cycling. Increased crop yields and improved quality are often reported.

Additionally, biofumigants are effective in reducing nematode populations,

This article is based on content from PotatoLink webinar: Biofumigants and cover crops for disease and nematode management, by John Duff (DAF).

Watch the full webinar here, including a presentation from Dr Mieke Daneel (ARC, South Africa) on nematodes.

Other resources

Guide to: Brassica Biofumigant Cover Crops: Managing soilborne diseases in vegetable production systems.

This resource was developed with funding from the vegetable levy, through project VG16068 - Optimising cover cropping for the Australian Vegetable Industry

1. Biofumigants may not always be successful at controlling soilborne diseases; growers should research the species they plan to grow to see if it hosts other problem diseases as well. Consider the whole system and rotations with other crops. Brassica biofumigants may not be a suitable fit if growing other brassica crops.

CASE STUDY

MANAGING VERTICILLIUM DAHLIAE IN POTATO FARMING

In a recent webinar, John Duff from the Department of Agriculture and Fisheries, Queensland (DAF), presented a case study from a potato grower in the Lockyer Valley who was facing a serious challenge with *Verticillium dahliae* (commonly known as Verticillium wilt) in their fields.

This soilborne pathogen was causing a significant reduction in tuber size with subsequent yield loss, as well as premature plant death. The grower had attempted crop rotations with cereals, such as sorghum and corn, but these strategies were not effective in reducing disease incidence. Moreover, as the pathogen can survive in the soil for up to seven years, extended crop rotations were impractical.

APPROACH

1. **Soil testing:** John and colleagues collected numerous soil samples for comprehensive soil analysis, including a Predicta Pt test. The testing focused on a wide range of soil-borne diseases, with a particular emphasis on the detection of active DNA levels of *Verticillium dahliae*.
2. **Test interpretation:** The soil tests revealed DNA levels well above the problematic threshold, often reaching hundreds or even thousands of picograms per gram of soil DNA. It was evident that the high pathogen load in the soil was a significant contributor to crop losses. In addition to *Verticillium dahliae*, other pathogens were identified, including black dot and nematodes.
3. **Biofumigant selection:** Based on the soil analysis, two biofumigant crops - BQ mulch® (*Brassica carinata* 75% and *B. nigra* 25%) and Caliente™ (*B. juncea*), both known for their high glucosinolate content, were recommended.
4. **Planting and incorporation:** To maximise the biofumigation effect, the grower decided to plant the biofumigant crops in both the spring and late summer/autumn. A minimum of 2 week gap was recommended between plantings and also the subsequent potato crop. John emphasises that it is vital to incorporate the biofumigant cover crop as quickly as possible on the same day.

Verticillium dahliae (Source: Ontario Crop IPM)

RESULTS

Pre cover crop results showed very high levels of *Verticillium dahliae* causing lots of problems for the grower (Table 1).

The biofumigants were very

Table 1. Soil sampling results for *Verticillium dahliae* (verticillium wilt) pgDNA/g sample (Source: J. Duff, DAF)

Date/ sample	2 Sept 2019 (pre cover crop)	21 Dec 2019	26 Feb 2020	20 May 2020	15 April 2021
1	351	Incorporate BQ mulch	8	Incorporate caliente	1
2	152		14		0
3	82		9		7
4	107		9		13
5	122		15		6
6	274		20		no data
7	364		23		13

NB. Predicta Pt recommendations for levels of DNA: *Verticillium dahliae* pdDNA/g sample; <4 considered low, 4-20 moderate, >20 high

Table 2a. Soil sampling results for *Colletotrichum coccodes* pgDNA/g sample - Area 1 (Source: J. Duff, DAF)

Date/ sample	2 Sept 2019 (pre cover crop)	21 Dec 2019	26 Feb 2020	20 May 2020	15 April 2021
1	661	Incorporate BQ mulch	123	Incorporate caliente	96
2	512		272		91
3	1128		202		136
4	441		193		96
5	513		194		165
6	368		220		no data
7	282		213		122

successful, disease load plummeting after the first incorporation. One year later *Verticillium dahliae* levels were still low, and only now, three years later, are they slowly increasing (results not shown). Going forward, the grower plans to include a biofumigant in his crop rotation to manage the issue.

Although the grower was not concerned about black dot, results showed elevated levels of inoculum in the soil. While the selected biofumigant crops were not so impactful against black dot as *Verticillium dahliae*, DNA load decreased dramatically (Table 2).

Because this grower's paddocks are sandier than elsewhere in the Lockyer Valley, he did have a nematode problem (note: the Predicta Pt test cannot distinguish between species of nematodes).

After one application of biofumigants, numbers almost disappeared. Even one year later after growing potatoes in the same soil, nematodes are still almost non-existent (Table 3a and 3b).

BIOFUMIGANT CROP MANAGEMENT

The biggest challenges faced by the grower were foliar diseases on the biofumigant crops, such as downy mildew, and the presence of aphids. These challenges required continual management, including regular monitoring for pests and diseases.

Case study funded by Queensland Department of Environment and Science and the Department of Agriculture and Fisheries as part of the project Horticultural farming systems approaches for improved waterway quality 2019-2022

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Table 2b Soil sampling results for *Colletotrichum coccodes* pgDNA/g sample – Area 2 (Source: J. Duff, DAF)

Date/ sample	2 Sept 2019 (pre cover crop)	21 Dec 2019	23 March 2020	27 May 2020	10 Sept 2020
1	492	Incorporate caliente	70	Incorporate caliente	69
2	563		93		129
3	517		123		70
4	518		87		144
5	586		205		186
6	487		200		173
7	421		166		264
8	493		194		214
9	387		177		173
10	558		200		286

NB. Predicta Pt recommendations for levels of DNA: *Colletotrichum coccodes* (black dot) pdDNA/g sample - <4 considered low, 4-40 moderate, >40 high

Table 3a. Soil sampling results for *M. javanica/incognita/arenaria* pgDNA/g sample – Area 1 (Source: J. Duff, DAF)

Date/ sample	2 Sept 2019 (pre cover crop)	21 Dec 2019	26 Feb 2020	20 May 2020	15 April 2021
1	261	Incorporate BQ mulch	1	Incorporate caliente	0
2	173		3		0
3	103		0		0
4	133		1		2
5	25		6		0
6	23		0		no data
7	11		0		0

Table 3b. Soil sampling results for *M. javanica/incognita/arenaria* pgDNA/g sample – area 2 (Source: J. Duff, DAF)

Date/ sample	2 Sept 2019 (pre cover crop)	21 Dec 2019	23 March 2020	27 May 2020	10 Sept 2020
1	184	Incorporate caliente	0	Incorporate caliente	2
2	36		0		0
3	232		0		0
4	76		0		0
5	50		2		0
6	73		0		0
7	194		0		0
8	199		0		0
9	68		2		0
10	15		0		0

NB. Predicta Pt recommendations for levels of DNA: *rootknot nemoatodes* pdDNA/g sample - <5 considered low, 5-50 moderate, >50 high

Dear Spud GP

I've noticed a few leaves getting chewed on plants around the edge of the paddock, but I can't see any insects on there – what's causing this?

Spike

ASK THE SPUD GP

Dear Spike

This looks like 28-spot ladybeetle (*Epilachna* spp.) damage. Not all ladybeetles are beneficial predators; 28-spots, sometimes called potato ladybird beetles, are very definitely plant eaters.

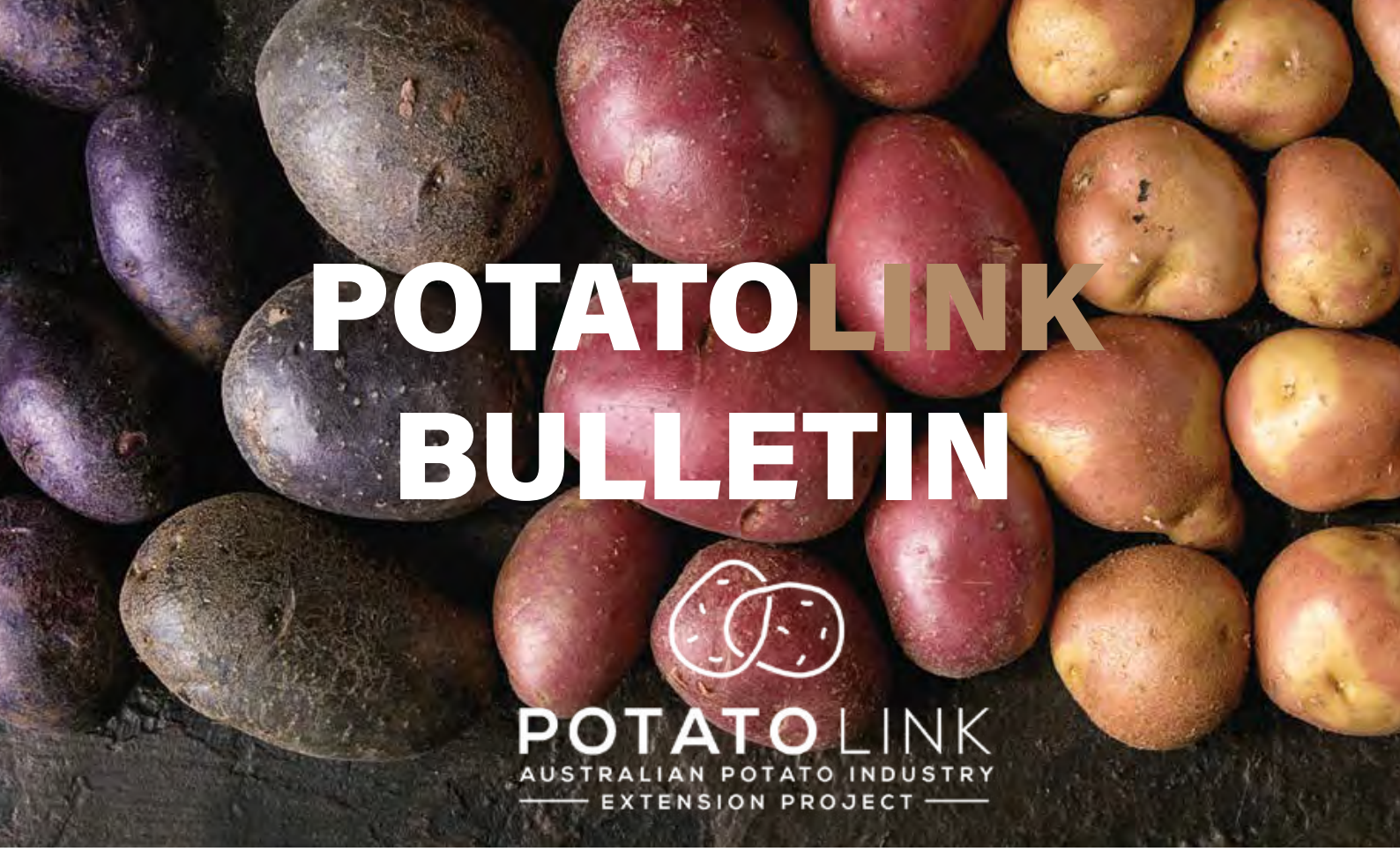
The adults are easy to see, being large orange ladybeetles with a variable number of black spots (not always 28, but quite a few) and a fine covering of soft hairs.

While the adults can certainly damage plants, the larvae are not only a lot better camouflaged, but voracious eaters.

The larvae are initially tiny, hatching out of clusters of 20 to 30 eggs laid on the undersides of leaves. They are nothing like the adult beetles, the larvae looking like small yellow grubs topped with a cluster of bristling spines. The spines are initially pale but darken and thicken as the larvae mature.

Larvae mostly feed on the leaf undersides, where they chew ribbed "windows" into the leaves between the larger veins.

Although 28-spot ladybeetles are not usually a major commercial pest, they can cause significant damage if large populations develop. Avoidance is the best control, so removing alternate hosts – including cucurbits and solanaceous weeds – is the first step in good management.



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POTATO LINK
AUSTRALIAN POTATO INDUSTRY
EXTENSION PROJECT

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AUSTRALIAN POTATO INDUSTRY
EXTENSION PROJECT

vegnet update

VegNET is funded by Hort Innovation using the vegetable research and development levy and funds from the Australian Government.

National Vegetable
Extension Network

NATIONAL

VegNet Overview

VegNET is the vegetable industry extension program that is run by growers, for growers and delivered by AUSVEG.

The program aims to keep Australian vegetable growers informed about current R&D activities, results and resources – supporting the adoption of industry best practice and bolstering vegetable productivity and profitability in key growing areas across the country.

Coordinated nationally by AUSVEG, VegNET is delivered "on-the ground" by regional development officers (RDOs) in key vegetable-growing regions who are responsible for developing and executing regional extension plans.

A critical step in ensuring growers receive assistance is the identification of each region's key priority issues, resources and connections requirements.

The most common challenges identified in consultation with industry are:

- Water (availability, quality and cost)
- Labour (availability, awards, HR and skills)
- Input costs
- Biosecurity
- Pest management
- Market development (including export)
- Post-harvest and marketing
- Urban encroachment
- Social license (environmental impact and chemical (mis)usage)
- Business management.

Now in **Phase Three,** the VegNET program is running with RDOs based in organisations with strong grower networks in vegetable production regions.

The program is overseen by a National Coordinator, who works with each regional group to ensure growers have consistent access to an 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.

In 2016 Hort Innovation invested in ten regional capacity building projects to effectively transfer R&D information to vegetable growers through regionally-based extension projects and associated coordination and training projects. These projects were contracted to delivery partners based in the ten major vegetable growing regions and were unified under a national brand – VegNET.

Phase One The first phase of VegNET finished in early 2020, with the regional development officers (RDOs) delivering R&D awareness and extension activities in their geographical regions.

Phase Two The second phase of VegNET finished in September 2021, and resulted in each region developing regional priority areas for extension. These regional priorities were collated into national priority areas to inform a national extension program that is nationally-consistent and regionally-specific.

VegNET is funded by Hort Innovation, using the vegetable research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

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Regional Funding

Dollars out there for your region

The VegNET Innovation Fund is a project funding mechanism designed to address regional and national extension priority areas by providing funding to develop programs of regional importance and cross-regional relevance.

Innovation funds are released by Hort Innovation twice per year and are used to address national priority areas as identified by the Regional Development Officer (RDO) and the National Coordinator from collated regional prioritisation.

Our RDOs are on the ground visiting, meeting, engaging with growers to establish if they may have issues and how best to support and give assistance. It could be that an innovative idea in their region be recognised as an issue, then move it forward to go to the regional REAG meeting for further discussion.

Each region where a RDO is located there is a Regional Extension Advisory Group (REAG) supporting the RDO in developing potential Innovation Fund concept proposals. RDOs will submit endorsed Innovation Fund concept proposals for the National Extension Advisory Group (NEAG) to discuss, approve or decline.

REAG meetings are held twice a year where concept proposals will be reviewed and if successful will be submitted to NEAG.

The NEAG members embodies all our states and territory providing a well-balanced representation within the group.

The time frame of holding two meetings annually for receiving submissions has been reviewed with additional meetings held over the past twelve months to ensure we cover growers across all regions within a timely manner.

Some things to think about:

- **Is it a benefit to the region?**
- **Is it adaptable to other regions?**
- **Does it align with regional properties?** *If you don't know what they are contact your RDO.*

A key foundation to this funding is that we share project learnings across regions. Often this is done through growers speaking of their experience, on farm field walks, case studies, fact sheets, demonstrations.

We invest in you the grower and look forward to you giving back to the industry by sharing your journey in these projects.

Projects under Innovation Funds

Some of our successful concept proposals:

- Western Australia's Heat Pumps in Horticultural Greenhouses: heat pumps were identified as being significantly more energy-efficient and cost effective, promoting optimal plant growth and minimising heat loss.
- Far North and North Queensland Co-support in trialling Autonomous Machinery Robotti: showcasing agtech to improve on-farm efficiencies.
- Northern Territory Attendance to Protective Cropping Conference: protected cropping is an important element in NT; the conference provided an opportunity to learn and network with other growers in this sector.
- Northern Territory Food Incubator Adding Value to Businesses: visiting businesses that specialise in value-add to produce reducing food waste and increasing business profitability through value-add products.
- South Australia Development of a Predicta PT DNA Test for Beet Cyst Nematode: beet cyst nematodes is a major pest for brassicas, the test will help diagnose and manage the pest.

FIND OUT MORE

Contact Cherry Emerick AUSVEG on 0418 389 680 or email cherry.emerick@ausveg.com.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 VEGETABLE FUND

VEGNET VICTORIA - GIPPSLAND

Regional Update

Warrick Purdon and Walter Chadwick are farm managers at Hussey & Co and Tripod Farmers respectively; two baby leaf farms located in Victoria's Gippsland region. Both growers have been significantly impacted by the severe and prolonged compound rain events that have occurred across the region over the last few months, and are willing to share the devastating impacts, gambles, and stresses that all baby leaf growers experience trying to produce high-quality baby leaf salads for supermarkets and wholesalers.

Significant rain events can have destructive consequences for baby leaf growers. The quality and supply of baby leaf salad into supermarkets and wholesalers can be substantially impacted for more than eight weeks after a severe, prolonged, or compound rain event. From flooding and mud, to bruising and shredding, yellowing, disease, and root decay; the impacts of a severe rain event can be broad-reaching and devastating.

Initial losses

Immediate yield losses can be experienced following a significant or prolonged rain event due to everything being simply too wet and muddy, with areas of land becoming too wet for machinery to access. By the time a crop has become both accessible and harvestable, a farm may have already missed sales due to the delay, and the market can experience an immediate drop in supply volumes.

Mr Chadwick noted that the adverse effects are stressful and deliver significant challenges. "The most instant impact is not being able to harvest something that is ready... you can't get a machine in, orders are in, the crop is ready; but you can't harvest it," he said.

Baby leaf crops are very delicate and susceptible to physical crop damage from rainfall. The impact of heavy rainfall or hail on fragile salad leaves can cause significant bruising and tearing.

"Everything standing, everything that's of harvestable size is affected...even below harvestable size; anything that's out of the ground can be affected," Mr Purdon explained. "In the case of a crop like chard, rain can completely flatten it, making it physically incapable of being harvested for days, or even at all," he said.

Australia produces high-quality product, so any bruising or damage to salad leaves can cause rejections by wholesalers and supermarkets. Thus, at their most severe, these initial impacts can render multiple weeks' worth of supply destroyed and unsaleable in a matter of hours. This can have an unpredictable and very significant impact on supply volumes and quality for weeks after a rainfall event.

Baby leaf salads are grown to very stringent specifications for sale within the Australian retail market. For a farm to produce product that meets these standards, there is a very small 'spec window' for harvesting of compliant baby leaf crops. During summer, under normal growing conditions, the spec window can be as short as two or three days. In the summer period, a baby leaf crop can go from seed to harvest in 20 to 30 days. Once a crop has gone beyond its spec window, its sales viability is reduced significantly.

Intermediate crop health losses

After the initial mechanical and physical losses from a rain event, comes many weeks of significant crop health losses that can be hard to predict and difficult to manage. From yellow leaves, to weakened crops, stunted growth rates and root decay; the impacts on crop quality and yield do not stop for weeks and months after a significant rain event.

Yellow leaves are something growers are constantly fighting against in the weeks following substantial or ongoing rainfall. Significant rainfall can cause the ground to become waterlogged and the plants to have an oversupply of water and a lack of nutrients, causing the leaf to turn yellow, explained Purdon.

Left. A spinach crop turning yellow following a rain event. Above. Harvest 'spec' sheets detailing the different crops and their acceptable length range.

"The plant is being smothered by water and the lack of oxygen in the soil. The plant is not drinking, because it doesn't need to, so it's not getting the nutrients it needs," he said.

Growers are in a race against time. The soil needs to dry out so the plant can breathe, and growers can supply nutrients to the crops as soon as possible to help delay or avoid a crop turning yellow. This race can be hampered by ongoing rainfall and machinery getting bogged, along with capacity and equipment limitations. Yellowing of a crop can happen very quickly and render a whole crop unsaleable.

When a crop's root system is saturated for an extended period, it can lead to root decay and cause significant yield and quality impacts over time, explained Purdon. "You end up with root damage; the plant sends out new roots to the surface to try and compensate for the excess water and the lack of oxygen in the soil," he said.

The plant's root system can decay to a point where it cannot fully recover, causing stunted growth. Purdon used lettuce as an example, with root deterioration, lettuce can become stunted. "Instead of a six-week growth cycle, it will need closer to eight weeks in the ground before it reaches minimum specification for harvest," he said. "This significantly impacts the supply of produce six to eight weeks after a weather event."

Chadwick highlighted the consequences of missing a spray or a fertiliser spread on a baby leaf crop due to rain. "It's the biggest challenge in baby leaf; there is no flexibility, especially in summer when the growth window is so short," he said. "You might get it to a harvestable size, but it can have insect problems, fungal problems or yellowing from lack of fertiliser."

A rainfall event is a major contributor to baby leaf crops growing too fast and becoming too soft. In a perfect world, crops would have moisture levels reduced prior to harvest to toughen up the crop for processing and shelf-life. Purdon explained that produce just won't have the shelf-life consumers expect. "It gets so wet, then you have to compensate with extra fertiliser, and because of the moisture and fertiliser, and potentially hot weather, everything is going to grow; but it's half drowned, it grows too fast, and it's weak, and now you have a shelf-life problem," he said.

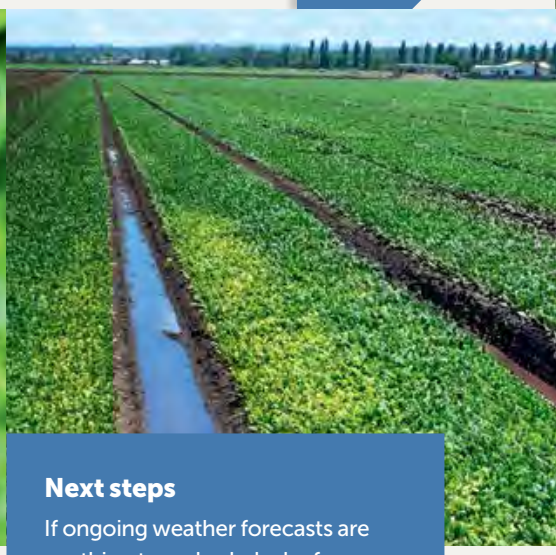
"Even something that looks half decent in the field potentially has no shelf-life whatsoever...and that's the part people don't understand," said Chadwick.

Longer term losses

Crop health is just one reason why there might be supply shortages weeks after a rain event. The other key reason is something growers refer to as a 'planting gap'. Just as harvest, spray and fertiliser machinery are impacted by the wet and muddy conditions directly after a rain event, so too is the machinery used to plant new crops. In a normal week, planting may occur two or three times, as such, a missed planting will create a significant gap in supply. Crops that have just germinated may also be lost to the sodden conditions, adding further to the planting and supply gap.

"The market four to six weeks after a rain event is going to be impacted by a shortage, because of the crops that couldn't be planted in the wet. There's a planting gap," said Purdon. "Planting gaps have a major impact on future supply."

In an attempt to 'rescue' crops following a rain event, farms will put double the fertiliser and double the spray onto crops to prevent disease and fungus, and to minimise the amount of produce that turns yellow. The extra inputs come at great expense and with no guarantee of a return. "It's a gamble, you run the risk of putting a lot more money into the crop and still getting nothing; but if you don't do it, you definitely get nothing," Purdon said.



Inset. Root decay in rocket.

Both farm managers highlighted the 'cost of perfection' in the baby leaf industry. "Everything has to be picture perfect," said Chadwick. "A crop can look fine, except the colour is too pale; [we are] constantly chasing that nice luscious dark green colour that consumers want."

Ben Gebert, CEO at Food & Fibre Gippsland has extensive experience across the sector and notes consumers' and markets' high-quality expectations when it comes to fresh produce. "The marketers' fixation with 'perfection', and consumer demands for longer shelf-lives and higher uniformity are often at odds with the realities of growing fresh produce – particularly when our growing regions are experiencing climate volatility," he said.

The baby leaf industry can be a ruthless one, with wholesalers and supermarkets dropping farms for weeks at a time when supply or quality are impacted by rain events. This can significantly impact a grower's market share and reputation for weeks to come, even after supply volumes and quality have returned. Purdon explained that there are long-term costs associated with trying to meet the high standards of Australia's baby leaf industry and he emphasised the need for balance. "You're trying to do the right thing by the customer, but the cost of perfection can come at the cost of your soils," he said. "Soil is a living organism; if you don't treat it right, you can damage it in multiple ways."

Noel Jansz, Branch Manager and Agronomist at Elders Bairnsdale, has extensive experience working with numerous baby leaf farms across Gippsland. He emphasised the long-term impacts that can arise from extended waterlogging in soil. According to Jansz: "Prolonged waterlogging poses a serious threat to the health of the soil and, consequently, the overall productivity of a farm."

He explained that when soil remains waterlogged for extended periods, it leads to a decrease in oxygen levels in the soil profile and in the long run, the structural integrity of the soil may become compromised. "Prolonged waterlogging can lead to soil compaction and the breakdown of soil aggregates, negatively impacting its porosity and drainage capabilities," he said. "This, in turn, exacerbates the risk of future waterlogging events and creates a vicious cycle of deteriorating soil health."

Next steps

If ongoing weather forecasts are anything to go by, baby leaf growers aren't getting a reprieve from these devastating impacts any time soon. So, while they battle with increasing stress levels, fight daily for their market share, and continue to gamble everything for perfection, what does the customer need to know?

All levels of customer need to be educated and informed about affected crops and the impacts of severe, prolonged, and compound rain events; while at the same time, supporting growers in buying baby leaf salad understanding that the shelf life on some products may not be as good as they might expect. How to do this? Well, that's another question entirely.

FIND OUT MORE

Please contact VegNET – Victoria (Gippsland) Regional Development Officer Emily Scott - Food and Fibre Gippsland on 0455 214 102 or email emily.scott@foodandfibregippsland.com.au

With special thanks to Walter Chadwick, Warrick Purdon, Noel Jansz & Ben Gebert.

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

Project Number: VG21000

QUEENSLAND
FAR NORTH

VEGNET FAR NORTH QUEENSLAND

Regional Update

Hemp seed cover crop to improve soil after significant salt inundation remediated at a property in north Queensland

Rising salinity issues due to mineralised bore water is a common issue in north Queensland where sub artesian water is the main source of water for the horticulture Industry. The use of industrial hemp may return the soil to an arable condition.

David Richardson, owner of Richardsons farming operations about 10 minutes north of Bowen in north Queensland is one property where salinity of artesian water differed greatly across his water table.

The increase in salinity in the soil made the ground unusable; soil testing confirmed that the ground was no longer suitable for vegetable production which required David to farm on a block further away from their processing facilities.

Initial discussions to manage the salinity inundated farmland focused on the application of gypsum annually to remove salinity or find salt tolerant tree crops as a potential farming practice.

Soil and water testing had not been completed for many years as David believed that the ground was no longer suitable for farming operations. After discussion with David, the VegNET regional development officer determined the best course would be to conduct new soil and water analysis to provide an updated baseline for soil remediation.

Gatton based soil scientist David Hall was engaged to take soil and water samples to better understand the extent of the salt inundation on the property and develop a remediation program based on the results.

Soil samples were collected over three depths (0-10cm, 10-30cm and 30-60cm) in March 2022. The samples were taken to monitor nutrient levels for crop production and prevent nutrient rundown. Water samples were also collected from the main bore and identified as being heavily saline.

The results of the testing indicated that the surface pH was within optimal levels for plant growth, however, the pH at depth increases in alkalinity due to chlorides. Careful management of the chlorides would be required as they are mobile and move up and down the soil profile with rainfall events and irrigation. The sample from the bore showed high salt levels and total dissolved salts which could explain the salinity issues in the soil from irrigating with heavy saline water.

Through the VegNET North Queensland project, David connected with Luke Hargreaves from Wandarra, a North Queensland industrial help company to see if industrial hemp would be suitable to remediate the soil while generating a cash return on the farm. It's important to differentiate industrial hemp from marijuana. Industrial hemp is the soft fibre from the cannabis sativa plant. It is distinguished from the psychoactive varieties by having less than 0.05 levels of THC (Tetrahydrocannabinol).

Industrial hemp has been widely used for thousands of years making paper and ropes for naval ships. More recently industrial hemp has been identified as an excellent source for CO^2 capture making it an important carbon sink helping to reduce global carbon emissions. Industrial hemp is also an important crop to help regenerate soil.

The long roots of the plant help bind the soil and reduce erosion during North Queensland's severe rain events. The deep-rooted plant also unlocks nutrients by tapping into subsoil nutrients that other plants cannot access. Hemp also kills nematodes which have a significant effect on vegetable production in the Bowen region.

David planted 50 hectares in October 2023 on remediated land and a further 50 hectares to be planted in March 2024. Industrial hemp seed takes approximately 100 days from sowing to harvest under favourable conditions. Initially 29 hectares of the crop will be harvested for seed providing a rich source of omega 3 and 6 fatty acids. While the remaining 21 hectares is hemp fibre which grows up to 5 metres in as many months and is used on Australian construction sites, textile and paper production.

The long-term goal is to return the land to vegetable production if the market pricing improves. With the soil aerated and carbon captured there is optimism that the remediated soil will once again produce high quality vegetables. David is happy with the hemp production, complementing his existing vegetable production and improving his soil on farmland that was once deemed unsuitable for horticultural production.

FIND OUT MORE

If you would like to take part in one of the Far North Queensland VegNet trials, or have an issue you would like to discuss with your VegNet RDO, please contact David Shorten on 0419 429 808 or email rdo@bowengumlugrowers.com.au

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

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

Project Number: VG21000

Hort Innovation VEGETABLE FUND

NORTHERN TERRITORY

VEGNET NORTHERN TERRITORY

Regional Update

"Do they grow vegetables in the NT?"

The Northern Territory (NT) is currently in its off season for vegetable production. The wet season runs from November to April and is a time where the Northern Territory receives most of its rain and extreme heat. Due to the bogged paddocks and difficult temperatures, December to March is a time when most vegetables growers will stop production. It truly is magical to experience a wet-season where extreme heat meets extreme weather events such as harsh tropical lows and cyclones.

As the NT VegNET project is currently quiet it is a great opportunity to focus on a much needed to be discussed about topic: vegetable production statistics.

If you have asked someone from the NT: 'do people grow vegetables in the NT?' you would not be the first; and for good reason. The NT's vegetable industry although small compared to other states, is often underrepresented in some key communication materials on vegetable statistics and reporting sites.

Annual statistic booklets could often lead one to believe that no vegetables are produced in the NT due to their near complete absence. Part of this may be due to mis-reporting, for example, not including bean production in the NT in annual statistics since snake bean is one of the most common vegetables grown in the NT. The other reason is that the vegetables that are reported nationally are often 'conventional' vegetables as they are the majority of vegetables grown in Australia. Broccoli, carrots, capsicums, lettuce, Brussels sprouts will all have reasonably correct statistics as the NT does not play a part in the production of these. If, however, the statistics on the proportion each State contributes to Asian vegetables: snake bean, okra, sin qua, long melon, bitter melon, the NT would indeed start to become a visible contributor on the national stage.

In the financial year of 2020-2021 the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) reported that vegetable production in the Northern Territory had an estimated value of $4.2million with 36 vegetable farms existing in the NT. Contradictory to this, the Northern Territory Government released a report for the same financial year that stated that the Northern Territory's vegetable industry had an estimated value of $80.1 million for the 2020-2021 financial year. Through the VegNET project, it can be confidently reported that the number of farms would comfortably exceed double the 36 farms reported by ABARES.

In order to strengthen the validity of the Northern Territory Government's statement of a $80.1 million vegetable industry, historical data of how the NT vegetable industry has grown will help paint a picture.

FIND OUT MORE
Contact Mariah Maughan, Vegetable Industry Development Officer, NT Farmers Association on 0417 618 468 email ido@ntfarmers.org.au

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Project Number: VG21000

Hort Innovation VEGETABLE FUND

A report published by the Rural Industries Research & Development Corporation (now AgriFutures Australia) in 2003 – *Asian Vegetable Industry, A Situation Assessment,* stated that:

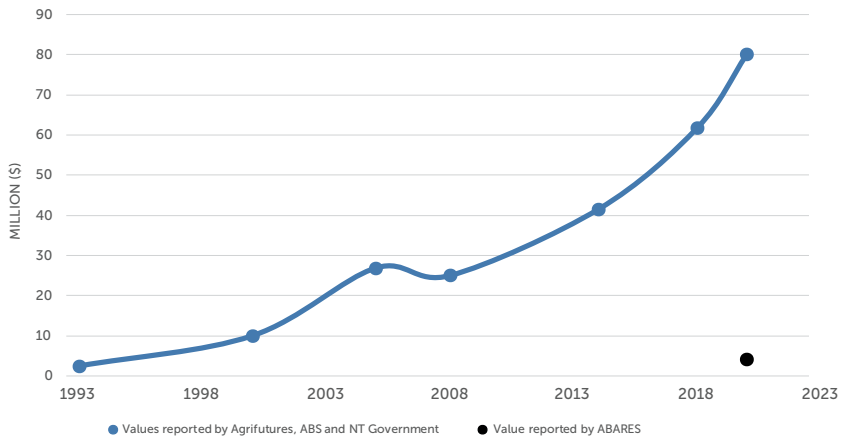
- FY 1993/94, 30 vegetable farms, $2.5m in Asian vegetables
- FY2000/21, 60 vegetable farms, $9m in Asian vegetables, $1.6m in conventional vegetables.

In the 2005-06 financial year the Australian Bureau of Statics (ABS) reported that the NT vegetable industry had a value of $26.88m and in 2008-09 a value of $25m. Fast forward to 2014-2015 ABS reported that the total value of the NT vegetable industry was $41.5m rising again to $61.8m value in 2018-19.

This leads us to the most recent Northern Territory Government report that states there is an $80.1m vegetable industry in the 2020-2021 period resulting resulted by increases in sale prices for farmers and a production of 23,207 tonnes.

Northern Territory vegetable industry production value over time

FIGURE 1.



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So what does the NT vegetable industry look like?

The vegetable industry in the Northern Territory predominately comprises of Asian vegetables such as bitter melon, hairy melon, long melon, okra, snake bean and leafy vegetables and herbs (water spinach/ kangkong, kaffir lime leaf, and basil). The climate is more suited to Asian vegetables then conventional European vegetables and majority of the NT vegetable growers are from Vietnamese descent. Most of the Asian vegetables are grown in the outer Darwin regions and sold to wholesalers in Melbourne, Sydney and Brisbane. Trucks leave Darwin 2-4 times a week from two main trucking businesses in the dry season to make this possible. Vegetable growers' products are also readily available in local Darwin markets. The NT also produces pumpkins, lettuce and asparagus in other regions of the NT, predominately Katherine and Central Australia.

Although NT vegetables a predominately sold domestically, a small quantity is exported. NT exports mainly pumpkins to Singapore, Nauru, Malaysia, Qatar, United Arab Emirates, East Timor, Cambodia, and Philippines.

When looking on a national stage, there is no denying the NT produces a small portion of Australian vegetables. It does however have a vegetable industry that provides Asian vegetables to cities like Melbourne, Sydney, Brisbane, and Adelaide. By having a warm growing season during the southern winter, the NT can provide produce that is difficult to grow in winter in colder states.

Conclusion

The data is available to track the growth of the value of the NT vegetable industry if you were to go looking for it however what you come across in every day reading is dependent on what statistics organisations use to report and share. There is a big difference between $80m and $4.1m which can understandably leave one a little confused asking the question "do they grow vegetables in the NT?".

VEGNET TASMANIA

Regional Update

Using ag tech to drive efficiency

The Tasmanian VegNET RDO recently caught up with John Heard, the manager at Formosa Estate, and spray operator Pete Armstrong to discuss incorporating technology on the property to drive efficiencies in their cropping operations.

Formosa is a mixed farming enterprise just south of Cressy in Tasmania's Northern Midlands. They crop around 400ha annually alongside their livestock enterprise of around 5,500 cross-bred and merino ewes, and approximately 240 head of cattle. Their cropping land is used for a mix of crops including wheat, barley, canola, oats, chicory, ryegrass seed, beetroot seed, peas and broccoli, and other commodities depending on the season and markets. With this range of enterprises on the property, technology is playing an important role in supporting the team in knowing what is happening with their crops, making strategic and tactical decisions and planning their daily operations.

Starting from scratch

When John first arrived at the property in mid 2016, there was no data linkage for the different enterprises. One of the first steps in introducing technology on the property was to sign up for Agriwebb. This tool digitised Formosa's livestock and grazing management. From there the team automated the pivots to be remotely controlled and monitored via their phone or device. There has also been benefits when spraying crop on those paddocks. Where the operator would previously have to stop spraying, get out and manually move the pivots, they now can move them remotely. This means he can move them while in the spray rig, allowing them to get the full paddock done with minimal disruption. There are WHS benefits as well since the operator no longer needs to get out of the vehicle in recently sprayed paddocks.

"Efficiency was the key driver in pursuing any new technologies we have implemented on the property," said John Heard.

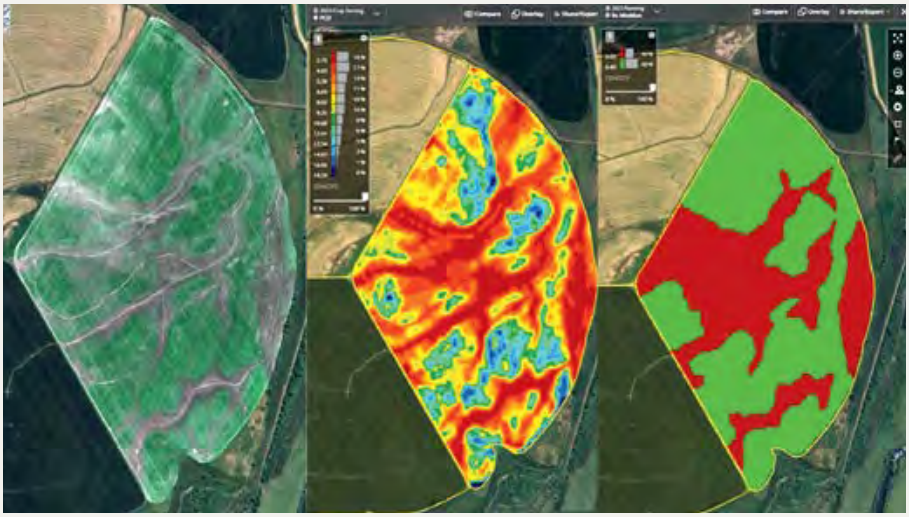
With all the pivots on the property now remotely monitored, the team have taken that technology approach to other parts of the property. Now electric fence units, security systems, tractors and the new drying floor for grains and seed crops are all remotely monitored. One of the key benefits of remote monitoring is confidence that everything is operating as it should.

"Not only does the remote monitoring save labour by not having to constantly check systems, it means we also get notified quickly if something is going wrong, and we can address the issue much more rapidly and reduce our risk of spoilt or lost product," said John.

Above L-R. The probe to remotely monitor the drying floor in ryegrass seed.
The drone for spraying, it has an 8L capacity and is just under 25kg when fully loaded.

FIND OUT MORE
Contact Ossie Lang, RMCG on 0430 380 414
or email ossiel@rmcg.com.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 VEGETABLE FUND



Right. These show the imagery used to create the variable rate maps. From left to right, the RGB/visual image, the Plant Cell Density imagery (NIR/R) image and lastly the resulting variable rate map for the plant growth regulator application.

Adding in technology on farm

When asked about the technology, John said that there were no defined rules of thumb, as the return as it depended on the investment level and type of technology. John and Peter said they had devised some questions they would consider as a part of reviewing new technology which included:

- What existing infrastructure is in place, will this technology work with what is already here?
- Is this in the skill set of the team, will they be able to use it without too much training?
- How realistic is the return on investment from this technology?

Next steps – Drones

Currently, Formosa use drones for assessment of crop health. This has allowed them to create variable rate maps for applying fertiliser and (when appropriate for the crop) plant growth regulators. In using imagery from the drone, the team get a timely and accurate variable rate map to use.

"In less than an hour (depending on the paddock) I can get the drone up, stitch the imagery together and create a variable rate map ready to use that day in the spreader or spray rig," said Pete Armstrong.

This use of variable rate applications has two key benefits, firstly their input bills are reduced by only using the input when and where it is needed at an appropriate rate. Secondly, the crop becomes more even across the paddock, reducing yield loss from under or overdosing parts of the crop. A more even crop also leads to better water use efficiency, and decision-making as the crop is all at the same growth stage.

While drones have been used in ground applications, the next area of exploration is product application from the air. Pete has been able to use a drone to target some specific hard-to-reach areas on the property for herbicide application. If a paddock is wet, it is difficult to get machinery in – Pete is looking at applying slug bait using a drone.

"With the low application rates of the slug baits, it lends itself to drone applications. With the size of the drone we have, fertiliser would need too many trips for the drone to apply it as the rates are so much higher per hectare," said Pete.

Ag Innovation on show

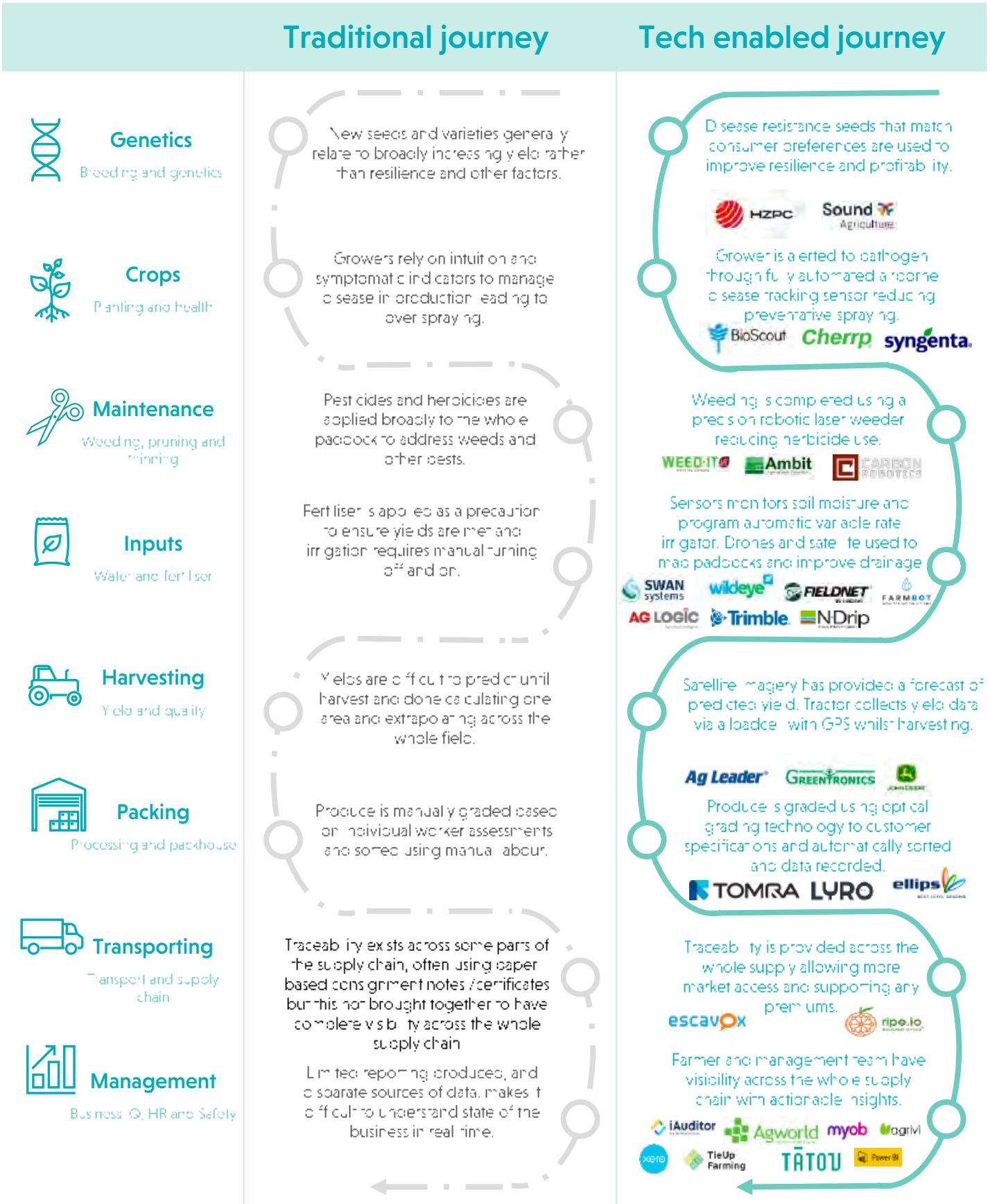
Once again, the Ag Innovation show will be hosted by the Tasmanian Agricultural Productivity Group, in conjunction with TasFarmers & Fruit Growers Tasmania. The Ag Innovation day is a great chance to get along and hear from technology providers and others about what is happening in the world of farm technology and a great networking opportunity. This year's event will be on the 18th April at the Hagley Primary School.

To aid with the planning of the day please follow the QR code to book your ticket or head to: bit.ly/Ag-Innovation-Day-24

If you're interested in how technology can help with your on-farm challenges then check out the Tasmanian Agricultural Technology Guide. This guide is a result of conversations with Tasmanian farmers including vegetable growers, to identify their key industry challenges and how they are using Ag Tech to address these. It is published by the TAS Farm Innovation Hub and the team at Beanstalk AgTech with funding from AgriFutures Australia and the Australian Government's Future Drought Fund. The following pages highlight some of the information in the guide for vegetables.

For more information and to access a copy of the guide head to: tasfarmhub.com.au/wp-content/uploads/2023/11/Tasmanian-Agriculture-Technology-Guide-September-2023.pdf or follow the QR code.

Technology solutions across the vegetables value chain



Vegetables

1 Reducing input usage

Farmers margins are being squeezed by ongoing negotiations with buyers on price, and increasing input costs. Additionally, a focus on sustainability and soil health requires a reduction in the use of chemicals and fertilisers.

Why is it important?

- Reducing input usage minimises exposure to future input price building a more resilient and profitable business.
- Reducing GHG emissions and maintain or improving soil health is critical to ongoing future and sustainability of the industry.

Value chain step

Inputs

Water and fertiliser

What does success look like?

- Reducing input usage in a way that has a positive return on investment.
- Solution works on a variety of crops given a large majority of vegetable farmers rotate crop types.

Breakdown of Levers:

	Value add/impact	Technology	Example solutions
Optimise usage & reduce waste	• Targeted spraying reduces pesticide and fertilizer usage. • Close to ground nozzles reduces waste from pesticide drift.	Smart precision sprayer CROPLANDS	WEED-IT (Crop-lands distributor in Australia) WEED-IT provides optical spot spraying, by detecting chlorophyll in actively growing weeds and targeting them with a fraction of the herbicide and water compared to blanket spraying
	• Ability to turn individual sections on and off at predefined locations in the field	Selection sprayer JOHN DEERE	John Deere Selection Control (Global) John Deere Section Control enables you to apply exact amounts of fertiliser, seed and crop protection – where they are needed reducing overlap and waste
	• Eliminate chemical use. • Lasers leave the soil microbiology and slurbee.	Laser weeding CARBON ROBOTICS	Carbon Robotics (USA) Carbon Robotics delivers chemical-free, no-till, weed control for specialty crops using computer vision and laser modules eliminating more than 100,000 weeds per hour.
Switch to alternative inputs / methods	• Supplements conventional fertiliser programs by offering essential micro-nutrients and other substances that enhances plant nutrition and yield.	Plant biostimulants OCP	Organic Crop Protectants (Aus) OCP offers a range of various biostimulant products such as Stim-Phos which is used to stimulate root growth, enhance plant strength and stress resilience. Acadian powders, which is derived from seaweed extract can be applied as a spray.
	• Nutrients are delivered through irrigation (fertigation) or ground injection to increase yield.	Soil & Fertigation RLF AgTech	RLF AgTech (Aus) RLF AgTech's Soil & Fertigation products deliver a nutrient package straight to seedlings by using liquid fertilisers via ground injection or drip irrigation. Trials have resulted in 25%+ increase in yield across tomatoes and sugar beet
Prevent loss of crop	• Reduces crop loss through early detection of diseases. • Reduces usage of preventative spray.	Early disease detection sensors BioScout	BioScout (Aus) BioScout provides early detection of fungal crop diseases. Sensors monitors for spores, and when the AI algorithm detects disease particles an alert text is sent to the farmer.
Data informed decision making	• Monitoring crop yield allows for better decision making as it allows for evaluation of management practices and areas of low productivity.	Yield mapping & decision support Ag Leader	Ag Leader – Spatial Management System (SMS) (Global) SMS software is a decision-making tool that integrates various data such as GPS field mapping and yield monitoring and analyses trends to generate decision insights for farmers.
	• Better understanding of soil nutrient needs allows for optimised fertiliser usage	Variable rate fertiliser mapping precision agriculture	Precision Agriculture (Aus) Precision Agriculture analyses soil health and creates variable rate application maps for fertilisers (lime, gypsum, phosphorus, potassium and nitrogen) to inform decisions

WESTERN AUSTRALIA CASE STUDY

Warming to heat pumps in WA protected cropping systems

Case Study September 2023

National Vegetable Extension Network
WESTERN AUSTRALIA

Purpose

Providing the right climate within agricultural greenhouses is essential to maximising yield and revenue but requires a large amount of energy and potentially carbon emissions. As part of the VegNET Innovation Fund, vegetablesWA engaged Australian Alliance for Energy Productivity (A2EP) to deliver feasibility studies looking at the installation of heat pumps in (3) West Australian horticultural greenhouse sites as a way of improving the energy productivity, in each distinct vegetable production system.

- 1 x LPG hot water heaters system
- 1 x Biomass boiler system – Agricultural Green waste
- 1 x No existing heating system – PV and waste Biooil heating options.

Consultants, Deta Global and Energy Smart Water (ESW) performed feasibility studies on three (3) greenhouse sites in the greater Perth area, Western Australia, each with different produce (cucumbers, capsicums and tomatoes) evaluated and assessed the current operating situation and proposed a solution for implementing heat pumps with the associated costs, benefits and risks to each specific site's intention.

Benefits of installing heating systems in greenhouses

Ideally, it is important to maintain ambient air temperatures of ~18–19°C and the root level of the soil at a minimum of ~20–21°C. This temperature range is crucial for successful yields over winter months.

Grown Smart Produce, Carabooda, WA.

Improved Yield

Heating is expected to lead to an increase in the size and quantity of production. This can address market demand in winter months, which are usually underserved. A heating system also allows the grower to maintain summer varietals and sizes over cooler/winter periods with potential yield improvements of 25–50% and reduced pest pressure.

**Grown Smart Produce's primary goal is to improve the length of cucumbers, with a target of maintaining a summer proportion of 90% XL to 10% large. Currently, winter production yields 5–10% XL and 95–90% large cucumbers. The case study anticipates heating will result in yield improvement of 25% to 50%.*

Higher revenue

A heating system can add 30% to revenue through yields year-round.

Key messages

- **A feasibility study was undertaken to assess heat pump water heaters for root-zone heating of cucumber, capsicum and tomato plants in greenhouse production systems in Western Australia.**
- **An air-source heat pump was capable of providing the required site heat load.**
- **The use of heat pumps was identified as being significantly more energy-efficient and cost-effective, promoting optimal plant growth and minimising heat loss.**
- **Financially, the heat pump systems proposed were challenging due to a range of factors, including high capital expenditure (CAPEX) compared to the added benefit and higher operational expenditure (OPEX) in the case of changing from burning biomass.**

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

AUSVEG

vegetablesWA

Space heating vs near root heating

Both systems can be modelled to compare energy usage. In most situations, it can be determined that root heating is considerably more efficient than space heating. Key benefits for root heating over space heating are listed below:

- Root heating focuses heat where it is most needed, promoting optimal plant growth.
- Root heating reduces heat loss by targeting the root zone, minimizing heat loss through the walls of the greenhouse.
- As a result, root heating requires lower energy input compared to space heating, leading to cost savings, smaller equipment footprint, and lower CO2 emissions.
- Root heating has fewer adverse effects on the humidity within the greenhouse, saving water and increasing plant health.

**In one site study, the comparison of space heating duty load and root heating duty load over a standard cold winter day revealed that root heating is approximately 68% more energy efficient than space heating.*

Costs and benefits

All three sites indicated that the application of heating to the greenhouses had the potential to increase in revenue.

1. Conversion from an LPG hot water generator to heat pumps	Energy consumption would be reduced by ~51%, and energy costs reduced by $18,200. Transition to heat pumps would save ~440 tCO2e per year. Transition to heat pumps would deliver an NPV of -$44,900 over 15 years based on the capital budgets used6. Given the relatively high costs of electricity ($0.201/kWh) when compared to LPG ($0.137/kWh), low utilisation outside of winter months, and high capital costs the system has an unfavourable simple payback of ~12 years.
2. Conversion from biomass hot water generator to heat pumps	The proposed system could provide a more energy-efficient set up to the current biomass heating system. Due to high supply and installation costs and current low costs of fuel, the financial aspects of the system make it economically challenging. The switch to heat pumps would increase the site's CO2 emissions by ~2,925 tCO2e per year. Energy savings of 2,550,000 kWh/year due to the Coefficient of Performance (COP). Although energy consumption is expected to decrease by ~80%, higher electricity costs relative to biomass will result in total energy cost increasing from ~ $122,000 to ~$169,000. Overall, this project would deliver a 20-year NPV of -$1,156,000.
3. No heating to heat pump system	360 kWp photovoltaic system, costing ~$620,000 was recommended after consultation. This site was able to demonstrate that in the Low Sell scenario, a negative NPV existed with a payback in 9.4 years. In the High Sell scenario, a positive NPV was proposed with a payback of 4.8 years -Further risk analysis and detailed feedback from participating businesses should be conducted to inform the investment decision-making process. The switch to heat pumps would increase the sites CO2 emissions, as there is currently zero. Air-sourced Heat Pump – adds to yield and revenue but increases operating costs and emissions unless using a PPA.

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WESTERN AUSTRALIA CASE STUDY

Warming to heat pumps in WA protected cropping systems

Improving grower productivity, profitability and preparedness

Overall, implementing air-sourced heat pumps for root zone heating offers a promising solution to improve yields, reduce costs, and minimise environmental impact.

- Low installation complexity when compared to other heat pump options.
- Comparative high winter temperatures in Perth suit the application of air-source-heat pumps
- Comparatively low capital costs when compared to ground source heat pumps.
- The lower electrical capacity required reduces capital costs vs. direct Electric heating.

Although the base scenario in each project represented a negative NPV at this time, several variables have been identified that would warrant re-evaluation of the heat pump system to progress into a detailed design to provide an economical net present value (NPV) and internal rate of return (IRR).

The feasibility study demonstrates the potential for energy-efficient and sustainable heating systems in the vegetable growing sector, identifying the potential to increase the yield by almost three times with heating during the winter period by growing larger-sized summer variants with better production that command higher pricing due to the winter shortage.

Economic factors

- Changes to LPG, biomass fuel and electricity pricing.
- Reduction to heat pump CAPEX – increased market access and pricing
- Government incentives or grants – There are no WA govt abatements.
- Existing heating equipment reaching the end of service life, requiring replacement.
- Further inquiry and estimation of the increased yields and low/high sell scenarios
- Extension to required heating in shoulder seasons and increased greenhouse temp.

Next steps

Following the completion of site-specific feasibility reports, participating growers have commenced a pilot project progression and with another vegetable production business having already completed an installation of heat pumps (2).

Grown Smart Produce in Carabooda have commenced a full metering study to verify and improve modelling of their heating demands, collecting further baseline data to ensure an optimal outcome to the final design and installation of a pilot project for two greenhouses onsite and thermal storage requirements.

This would involve the design, supply, and installation of:

- Hydronic pipework in the greenhouses
- Heat pump and thermal storage at the selected site
- Control and monitoring equipment.

The success and performance of the Grown Smart pilot project to utilise heat pump technology for enhancing its production will be evaluated and provided for public access, demonstration, workshops, training and extension activities to be delivered by vegetablesWA, at Grown Smart, through the VegNET project.

Packaged cucumbers

Further information and resources

Contact VegNET Western Australia Regional Development Officer Katrina Hill at katrina.hill@vegetableswa.com.au or 0427 373 037.

- **Heat Pump Feasibility study webinar**
- **Considering a Heat pump installation? This link can inform your heat pump requirements against existing systems - Heat Pump Estimator**

VEGNET WESTERN AUSTRALIA

Regional Update

Resources available to boost input use efficiencies

Input use efficiency event spotlights progressive new growers 'business development insights by embracing the 'One Percenter' philosophy across their whole farm production system.

Grown Smart Produce Cucumber Farm in Carabooda, WA, hosted a summer event with an inspiring grower-led farm walk, specialist presentations, and a mini-field afternoon offering 50 attendees interactive exhibits from manufacturers of irrigation, soil, water and crop monitoring hardware, software, and new technologies.

Vegetables WA, VegNET and Irrigation Australia partnered to facilitate the event to highlight tangible resource opportunities available for both vegetable and cross-commodity horticultural businesses in the North Metropolitan Region of Perth to support water efficiency initiatives. Some of the financial grants available include:

- Gnangara water efficiency grants supporting infrastructure development ($50K) new technologies and soil health programs ($30K) available from DPIRD
- Soil health consultation or water management vouchers (5K)-DPIRD

VegNET projects available to growers include Input Use Efficiency (IUE), Biosecurity Pest and Disease communications, business capacity cost and labour and Innovation Fund projects.

Attendees engaged in presentations by Doris Blaesing and Carl Larsen of the Soil Wealth ICP team that focused on water and nutrient efficiency and current opportunities within the Soil Wealth Program including a new regional Nutrient Use Efficiency project.

Certified irrigation designer Paul Wilmott detailed the aspects of a whole-farm water efficiency consultation available through the Gnangara water efficiency voucher scheme. The benefit to growers in taking up the opportunity is a fresh review of current irrigation practice and design to improve both efficiency and crop health.

Host growers and former plumbers led an enlightening farm tour to give insight into VegNET-supported whole-farm metering study that contextually demonstrated how and why the monitoring baseline data has improved their business capacity and informed future investment and funding leverage. Some of the initial results include:

- Informing the final design of a closed-loop water and nutrient recycling system
- The initiation of a heat pump pilot project see page 138.
- Climate and water monitoring equipment requirements for future Tech upgrades.
- Waste Management - Value add product development.

Funding contributions are available for these projects.

The event concluded with a networking opportunity, fostering connections among participants, exhibitors, and industry experts. This has sparked new project partnerships with VegNET, Soil Wealth ICP with regional farm visits and furthered industry collaboration driven by overwhelming interest in protected cropping systems – from startups to system improvements and the adoption of new technologies.

Manufacturers exhibiting - Swan Systems, Wildeye, Toro, CropX, Sentek, WASP, HR Products.

Above L-R. Grower sharing new greenhouse build design. Grower Doug Chamberlain leading Farm tour explaining Cooling System.
Inset. Doris Blaesing Soil Wealth ICP presentation on water and nutrient use efficiency.

FIND OUT MORE

Contact contact Katrina Hill on 0427 373 037 or email katrina.hill@vegetableswa.com.au.

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Project Number: VG21000

Hort Innovation VEGETABLE FUND

WIDE BAY BURNETT

VEGNET WIDE BAY BURNETT

Regional Update

On the forefront of Biosecurity and Pest Pressures

With the unexpectedly wet summer, it comes as no surprise the region is now experiencing higher pest pressures. The VegNET project's focus over the past three months has been on biosecurity and managing pest pressures. Shakira Johnson from AUSVEG joined Regional Development Officer Jessy Logan on farm visits and participated at the Region's annual agronomist workshop in November.

More than 20 Agronomists and industry representatives met to understand the latest diagnostic tools and Integrated Pest Management work being conducted for Exotic Leaf Miners and Fall Armyworm. John Duff, Senior Plant Protectionist shared his wealth of knowledge, with Praise Tadle and Greg Owens supporting him through practical demonstrations. The hands-on learning was a great opportunity for participants to experience various beneficials and pest samples and better understand available chemistry and resistance issues found to date.

Whilst Shakira was in the region, Jessy also hosted a Biosecurity morning tea, inviting key government personnel from the Queensland Department of Agriculture and Fisheries to speak with our biosecurity industry stakeholders. This was a great opportunity to network with government and learn the challenges both sides face when dealing with biosecurity related issues. Collaborations such as this will be key to effective biosecurity outcomes for growers across the region.

Above L-R. Agronomist Workshop group shot. Workshop practical session.

With the help of the VegNET program, Queensland Department of Agriculture and Fisheries were also able to collect enough samples from the region to start their native colony of Fruit Fly in their Research Facility Located in Redlands. The Fruit Fly colony will be used for market access research trials across various commodities in the region, with the initial focus being on Avocados, there is also opportunity to consider vegetable commodities in the future if market access needs arise. As this particular pest can vary across regions it was important the colony was sourced from local farms in Bundaberg. We thank the growers involved who allowed access to their properties for the collection of larvae from their spent crops. Without strong industry and government partnerships this type of Research and Development wouldn't get off the ground.

The VegNET program in conjunction with RapidAIM has also completed the extension and expansion of the RapidAIM Fruit Fly Forecasting trial across an additional nine farms (bringing the total to 18 farms across the Bundaberg region). The real time data received from across the trapping grid will strengthen the forecasting reports developed for all growers to access. Positive feedback has been received by those involved. Knowing the timing of pest activity and pressure trends has allowed for better management of insecticide applications, saving money on input costs. Having this understanding of pest pressures gives growers greater control with managing Fruit Fly on farm.

For those interested in seeing forecast data please follow the link pest-forecast.rapidaim.io/bundaberg

Fall armyworm pressures have also spiked over the recent months, thanks to ideal weather conditions disrupting monitoring and spray application timings, allowing populations to grow. The Bundaberg Fruit and Vegetable Growers in conjunction with the VegNET project will be supporting lure trials across the region to monitor their effectiveness to FAW. The VegNET program is also eagerly awaiting RapidAIM's new FAW real time monitoring trap, which is in the final stages of development. The new traps will be able to not only attract Fall Armyworm moths and real time monitor numbers, when the moth exits the trap they will take entomopathogens with them. This pathogen is then spread to other FAW moths, eliminating them before they can cause further crop damage

As 2023 wrapped up it was important for the VegNet Regional Development Officer to look back at what the VegNET program had delivered throughout the year. An annual summary report was developed and shared with growers across the region and reminded us of the great traction the program had achieved.

For those interested in reading the Project Summary for 2023, please follow the link to access: bfvg.com.au/bfvg-services/projects-vegnet/

The real time data received from across the trapping grid will strengthen the forecasting reports developed for all growers to access.

FIND OUT MORE

Contact your Regional Development Officer: If you would like to take part in one of the Wide Bay Burnett VegNet trials, or have an issue you would like to discuss with your VegNet RDO, please contact Jessy Logan on 0407 366 797 or email vegnet@bfvg.com.au

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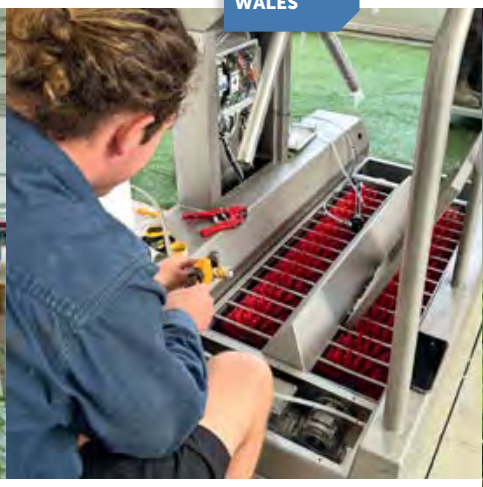
Project Number: VG21000

Hort Innovation VEGETABLE FUND

Above. Jessy Logan speaks with Dicky Bill farm manager, Pete Lisle. **Inset.** RapidAIM trap.



VEGNET NEW SOUTH WALES

Regional Update

Nursery seedling producer Jack Mooney in focus

LOCATION

Wells Crossing, North Coast, NSW

Jack Mooney is the founder and owner of Provenance Propagation in Wells Crossing, 30km south of Grafton. New South Wales Regional Development Officer Sylvia Jelinek chats to Jack about his business and its innovations as well as R&D practices that he is focused on such as biosecurity and strict farm hygiene procedures, and grafting optimisation. Jack Studied at the University of New England and completed his PhD in Grafting of herbaceous plants.

Describe your business and the products grown

Provenance Propagation is a propagation nursery of grafted cucumbers, eggplants, capsicums, tomatoes and watermelons. The nursery is 5,700m^2 under glass.

What challenges do you face as a vegetable grower?

Just like vegetable growers, nursery businesses are affected by fruit and vegetable prices, stemming from super-market decisions. These have a flow on affect to agents, growers, and seedling/propagation nurseries.

Pest and diseases are always at the forefront with lots of mitigating steps to prevent infestations.

As a business owner, propagation nurseries have the biggest lead time to think about in the supply chain to ensure our stock numbers match customer demand.

How do you manage these challenges, or try to overcome them?

Some challenges can be out of your control, but one I control is putting in place biosecurity measures. I recently installed a Royal Brinkman Clean Gate Total which brushes and disinfects shoes on entry and sanitises hands. The glasshouse boasts a top-of-the-line recirculating irrigation system with UV treatment to eliminate any waterborne diseases.

What new innovations, research and/or practices has your business implemented recently?

We designed are own grafting and healing technology for tomatoes and most recently for cucumbers, involving temperature and humidity control growth chambers in a vertical growing system. I have the infrastructure to handle large volumes and I am able to provide fusarium resistant plants to local growers.

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

The farm runs on net water. All the water is captured from rain and recycled which guarantees water security into the future. Having a full recycling system with UV treatment is the pinnacle to having disease free plants.

Farm hygiene and biosecurity is the one of the most important factors to growing. Disinfecting surfaces, trolleys and growing bays in between orders is a high priority. This ensures sustainability of healthy seedling production.

Above L-R. Staff at Provenance Propagation. Royal Brinkman Clean Gate Total being installed. **Inset.** Jack Mooney, founder and owner of Provenance Propagation. *Images courtesy Provenance Propagation.*

In terms of research and development, what do you think is vital to the vegetable industry right now?

For grafted cucumbers, new rootstocks that are easy to grow and affordable, optimised growing techniques to provide the best product for our customers that will grow better, flower and fruit sooner for them.

How did you become involved in the vegetable industry, and how did you get to where you are today?

I worked on a large Australian vegetable producer as a nursery manager for four years, producing more than 800,000 seedlings a year. I went to Canada for a year and worked as a senior grower at Roelands Plant Farms in Ontario. Roelands Plant Farms was turning over 21 million plants per year at the time of my visit. I taught grafting in exchange to learn about the nursery business. During that time, I started planning and searching for funding and shareholders to bring my dream to life.

What is your proudest achievement as a vegetable grower?

80,000 grafted tomatoes, my largest single order delivered in full and on time ('DIFOT')! If the customers are happy, I'm happy!

Do you have future plans for the farm – is there a particular direction you'd like to pursue? Where would you like to see the business develop across the next decade?

As the farm is already capturing net water, I want to investigate renewable energy further, with a plan to prepare for potential expansion. My take home message from the Canadian trip was always plan for the facility to be bigger than you imagine. Running off a basic plan of 5ha under glass in this location, with the next five years to increase the farm size to 2.5ha in line with customer demand.

Above. Grafted cucumbers growing at Provenance Propagation. **Inset.** Aerial of property. *Images courtesy Provenance Propagation.*

Below. Matthew Plunket with Jack Mooney on a recent visit. *Image courtesy Sylvia Jelinek.*

Created out of need, Provenance Propagation is the only high-tech grafting facility for the free market on Australia's east coast.

FIND OUT MORE

Contact Sylvia Jelinek on 0427 086 724 or email sylvia.jelinek@lls.nsw.gov.au

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VEGNET SOUTH AUSTRALIA

Regional Update

First Annual State of Industry Report for SA Vegetable Growers

AUSVEG SA has secured funding from the Department of Primary Industries and Regions SA for the first annual State of the Industry Report into intensive horticulture which will provide economic analysis on fresh produce margins, economic contribution of the sector and key opportunities moving forward.

The Annual State of the Industry Study is an important initial step for government and industry to better understand key issues which will inform future industry and policy responses and quantify the investment potential and economic story of this important sector to the state economy. AUSVEG SA has engaged the South Australian Centre for Economic Studies (SACES) to develop an annual State of the Industry report with support from AUSVEG SA and VegNET SA to investigate key issues for industry.

AUSVEG SA first proposed the Annual state of the Industry Study to the then Labor opposition in late 2020 as a key part of the platform to grow vegetable and intensive horticulture in the state. The intensive horticulture industry is valued at over 1.5 billion in Adelaide's North and vegetables worth $2.5 billion statewide, so it is important to understand the pressure points, investment potential to inform industry and government policy development moving forward.

With expected continued food inflation, food security post COVID-19 is expected to become a critical public policy issue in the coming years, along with health as lower income families face challenges in equitable, affordable access to nutritious fresh produce.

At present, growers face considerable challenges, producing at record low margins of 1-5 per cent while retailers post record profits and consumers face pressures to put food on the table in the impending cost of living crisis. It is critical that in the current environment government and industry understand the market challenges facing our growers.

The inflationary pressures on food and fresh produce have seen individual food inflation rises north of 10 per cent and there are ongoing challenges of consolidation and smaller growers being forced out of the industry. In spite of these pressures, there is also a strong potential for further investment in the sector which we are seeing with institutional investors entering the industry and family businesses investing strongly for the future.

Above. Braham Produce.

The State of the Industry study has been designed to achieve the following key objectives:

- Better understand retail margins and validate existing data in an empirical manner to understand the impacts of the current market environment on growers and SA consumers.
- Improved knowledge of pressure points for industry and investment opportunities to better inform public policy around key investments such as the Northern Adelaide Irrigation Scheme.
- Development of data sets to better understand the impact of retail behaviour on the sector and ability for industry and government to demonstrate and hold accountable current practices.

From this foundation, years two and three of the program will focus on expansion of the commodities into the farmgate vs retail returns analysis, continuation of survey work on grower challenges and sentiment and further analysis in areas such as grower costs, inflation in prices at the retail level and likely causes of cost-of-living pressures for consumers.

Cost of living is expected to continue to be a key challenge for state and federal governments in the coming period with Agricultural expected to play a key role in providing solutions and initiatives to ease supply side pressures. The State of the Industry Study is an important tool for industry and government to better understand these issues over the coming years which will increasingly affect the lives of South Australians.

AUSVEG SA looks forward to working with VegNET SA and SACES to complete this important piece of work which will quantify retail margins for key produce lines grown in the state and be an important advocacy tool moving into the new year.

Inset. Virginia Farm Produce.

AUSVEG SA plans to evolve the study over a three-year. In the first year, the focus will be on developing a methodology for a grower sentiment survey, ground proofing of initial analysis of farmgate vs retail returns for a select group of commodities and preparing baseline economic analysis of the contribution of the sector (in particular, the industry in Adelaide's North).

FIND OUT MORE

Contact Peta Coughlin, AUSVEG SA on 0409 029 745 or email peta.coughlin@ausveg.com.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 VEGETABLE FUND

VEGNET SOUTH-EAST QUEENSLAND LOCKYER VALLEY

Regional Update

Whilst summer is a quieter time of year there are still a number of crops in the ground including pumpkins, sweetcorn, beans and melons. Most growers are looking forward to improved opportunities in 2024.

The Lockyer Valley Charity Gala Dinner last November was a welcome chance for growers to come together to celebrate the region and industry, meet old friends and connect with new ones.

The evening raised $140k for Icon Cancer Foundation and Life Flight, with more than 450 guests attending. The MC for the night was comedian Merrick Watts.

Events such as the Gala Dinner, grower BBQs are an important part of the social network of the region, and it is opportunity for industry updates to be given by guest presenters.

In the first few months of 2024 we are looking forward to the Lockyer Valley growers' group Growers BBQ where the CSIRO will present a Supply Chain Resilience study in the Lockyer Valley. Rachel Chambers CEO of QFVG will also address the group. On the 15th February there will be a Working lunch looking in detail at energy specifically electricity consumption, guest speakers from the NFF will discuss audit programs and Electricity Tariffs.

Save the date After a very successful 2021 expo, planning is full steam ahead for the Lockyer Valley Growers Expo 2024 to be held 14-15th June. As the last one was held during COVID, the region is looking forward to welcoming interstate visitors this year.

As we head into 2024 there are a number of issues facing growers in the Lockyer valley and Southeast Queensland.

Weather Ongoing storms through November to January have put a dampener on the positives that usually come out of a summer with good rainfall. Hail and minor flooding have resulted in crop losses across the region. Some parts of south east Queensland have had a disaster declaration and are eligible for assistance.

Biosecurity Biosecurity is an ongoing issue and is never far from the minds of growers. On the 7th of December a Fire Ant GBO workshop was held at Browns Plains. The workshop involved discussions around proposed changes to the regulations including more risk mitigation options for hay and soil; restrictions on the movement of nursery tube stock will be lifted; baled cotton will have restrictions; businesses that move fire ant carriers must keep high risk parts of their sites free from fire ants. In addition, a person managing land development or construction sites greater than 2,500 square metres must develop a soil disturbance plan.
General biosecurity issues and in particular those that form part of an incursion were discussed at a Biosecurity Response Readiness Training session held in Toowoomba in December, where representatives from a range of agricultural enterprises attended.

Grower concerns and issues

Many growers have expressed concerns about the continued pressure for increasing input prices, and poor farm gate pricing. Some areas of the region are still recovering from flood damage and looking to consolidate their enterprises and expenditure.

Drought Resilience Planning

A workshop regarding the Queensland Regional Drought Resilience Planning was held in December, hosted by the Queensland RDRP. The project sought advice and feedback from individuals and organisations. The RDRP is a regional plan that will complement farm-based drought-related activities and plans such as a Farm Business Resilience Plan. More information is available here: rdrpqld.org.au

Above L-R. Sweet Corn - January 2024. Young Bean crop - January 2024. **Inset.** The Lockyer Valley Charity Gala Dinner 2023.

FIND OUT MORE

Contact Darren Brown, Lockyer Valley Growers on 0456 956 340 or email ido@lockyervalleygrowers.com.au

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Hort Innovation VEGETABLE FUND

VEGNET VICTORIA NORTH, WEST AND SOUTH-EAST

Regional Update

At the beginning of 2024, the VegNET – Victoria (North, West and South-East regions) project as well as the Regional Development Officer, Danielle Park, transferred to the Victorian industry group, AUSVEG VIC. In this column, we introduce a number of the local growers and industry members that will help guide the project into the future.

In this first VegNET update with AUSVEG VIC at the helm, there is the opportunity to highlight a few of local vegetable producers and industry members who are helping to provide guidance to the project through its Regional Extension and Advisory Group (REAG).

The REAG plays a critical role in setting the direction and ensuring relevance of the VegNET project in Victoria's North, West and South-East regions.

The Werribee South Perspective

With a vast knowledge of vegetable production and the challenges and opportunities facing the production systems in the Werribee region of Victoria, Stephen Moore from E.E. Muir & Sons Pty Ltd has been a member of the VegNET REAG for a number of years and we continue to seek his input into project direction.

Stephen has already made a significant contribution to the group, with an instrumental role played in the investigation of native vegetation insectaries in the Werribee South region. The focus in this area, resulted in the involvement of Port Phillip and Westernport Catchment Management Authority and later Melbourne Water in supporting the trial of native vegetation insectaries (NVI) in the Werribee region.

A Voice from Victoria's North

A long standing member of the VegNET REAG, Nathan Free of Wattle Organics is a grower from Lake Boga near Swan Hill in Victoria.

Nathan has long held an important role in the Victorian vegetable industry and continues to contribute and participate to the broader vegetable industry and its future. Nathan's contribution currently includes that of VFF Horticulture Director.

As a member of the REAG, Nathan provides invaluable insight into the production systems and opportunities in growing vegetables across Victoria's Northern region, where climatic conditions, crops grown and logistics can be markedly different to the other key growing regions in the state.

Statewide Industry Perspective from AUSVEG VIC

As one of the new members to join the REAG in 2024, Jo Van Niekerk is welcomed to the group.

With more than 25 years' experience across ornamental and vegetable production horticulture, Jo believes her network and relationships across the industry, coupled with her passion for serving Victorian vegetable growers on the AUSVEG VIC Executive Committee, will make her a useful addition to the REAG.

"The move of the project to AUSVEG VIC means the direction and decision-making process is that much closer to stakeholders, that is, Victorian vegetable growers.

"AUSVEG VIC is excited to now be involved at the very start of this process, and looks forward to engaging with our grower members across the state and supporting Danielle in this important work."

Register for VegNET Victoria's Regional Update

A calendar of events are planned for 2024 as a part of *VegNET 3.0* and the VegNET – Victoria (North, West and South-East) project. To find out more on what is happening in the region contact Danielle Park at rdo@ausvegvic.com.au

Above L-R. Stephen Moore, E. E. Muirs in front of a Native Vegetation Insectary in Werribee South. Nathan Free, Wattle Organics.
Inset. Jo Van Niekerk, Boomaroo Nurseries.

FIND OUT MORE
Contact VegNET – Victoria (N, W and SE Regions) RDO Danielle Park on 0432 324 822 or email rdo@ausvegvic.com.au

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Hort Innovation VEGETABLE FUND

VICTORIA
GIPPSLAND

National Vegetable
Extension Network
VICTORIA - GIPPSLAND

The practicalities of soil data monitoring in intensive vegetable production

Introduction

Soil data monitoring technology can see a vegetable farm improve its water use efficiency and farm practices by measuring the moisture and salinity levels throughout the soil profile. This provides information on the saturation point, root depth, soil composition and potentially even provide an indication on nutrient levels within the soil profile. While all this data sounds fantastic on a glossy brochure, what are the realistic benefits and challenges of using the technology in intensive vegetable production?

VegNET Gippsland, through Food & Fibre Gippsland's ongoing funding from the Commonwealth Government's Future Drought Fund through a "Hub-Hub" project – a collaboration between the Victorian, WA and NT Drought Resilience Hubs – hosted a soil moisture monitoring field day in late November 2023. The field day aligned strongly with VegNET Gippsland's water quality and security and smarter growing focus areas and saw a successful collaboration between VegNET Gippsland, Elders Bairnsdale, Agriculture Victoria and Sentek Technologies. The field day focused on providing the 25 attendees with the opportunity to learn about the practicalities of adopting soil data monitoring technology in intensive vegetable production.

Participants at the VegNET Gippsland Soil Moisture Monitoring Field Day in November 2023.

Tailored event

The field day consisted of three key components – a technical presentation, networking lunch, and field demonstration. Medi Zaboli and Marc Intervera from Sentek Technologies led a technical discussion on soil data probes and how they work, including how growers can utilise the data interface; integration of additional technologies such as weather stations; and how to interpret the data to inform decision-making. Lunch and a networking session were then provided to allow attendees to have individual conversations with the presenters and other attendees.

Noel Jansz and Hugh McShane, agronomists from Elders Bairnsdale, led a field demonstration on the installation and removal of a probe and provided growers with an

KEY MESSAGES

- **The field day provided growers with the opportunity to learn about the practicalities of adopting soil data monitoring technology in intensive vegetable production.**
- **The agronomists and growers who have been trialling the soil data monitoring technology for the last two years believe that while there are challenges associated with its use, the benefits out-way the challenges.**
- **Growers have changed farming practices following the integration of soil data monitoring technology into their farming operations, and have seen an increase in the consistency of crop yield and quality.**

Hort Innovation 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

Food & Fibre Gippsland

AUSVEG

National Vegetable
Extension Network

The practicalities of soil data monitoring in intensive vegetable production

agronomist's perspective on the technology. Noel was also joined by several Gippsland growers who have been trialling the technology in intensive vegetable production for over two years as part of a larger project, to answer questions from a grower's perspective.

Elders agronomist Noel Jansz pointing out key features in a soil moisture graph.

The practicalities

Feedback from the event showed that 40% of growers reported owning probes although not really using them, suggesting that there are barriers to the use of soil data monitoring technologies. Time, probe installation/removal, smartphone interface, and technical and agronomy support were some of the key barriers raised by growers at the field day.

It should come as no surprise that time is one of the primary barriers to the continued use of soil data monitoring technology in intensive vegetable production. With growers under constant time pressures, there is minimal spare time in the day to be sitting in front of a computer analysing detailed soil monitoring data. With substantial amounts of data available from a probe, the time required to fully analyse and understand the information can be quite significant.

Support from an experienced agronomist to analyse and interpret the data can help to relieve the time burden, however it can also add an additional cost to the use of the technology. The time input required is particularly significant for growers new to the technology, with it potentially taking over a year to confidently integrate the technology into an intensive vegetable production system. An element of self-discipline also exists, with growers only getting out as much as they are willing, or able, to put in.

Time also comes into the play with respect to the movement of probes from crop to crop and the associated installation and removal processes. This is particularly relevant for baby leaf growers, where the short growth cycle of the crops means that probes are constantly being removed, moved and re-installed. Despite this, one grower who has been using the technology for over two years commented that he was surprised at how useful he found a probe located in a spinach crop to be.

Multiple attendees noted that a key learning they took from the field day was the importance of taking the time to install the probe correctly, including the use of the baseplate, as incorrect installation can cause the probe to display inaccurate soil moisture readings. Challenges were also noted in the installation of probes in some soil types, with the risk of air pockets impacting readings, as well as topography limiting the value of the data.

A challenge that was actively discussed by attendees at the field day was the usability of a probe's smartphone interface while out in crops. A consequence of growers' lack of time and the nature of farming, is that growers are rarely in front of a computer with large monitors; rather, they are in the field with only a smartphone to access the probe data.

Elders agronomists Noel Jansz and Hugh McShane, along with Marc Intervera from Sentek Technologies, demonstrate the installation of a soil data monitoring probe.

Hort Innovation VEGETABLE FUND

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Food & Fibre Gippsland

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National Vegetable Extension Network

VICTORIA GIPPSLAND

The practicalities of soil data monitoring in intensive vegetable production

The field day was a collaboration between Sentek Technologies, Elders Bairnsdale, Agriculture Victoria, VegNET Gippsland and local Gippsland growers.

The benefits

Many growers noted that one of the key learnings they took away from the event was that soil data monitoring can be used to make more improved irrigation decisions to ensure crops have adequate moisture throughout all growth stages. It's important to note, however, that the adoption of this technology is not about replacing current methods of irrigation scheduling; it is about improving a grower's understanding of the interaction between plant, water, and soil.

The field day demonstrated that the benefits of using soil data monitoring technology can be broader than simply increasing irrigation and water use efficiencies. One attendee noted that they see the probes as a "tool to assist [in] gaining a more in-depth knowledge about how crops are growing - beyond just irrigation." From information on moisture and fertiliser movement through the soil profile, to the integration of satellite imagery and weather data, and an understanding of root zone depth, the benefits of the technology are broad-reaching. One of the project's growers confirmed that over the two years they have been trialling the technology, it has triggered them to review and modify their farming practice to help improve infiltration rates and led to an increase in the consistency of crop yield and quality.

The technical session demonstrated to growers how far the technology has come in recent years, with increased data outputs, integration of both satellite and weather station data and multiple ways to view, compare and analyse the multitude of data sets available through the technology.

Conclusions

It was clear throughout the field day that the agronomists and growers who have been trialling soil data monitoring technology for the last two years believe that while there are challenges associated with the use of the technology in intensive vegetable production, the benefits outweigh the challenges. Walter Chadwick from Tripod Farmers stated during the field day that he has changed and improved farming practices following the integration of soil data monitoring technology into his farming operations. This was echoed in the feedback from other attendees, with 90% of the growers who completed the feedback stating that they would likely change farm practices or advice following the event. Qualitative feedback also showed that there was a 70% increase in attendees' knowledge and skills associated with soil data monitoring technology following the event.

Next steps

It is hoped that Food & Fibre Gippsland's ongoing funding from the Commonwealth Government's Future Drought Fund will see the successful collaboration between VegNET Gippsland, Elders Bairnsdale, Agriculture Victoria, Sentek Technologies and Gippsland growers continue into 2024. VegNET Gippsland is also looking to deliver additional events and information to support growers to adopt soil data monitoring technologies across the region. To keep up to date with all VegNET Gippsland events, follow 'VegNET_Gippsland' on Facebook and Instagram.

Case study written and published by:

Emily Scott - VegNET Gippsland Regional Development Officer.

For more information email emily@foodandfibregippsland.com.au or call 0455 214 102.

With thanks to Noel Jansz, Walter Chadwick, Kane Busch and Scott Botten.

Elders Bairnsdale | Sentek | Agriculture Victoria

AUSVEG state update

VICTORIA

AUSVEG VIC are excited to announce that VegNET RDO Danielle Park has joined the team and will now work for the state organisation to deliver projects and assist growers improve their growing practices and profitability.

Danielle has a Bachelor of Agricultural Science from the University of Melbourne, and a Master of Business Administration from Charles Sturt University. She has over 20 years of experience across a wide array of ag/hort industries and roles, including on-farm operations and state government agricultural extension. She was an integral member of the Vic VID 2023 organising committee.

AUSVEG Vic President, Paul Gazzola expressed, "We are looking forward to working closely with Danielle and progressing issues that are relevant and important to Victorian vegetable Growers in the North, West & South East".

We welcome Danielle to the team and encourage any Victorian vegetable grower that may be interested in being part of her REAG (Regional Extension Advisory Group), to help guide projects and set direction, to reach out to Danielle on rdo@ausvegvic.com.au or call 0432 324 822.

SAVE THE DATE
SATURDAY 27TH APRIL
Annual Awards for Excellence 2024

Nominations are now open for AUSVEG VIC Annual Awards for Excellence, please go to: ausvegvic.com.au to download nomination form.

The AUSVEG VIC Awards for Excellence event shines the spotlight on some of the highest achieving Victorian vegetable growers in the industry, this year the MC is comedian Brian Nankervis.

The event offers a chance for the Victorian vegetable and potato value chain to come together every year to develop new and strengthen existing connections. The growers and industry members who are nominated provide a snapshot of the amazing achievements of Victoria's vegetable industry.

Sponsored by E.E. Muir and Sons book your table at ausvegvic.com.au

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NORTHERN TERRITORY

The Northern Territory has seen an extensive amount of flooding in January causing critical roads to be cutoff. Rail access has also been damaged resulting in limited supply of fresh produce to Darwin, regional towns, and indigenous communities. Rail freight company Aurizon reported that localized flooding north of Tennant Creek had damaged the Adelaide- Darwin railway. The freight will now be sent by rail to Alice Springs and then transferred onto trucks to reach the rest of the NT once water levels on the Stuart Highway subsides.

Vegetable growers in the NT often prepare for high levels of rainfall in the Wet Season (summer) and most do not grow in these months. Paddocks are often waterlogged, and the combination of heat and humidity can mean plant diseases are harder to control. The majority of the NT vegetable production is grown in the NT's Dry Season (April- October) and comprises of Asian vegetables to which the northern climate is best suited to producing. These vegetables are predominately sent to Sydney, Melbourne, and Brisbane markets and therefore, the NT relies heavily on importing their fresh produce from other regions of Australia for consumption, predominately Adelaide.

The NT vegetable industry hopes for a more profitable season for 2024 as market prices in 2023 were much lower in key commodities then 2023. In other Agricultural news, the NT's first Cotton Gin was opened in late 2023 which is expected to be fully operational in 2024. The Katherine Cotton Gin is anticipated to result in $30 million to flow through the economy in 2024 due to an expanding cotton industry in the NT with 11,000-15,000 hectares of cotton planted for the 2024 season.

Mariah Maughan
NT Farmers Association | ido@ntfarmers.org.au
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AUSVEG State News

QUEENSLAND

It's been quite the ride in Queensland over the summer months.

On the weather front we've had it all - extreme heat, bushfires, hail, storms, flooding, and cyclones - with each event impacting multiple parts of the state, some areas with cumulative impacts. Replanting after disaster is still a topic of contention with the State still not funding this activity however, currently we are throwing everything at this issue. We also have extra freight costs of $15 - $30 per pallet being added to growers in the far north due to damaged infrastructure extending freight routes.

As expected, all our growers have struggled to continually keep abreast of the multiple IR impacts with many reporting their current operating model is shaky at best. PALM worker costs, (not to mention the operational issues) are now prohibitive to growers who are now even more desperately seeking alternatives. Growers are now using the Horticulture Award rather than their zombie enterprise agreements with employees now reporting frustrations as to how this has detrimentally impacted them. We did try to say they wouldn't be better off overall – but what would industry know!

Lastly, we launched the We Give a Fork campaign in December ready to tackle all the challenges head on during the year. What we didn't expect was that our newly 'elected' Queensland Premier would throw whatever weight he yielded into the supermarket narrative. Some very clever 'cost of living' politics there! As growers would expect, we are making hay whilst the sun shines and are ensuring we combine forces to both protect and provide positive outcomes for horticulture. To find out more about the campaign head over to wegiveafork.com.au

We have very clearly heard our industry expects strong, loud and brave advocacy so if you like the direction we are going, then why not consider becoming a member today and help us steer the ship: qfvg.com.au/join

Rachel Chambers
QFVG CEO | rchambers@qfvg.com.au
Phone. 0488 034 344

NEW SOUTH WALES

Bringing anti-competitive behavior to account has been the focus of significant effort by NSW Farmers throughout the past six months. Growers are often price takers, and this is felt acutely in the horticulture industry.

As part of these efforts, NSW farmers has recently made a submission to the Unfair Trading Practices legislation consultation, and participated in the Australian Council of Trade Unions Inquiry into price gouging and unfair pricing practices, and the National Farmers Federation (NFF) Competition Industry Roundtable

As NSW Farmers welcomes an Australian Competition and Consumer Commission (ACCC) inquiry into the supermarket sector, submissions are being prepared for the Senate Inquiry into supermarket prices as well as the Food and Grocery Code review to highlight the concerns of members across a range of industries who are exposed to market power imbalances.

NSW Farmers has called for an independent review of the supermarket sector by the ACCC for some time, as the gap in prices between consumers and farmers grows. The ACCC has not reviewed the sector since 2008 and it was disappointing to see the recent recommendation to introduce an independent dispute resolution mechanism in the Food and Grocery Code ignored. The ACCC's unique powers ensure it can compel supermarkets to share their cost of production data – including the prices farmers are receiving – and interrogate their margins, ultimately providing a clear picture of any potential price gouging.

In recent months, NSW Farmers has also engaged in discussions with Assistant Competition Minister Andrew Leigh and created relationships with Treasury and the ACCC to communicate members concerns across directly. Messaging to government has been consistent with that of the NFF, who hosted a roundtable with the Assistant Minister and government representatives in December 2023.

As we look to the future, NSW Farmers continues to work with AUSVEG in partnership with the NFF and the NFF's Horticulture Council on competition reform to achieve better outcomes for the industries we represent.

Elen Welch
NSW Farmers
Senior Policy Advisor – Agricultural Industries (Extensives)
Phone. 0419 124 691

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