

# potatoes

## australia

| Winter - 2022



HORT CONNECTIONS 2022 A TREMENDOUS SUCCESS | AWARD WINNERS AND EVENT OVERVIEW  
AUSVEG INVESTIGATION | SPECIALS AND PROMOS IN THE FRESH VEG AISLE  
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## PotatoLink

Flip over the magazine to read *PotatoLink*.



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**AUSVEG**



## Editorial

After 12 months of significant disruptions due to COVID-19, issues throughout the supply-chain and increases to input costs, the Australian horticulture industry came out in force to attend Hort Connections 2022, which was held at the Brisbane Convention and Exhibition Centre from 6-8 June 2022.

Around 3,100 delegates from all sectors of the horticulture industry descended on the Brisbane Convention and Exhibition Centre for the event, which explored the theme of 'Growing Together'.

AUSVEG recognises the difficulties that growers are facing with rising input costs, labour shortages and unprecedented weather events. We believe Hort Connections was a much-needed opportunity for the sector to get off-farm, get together, catch up with old friends and meet new growers and industry members.

Throughout the conference, networking events were held to connect growers with agribusinesses, researchers, and representatives from all areas of the supply chain, transport and retail sectors.

This included the Hort Connections Gala Dinner, multiple off-site and on-site events held by Hort Connections sponsors and a variety of other events that coincided with the conference.

The Hort Connections 2022 trade show was a major highlight of the conference and presented an unparalleled opportunity for delegates to network with the leading supply chain partners in Australian horticulture.

It featured over 190 exhibiting companies from across every sector of the industry and provided delegates with the chance to look at the latest trends, technologies and services available to them to give their businesses an edge in both productivity and profitability.

The capstone event of Hort Connections 2022 was the Gala Dinner, where industry members from across the supply chain gathered to celebrate the achievements of the best and brightest in the Australian horticulture industry. Queensland avocado growers Annaleise and Lachlan Donovan were announced as

Syngenta Grower of the Year, while Costa Group's Elise Siliato won the 2022 IFPA-Produce Plus Marketer of the Year Award, sponsored by Seeka.

You can read more about Hort Connections 2022 in our feature section from page 8.

In a boost of confidence for future Hort Connections conferences, AUSVEG welcomed a government announcement that will result in \$6 million to support growth in large conferences and events for various agricultural sectors, including \$2 million support for horticulture industry events including Hort Connections.

This funding will provide a much-needed boost to support grower attendance at the event to develop industry partnerships, hear from the industry's leaders about innovations in the sector, and provide important opportunities to connect face-to-face with industry colleagues.



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**Michael Coote**  
CEO  
AUSVEG

## Message from the CEO

It was pleasing to see so many growers at Hort Connections in Brisbane in June.

Hort Connections encompasses the potato, vegetable, fruit, nut, cut floral and nursery sectors. This year, more than 72 event sponsors and industry organisations partnered to provide added value to delegates and allow them to access the expertise and services of a range of industry members in-person and online.

The three-day event was an opportunity for supply chain members, growers and industry stakeholders in the fresh produce and floral industry to come together and see the latest in technology and innovation, hear from industry experts, meet leading local and global agribusinesses.

I would like to thank the event's major sponsors, including Principal Convention Partner Hort Innovation, as well as the Australian Department of Agriculture, Syngenta, Coles and the Queensland Department of Agriculture and Fisheries.

There were also many opportunities to meet the AUSVEG Board and team at the AUSVEG Trade Show stand and at the many other networking events for growers integrated throughout the program.

While growers spoke to us about a wide range of issues, there were some common issues facing growers from every sector, and from all parts of the country.

The main issue on everyone's mind was the increasing costs of production.

AUSVEG – as the national industry body that represents the interests of potato growers to government and the broader supply chain – has stepped up our advocacy to ensure that growers' concerns are raised to all levels of government, including parliamentarians, ministerial and departmental staff throughout the pandemic.

AUSVEG is raising the issue of costs of production with the new ALP Government, including directly with the new Federal Agriculture Minister Senator Murray Watt at Hort Connections and in several follow-up meetings and industry – government roundtables.

Part of this work is raising the awareness of the increasing costs of production and what this means for retail pricing. What we have seen is that when the costs of fresh produce go up, as has been the case with fresh produce from the Lockyer Valley over recent months, the interest from the public and the media increases significantly.

AUSVEG has been active in the press, with retailers and throughout the broader supply chain highlighting the significant issues that growers are facing in getting fresh produce planted, harvested and sent to market. This includes continual monitoring of not only costs of production, but trade data to understand the market environment for growers, including changes in the level of potato imports.

The AUSVEG Board and team are here to support and help you through this difficult time. We are working in the background to represent the interests of growers on the issues that are impacting your business and your community.

I am confident that the industry will rebound from these difficult times and that our industry will become stronger and more resilient as a result of the hard work and dedication of growers all around the country who are working harder than ever before.



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# HORT CONNECTIONS

6-8 June 2022  
Brisbane Convention Centre

Growing together



## Syngenta Grower of the Year

Annaleise & Lachlan Donovan, QLD

L-R: Federal Agriculture Minister Murray Watt, Annaleise and Lachlan Donovan, Managing Director, Australia & New Zealand Syngenta Australia and New Zealand Paul Luxton



## IFPA-Produce Plus Marketer of the Year

Elisa Siliato, Costa Group

L-R: Federal Agriculture Minister Murray Watt, Elisa Siliato, IFPA-ANZ CEO Darren Keating



## Boomaroo Nurseries Women in Horticulture

Rien Silverstein, Vic

L-R: Lindy Nieuwenhuizen, accepting the award on Rien's behalf, Boomaroo Nurseries Director Nick Jacometti



## E. E. Muir & Sons Community Stewardship

Sam Kisvarda, Victoria

L-R: Sam Kisvarda, Flavorite Marketing Advisor Rruta Narula



# National Awards for Excellence Award Winners

The Hort Connections 2022 National Awards for Excellence Gala Dinner, sponsored by Costa Group, celebrated the outstanding achievements and contributions made to the Australian horticulture industry by growers, marketers, researchers and supply chain members.



## Corteva Agriscience Young Grower of the Year

Damien Manno, SA

Corteva Agriscience Area Manager Dan Cornally accepting the award on behalf of Damian Manno



## UPL Tech Innovation Award

Tim Bond – J-Tech Systems for its Aporo Robotic Fruit Packer

L-R: Tim Bond, Michael Caldwell, UPL Sub Region Manager Australia and New Zealand



## Butler Market Gardens Environmental and Sustainability Award

Marlon Motlop, South Australia

Butler Market Gardens CEO Rick Butler, accepting the Butler Market Gardens Environment and Sustainability Award on behalf of Marlon Motlop.



## Hort Innovation Exporter of the Year

Michael Simonetta, New South Wales

L-R: Federal Agriculture Minister Murray Watt, Hort Innovation CEO Brett Fifield, Michael Simonetta from Perfection Fresh



## Visy Industry Impact

Goulburn Murray Valley  
Fruit Fly Area Wide  
Management (FFAWM)  
program, Victoria

Goulburn Murray Valley  
Fruit Fly Area Wide  
Management program  
accepting the Industry  
Impact Award from Visy's  
Kym Ziersch



## Bayer Researcher of the Year

Peter Leach, Queensland

L-R: Peter Leach, Tony  
May, Head of Customer  
Marketing, Australia and  
New Zealand Crop Science  
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L-R: AUSVEG CEO Michael Coote, AUSVEG Chair Bill Bulmer, Federal Agriculture Minister Murray Watt and Senator Raff Ciccone.

## Growing Together – Hort Connections 2022 a tremendous success

After 12 months of significant disruptions due to COVID-19, issues throughout the supply-chain and increases to input costs the Australian horticulture industry came out in force to attend Hort Connections 2022, which was held at the Brisbane Convention and Exhibition Centre from 6-8 June 2022.

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Hort Connections encompasses the vegetable, fruit, nut, cut floral and nursery sectors. This year, more than 72 event sponsors and industry organisations partnered to provide added value to delegates and allow them to access the expertise and services of a range of industry members in-person and online.

The three-day event was the premier opportunity for supply chain members, growers and industry stakeholders in the fresh produce and floral industry to see the latest in technology and innovation, hear from industry experts, meet leading local and global agribusinesses and network at the most highly anticipated social event on the industry's calendar.

Major sponsors of Hort Connections 2022 included Principal Convention Partner Hort Innovation, as well as the Australian Department of Agriculture,

Water and the Environment, Syngenta, Coles and the Queensland Department of Agriculture and Fisheries.

### Business opportunities

#### Trade show

The Hort Connections 2022 trade show was a major highlight of the conference and presented an unparalleled opportunity for delegates to network with the leading supply chain partners in Australian horticulture.

It featured over 190 exhibiting companies from across every sector of the industry and provided delegates with the chance to look at the latest trends, technologies and services available to them to give their businesses an edge in both productivity and profitability.

The trade show was sponsored by Australia's Fresh Produce Markets. Over the three-day event, many growers and industry members were able to forge new partnerships with a range of leading

agribusinesses and reconnected with friends, colleagues and supply chain partners to celebrate the achievements of the horticulture industry through what was the most difficult year for many businesses and communities.

The Hort Connections 2022 trade show also featured a dedicated networking hour, with the trade show Happy Hour sponsored by Nufarm at the close of Tuesday 7 June, which allowed delegates to mingle with exhibitors around the entire trade show.

### Industry events

#### Dedicated industry speaking sessions

There were many informative and engaging speaking sessions at Hort Connections 2022.

- Supply-Chain and Production-focused speaker sessions, which covered a number of topics, such as:
  - o Retail landscape
  - o Food safety



- Digital decision-making
- Improving supply-chain performance
- Horticulture advocacy
- Crop protection
- Taking advantage of weather
- Growing innovation and food waste
- Plenary Sessions featuring leading thought-leaders and industry figures:
  - Federal Agriculture Minister Murray Watt
  - State of the Industry panel
  - Commentator Bernard Salt
  - Mulgowie Farming Company's Shane Quinn

AUSVEG also hosted its Annual Vegetable Industry Seminar, which covered important industry topics including:

- Soil health
- Horticulture extension
- Biosecurity
- Protected cropping
- Mental health and resilience

## Networking opportunities

Throughout the conference, networking events were held to connect growers with agribusinesses, researchers, and representatives from all areas of the supply chain, transport and retail sectors. This included the Hort Connections Gala Dinner, multiple off-site and on-site events held by Hort Connections sponsors and a variety of other events that coincided with the conference.



Shane Quinn from Mulgowie Farming Company

## Women in Horticulture

More than 300 delegates from the entire supply chain gathered at the Women in Horticulture event at Hort Connections 2022, proudly sponsored by Boomaroo Nurseries.

The annual Women in Horticulture event recognises the ever-important role that women play in the traditionally male-dominated sector and aspired to empower women in the agribusiness and fresh produce and floral communities to become stronger leaders in their industry and develop skills and strategies to build resilience.

The event featured guest speakers Catherine Velisha, Managing Director of Velisha Farms and winner of the

2021 Boomaroo Nurseries Women in Horticulture Award, and Shanna Whan, CEO and Founder of Sober in the Country.

## Gala Dinner

The capstone event of Hort Connections 2022 was the Gala Dinner, where industry members from across the supply chain gathered to celebrate the achievements of the best and brightest in the Australian horticulture industry. Queensland avocado growers Annaleise and Lachlan Donovan were announced as Syngenta Grower of the Year, while Costa Group's Elise Siliato won the 2022 IFPA-Produce Plus Marketer of the Year Award, sponsored by Seeka.



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## The Unbreakable Farmer: Breaking down mental health stigma in the bush



Warren Davies.

The day Warren Davies lay on his dairy floor wondering if the world was better off without him was a turning point in his mental health and personal journey. At the Annual Vegetable Industry Seminar, Warren described his mission to raise awareness and inspire conversations about mental health – particularly in regional and rural communities. Sophia Auld reports.

Warren's tipping point came after a series of stressful farm-related events, but the seeds were sown earlier. His family moved a lot, making it hard to establish childhood friendships. The transition to high school was particularly tough.

"I was the only kid from my primary school who ended up there. The verbal bullying started the first day. It became physical by the end. That had a major impact on my mental health but also my education. I went from a straight A student in year seven to failing in year nine," Warren said.

A move to the country proved positive, with Warren soon finding work on a dairy farm.

"Luckily it was with one of the best farmers in the district. He said, 'if you stick with me, I'll teach you everything you need to know'. I learned to be a plumber, welder, to grow grass, and fix cows and tractors."

Another great thing was finding his girlfriend, now his wife. Getting engaged when Warren was 22, they purchased 200 acres next to his parents' property and joined them together in a family business.

### Farming challenges set in

However, they soon encountered troubles. First came a flood. "My farm turned into a swimming pool. We were underwater for about four weeks," Warren said this taught him about overcoming adversity, but also triggered his adverse childhood experiences.

Next came a "family bust-up", which led to Warren and his wife buying out his parents' property. Despite a robust

10-year plan, their business dream began unravelling when prolonged drought struck.

By the third year, the situation was dire. "I was in a really dark place, spiralling out of control. When cows I was supposed to look after we're starting to die, I felt a lot of guilt and shame."

After coward punching his best mate on the AFL field, "I knew I was in a bad spot," Warren said. "I started to isolate myself."

Following this came the "dark afternoon" lying on the dairy floor. "I call that my 'two feet of perspective' because at that moment, where I thought ending my life was the best option, my whole life flashed before my eyes. Life gave me two choices: I could continue to spiral out of control, or I could choose to become better," he said.

"I chose to become better that afternoon."

Ongoing drought meant they walked off their farm. Warren's quest to find identity and purpose outside farming led to his speaking career as The Unbreakable Farmer.

### Prioritise your mental health

Warren noted farmers are great at protecting their soil and crops, and should do the same for their most important business asset – themselves. He described three 'As' for doing this.

First is awareness. He recommends reviewing your social, physical, emotional, vocational, and financial wellbeing regularly, and knowing your values.

Second is acknowledge: your support networks (particularly finding five people you love and trust), your triggers, and the

non-negotiable things you need to do for yourself.

Thirdly, act on what you can control, including practicing gratitude and mindfulness.

### Helping others

Warren also offered tips for helping someone dealing with mental health challenges, including listening attentively, not judging, and being empathetic. He emphasised the importance of seeking help if you or someone you know needs it. Organisations like Lifeline and Rural Aid have the training and resources to assist.

#### Find out more R&D

The AVIS videos will be available on the AUSVEG website shortly.

*The Annual Vegetable Industry Seminar* 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: VG21003

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## Building a thriving business: 5 lessons from a successful wine-preneur

Justin Dry has experienced the highs and lows of business – from hiring (and firing) his first employee at age 10 to owning 43 properties to losing everything at 30. At a breakfast session sponsored by Perfection Fresh Australia, the CEO and co-founder of Vinomofo shared some lessons with Hort Connections delegates. Sophia Auld reports.



Justin Dry.

Justin Dry says wine is in his DNA. His ancestors farmed some of the first vines in the Barossa Valley. He was tasting wine at 16, studying it at 18, and by 23 “was completely in love, but I wasn’t sure if wine would be a passion or a profession”.

Thus followed a stint in stockbroking and property investing. Justin’s prospects looked great, until a decision made “with my heart and not my head” (going guarantor for a family member’s business) saw him lose everything.

“At 30 I was starting again,” he said. “These were the hardest years of my life. I hit rock bottom.”

But rock bottom led him back to his first love, where he launched his next entrepreneurial steps. While backpacking overseas, Justin sensed the potential of a “Facebook for wine” to build community around the thing he loved. He started social wine review site Qwoff, which “did quite well in terms of community but the business model sucked.”

His next business, Road to Vino, involved “travelling the country, surfing and drinking wine,” which “didn’t pay much, although it paid enough.” Then came The Great Australian Wine Adventure – an app which presented offers (such as a cheese platter) to people on winery check in.

“You can see the evolution of the business,” Justin said. “Qwoff was about community. Road to Vino was about

expanding our network and storytelling. The third was making offers around wine.”

This took him to 2010, when the fastest growing company in the world was Groupon, Justin said. “I thought *what if we do a Groupon for wine?*”

Vinomofo, an online wine retailer offering daily deals, was launched in 2011. It now has 500,000 members, \$50 million in revenue, and over 100 staff.

Justin shared five lessons to help people in the horticulture industry build businesses that will thrive into the future.

### 1. Disruption is inevitable and continuous

“Think about industries that have been disrupted,” Justin said. “Blockbuster went bankrupt in 2010. Uber overtook taxis within seven years. You can bury your head in the sand, or you can face it.”

He said business owners must think about how blockchain and Web 3.0 could change the industry. “Trust me, they’re coming, and it’s going to be as big as the internet, if not bigger.”

### 2. Go early

Justin uses a surfing analogy to explain how his team approaches new ideas. Don’t start paddling too early because you’ll still have to wait for the wave. Don’t

delay to the point where competition has increased or the wave has passed altogether either. Rather, aim for the stage where “you just paddle a couple of times and you’re first and early onto the wave.”

### 3. Get inspiration from outside your industry

Justin said Vinomofo “didn’t recreate the wheel” but drew on existing ideas like Facebook and Groupon. “Just elevate above what you’re doing and see if there’s opportunities or inspiration from other places.”

### 4. Focus

He also suggested getting good at a few things. “You can’t be all things to everyone. Tim Ferris said ‘one gun, six bullets’. Make sure you’re targeting the right things.”

### 5. Always be learning

Finally, Justin suggests being curious. “Epictetus said, ‘Man cannot learn something he thinks he already knows’. The best companies and the best people in any industry are constantly questioning and open to learning.”

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- Grower and consultant, Tim Walker

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## Sober in the Country: Changing rural lives with alcohol awareness

Shanna Whan's 20-year alcohol addiction nearly led to her death. It also made her the ideal person to start a charity dedicated to making it okay to say no to beers in the bush. In her Women in Horticulture session – sponsored by Boomaroo Nurseries – the CEO and Founder of Sober in the Country discussed why alcohol is a problem in rural communities and what the industry can do about it. Sophia Auld reports.

While drinking wreaked havoc in her life, Shanna emphasises Sober in the Country is not anti-alcohol.

"We're just pro-mates and pro-choice," said the 2022 Australian of the Year Local Hero recipient.

"We want to see healthy, happy people who, if a problem arises, know what to do and where to go for help. We want to open up conversations around alcohol in the bush."

Spending 20 years working in corporate ag, Shanna was a "serious red flag drinker". A series of traumas she experienced as an 18-year-old jillaroo led to heavy binge drinking and a party-girl reputation. "I was the crazy one who did the dumb stuff. It was funny for a while, until I was getting picked up off the floor and going to emergency. Binge drinking took me to the depths of hell.

"In 2015, I was so sick my family was planning my funeral." Her turning point came after meeting another person battling alcohol addiction. "The day I met someone else like me was the day my world changed."

### The joy of missing out

Shanna said getting sober has had numerous benefits. "Some people feel sorry for me because I can't drink, but my life now is bloody amazing. Once I was sober, I had the greatest health, energy, and zest for life."

While she acknowledged many people can handle a few drinks, she noted alcohol addiction is a significant problem in rural communities. At her talks, nobody has yet put up their hand when the group was asked if they didn't know someone affected by problem drinking.

She challenged the industry to think about alcohol awareness, making four suggestions.

### 1. Offer alcohol alternatives

Many events, from beers after work to corporate functions, are steeped in alcohol culture, Shanna noted. "I dream of the day there are delicious alcohol alternatives aplenty, where people like me don't have to spear tackle waitresses when they see sparkling water with lime in it." Consider stocking your fridge with alcohol-free alternatives and offering 'non-drink' tickets at events.

### 2. Check in with colleagues and mates

"People doing dumb things on the grog are not OK," she said. "We don't play up like secondhand lawnmowers because we're looking forward to what people will say about us. So please, take an interest in your colleagues."

### 3. Let it be okay to say no

If you only do one thing this should be it, Shanna said. "Congratulate them, celebrate that choice and go about your business."

### 4. Make use of resources

Shanna suggested exploring the resources at [www.soberinthecountry.org](http://www.soberinthecountry.org). They also have a peer support group called the Bush Tribe, where "rural people get together, have a yarn, and help each other," she said. "Some of these people have spent 20 years feeling isolated in their own communities. Now they've got mates."





## Growing brave: Call for horticulture to reclaim its value

Catherine Velisha.



It's time for growers to reclaim their value, according to Catherine Velisha, third generation vegetable grower and Managing Director at Velisha Farms. In her Women in Horticulture session entitled 'Growing Brave' – sponsored by Boomaroo Nurseries – she discussed ways growers can let the world know how important they are, and why industry leadership needs to better reflect the workforce.

The horticulture industry and businesses must step into places they've been scared to before, according to Catherine Velisha.

"Veggies and fruit are the only necessity other than water and air. We can live without dairy and meat. We are growing the only thing humans and the planet need to survive, so we are the most important people in this world," Catherine said.

A good place to start is recognising that growers are entrepreneurs.

"My grandfather came to Australia from Albania, bought some land and grew produce with the hope of selling it. If that's not a start-up, I don't know what is," she said.

"Every day we take risks with money and fight the hard fight. People in tech and finance use terms like 'entrepreneur' to encourage young people into their industries. If we reframe our language, we allow people to think differently about our industry."

In addition to the excitement of the stock market (lettuce prices were skyrocketing at the time), Catherine noted horticulture offers the glamour of

hospitality and excitement of media.

"Without us there's no restaurants. None of Australia's 61 cooking shows would exist without our fresh produce. We're the cooking sensations. We should be the ones showing the vibrance and excitement of what we do."

### Sharing stories builds awareness

While not everyone wants to be in the media, every industry member has a story to tell, Catherine said.

"Everyone needs to talk about their passions. Mine is talking about the opportunities and reframing what horticulture actually is," she said.

"For you it might be food safety or safety on farm, but you need to find your own voice and talk to people. It could be on a simple scale like telling people how much you love working in the industry or as big as you want. The important thing is if everyone speaks up, we have a collective voice and we then attract other people to our industry."

### Future food leadership should reflect diversity

A key issue is who should lead our food futures.

Catherine noted women make up 30 per cent of the agricultural workforce. Of these, 22 per cent are in the fresh produce sector. Moreover, 70 per cent of agricultural employees from culturally and linguistically diverse backgrounds work in the fresh produce sector. However, this is not reflected at higher levels.

"I am shocked every time I come to this event," Catherine said. "Our faces and our leaders do not represent our workforce."

She suggested business leaders, both men and women, should look at who they're bringing up behind them.

"The only way we can really look after our industry is if we have boards, CEOs and team leaders that reflect our workforce. That's my challenge to you today," Catherine said.

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- Agronomist, Tom Brown

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# The Hort Connections Trade Show



Fruit & Vegetable Consortium Managing Director Justine Coates addressing delegates.



Hort Innovation Marketing Manager Belinda Van Schaik.



Primary Industries Education Foundation Australia CEO Luciano Mesiti.



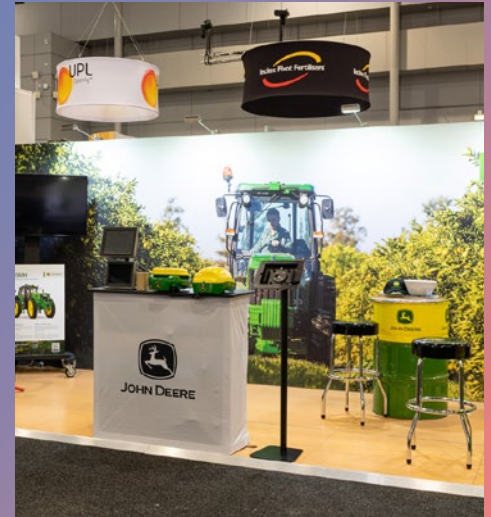




Fruit & Vegetable Consortium Project Manager Michelle Lausen.



Nominees for the 2022 IFPA Produce Plus Marketer of the Year award.



L-R: AUSVEG CEO Michael Coote, Senator Susan McDonald, AUSVEG Chair Bill Bulmer.







## Shining a light on careers in Australian horticulture

AUSVEG has launched the Grow Your Career in Horticulture video series, which highlights the diverse range of careers in the Australian horticulture industry. AUSVEG Communications Officer Sophie Burge reports.

The Grow Your Career in Horticulture series features video interviews with employees from nut, fruit and vegetable businesses across Australia to gain an understanding of those vital 'behind-the-scenes' roles in the industry. These videos show the daily tasks, responsibilities, and pathways of current employees on Australian farms.

AUSVEG National Public Affairs Manager Tyson Cattle said that the series is designed to highlight the technical and skilled opportunities that are available on fruit and vegetable farms across Australia.

"The horticulture sector is a large, developed and diverse industry that employs a wide range of skilled people. While much of the media attention is focused on harvest labour within the sector, it is often forgotten that the industry requires a range of skillsets to manage and operate their farm business," Mr Cattle said.

"The horticulture industry has many opportunities for workers to upskill and access on the job training further their career in horticulture. While there are many harvesting opportunities on the Harvest Trail, there is also a range of other essential roles to be found on farm and production line."

Many of the roles highlighted in the video series are in the highest demand in businesses across the horticulture sector and align with the approved 31 occupations under the Horticulture

Industry Labour Agreement – supporting growers to sponsor skilled and semi-skilled workers from overseas to fill these critical occupations.

"Growers' preference is always to employ locals first where possible, when they have the right skills and attitude," Mr Cattle said.

"These videos aim to showcase the many varied career opportunities for local workers in the exciting \$15 billion Australian horticulture industry to entice people to give the industry a go.

"Many people we interviewed for these videos did not intend on a career in horticulture, but discovered a passion for it after working on the farm. They have each come from various backgrounds and landed in horticulture through different avenues by transferring key skills from seemingly unrelated courses and past careers to start successful careers in horticulture.

"A job in horticulture can be the start of a lifelong, satisfying career with plenty of opportunities for upward growth. Putting food on the table for millions of families in Australia and abroad makes it a worthwhile and fulfilling career."



Grow Your Career video series



## At a glance

**Name:** Jordan Kleesh

**Age:** 25

**Job:** Production Assistant/Sales  
at Red Gem Potatoes

**Location:** Nar Nar Goon,  
(Gippsland) Victoria



As a Production Assistant at Red Gem Potatoes, Jordan Kleesh works primarily in the processing facility in Nar Nar Goon, Victoria. Jordan oversees the product movement throughout the day, and works with various teams in the facility coordinating the processes and market orders.

He helps to load and unload trucks, check the packaging line and pick orders – while ensuring proper food handling, quality and safety standards are met.

Red Gem grows and supplies brushed and washed varieties of potatoes to major retailers around Australia. The business is based in Nar Nar Goon, but it also has farms operating in Hillston in the Riverina region of New South Wales and Mount Gambier in South Australia. Trials of sweetpotato and onions are also underway through joint venture crops in Gippsland.

Red Gem grows more than 15 potato and onion varieties annually on 1,000 acres (400 hectares) of land around Australia.

AUSVEG caught up with Jordan for the 'Grow Your Career in Horticulture' series.

### Jordan, can you please tell us about your role at Red Gem Potatoes and what it involves?

At Red Gem, we grow brown onions and several potato varieties including Kipfler, Nicola, Mozart, Royal Blue and Crème Royale. In addition, we manage many farms to help support our volumes to our customers, which are very important to this business – from our biggest customers such as Coles & Hello Fresh to smaller ones located locally and interstate.

I work on the packing side of the business. After we receive the freshly harvested potatoes into our packhouse,

we prepare and package them, so they are ready to be sent out to our customers quite quickly – they are in and out on the same day if necessary.

My day-to-day duties include loading and unloading trucks, picking orders, running the line and machines, as well as other general factory and forklift duties.

In our packing shed, we have two different potato lines: the brush line and the wash line.

The waste or defective potatoes are rejected for other markets – utilising waste and having less of it is very important to the business. The washed side is a little more involved, as the potatoes must go through a washing plant to be washed before they come through the lines to get packaged. It's a simple process but at the same time, there's a lot behind it that you've got to do to get it right.

We are very lucky to have been the first company to utilise x-ray vision technology to help us with sizing and grading our brushed potatoes. With this, we have achieved a quality no one else can do in the industry!

### What does a typical day look like for you?

My day typically starts with a production team meeting early in the morning to outline and organise what the goal is to achieve for that day. This involves determining what our orders are for that day and the day after and making sure we have got enough product coming in for us to package to then send out again.

From there, we set up the lines where we prepare the pallets and do whatever else is needed to unload the potatoes from the truck.

Throughout the day once the team arrives, we begin the process of packaging, which involves things like keeping track of

timelines, moving pallets around, moving people around and making sure the lines are operating correctly and are not overflowing.

My day also involves looking at quality assurance, where I check the product to ensure it meets the customer's specifications and requirements. To do this, I pick up a bag off the production line and tip it out before I hold or cut up potatoes to ensure they do not have any internal defects and weigh correctly.

### Can you please tell us about your journey into horticulture?

When I was 16, I began working at Red Gem as a casual employee where I would fold crates and help with packing and other general factory duties. After a year, I left to try something else.

While I was at school, I was studying sports science and then I came back to work at Red Gem for a year and a half where I did inventory, quality assurance and more general factory duties and light forklift duties. From there, I left to do my carpentry apprenticeship that I had finished just as the COVID-19 pandemic started.

The COVID situation impacted my carpentry career, but luckily enough – as a result from my prior work experiences at Red Gem – I was able to find work again with the team doing casual forklift driving. What began as casual work ended up being full-time work again, and I found the opportunity to progress through the business to where I am today.

### What are some common misconceptions about careers in horticulture?

There is a whole lot more to horticulture and a lot of people don't realise that until



they actually start working in it.

About four months into working at Red Gem again, I had the opportunity to visit the Hillston farm in New South Wales, where I saw and learnt the entire process of planting. This included the overall groundwork that prepares a crop before planting, such as soil conditioning.

It was witnessing the planting process and the factory side of things – which are not as simple as people would think – that ignited my interest in horticulture.

The whole process is not just as simple as putting a potato into a bag. We have got so much to organise such as inventory, quality control, the factory side of things, logistics and forklifts – plus the various office roles for the business side of things.

I've learnt the inventory side, the quality control side, and now sales. If you're prepared to learn, there are numerous opportunities to grow your career in horticulture.

Another common misconception about working in the industry is that there is only seasonal work, which is not the case. There are plenty of packing sheds that operate all year round because the potatoes come in from numerous different places around Australia and not every farm does harvest at the same time. The potato industry is always growing and harvesting, and there's always work.

## Why do you do what you do?

I love my job as every day is different. One day I could be working on the factory floor or in sales or be up at the farm for a week helping that team, to then come back to the packing shed. If you've got the dedication to the industry, I find it tends to give back to you because employers notice and reward effort.

In my situation, Red Gem has provided the opportunity for me to move forward in the business which is fantastic.

From my experience, it's never too late to get into horticulture. I'm 25 and although I was in and out of the industry at the start, I'm glad I returned.

It's also a good feeling to see the product you're producing end up on somebody else's plate.

At the end of the day, I get to watch the process from start to finish. When you go into the shop, there's no better feeling than when you look at a bag or the tag, and you see that tag has gone through your hands before landing in the local shopping centre.

Overall, working for a company with a great heritage gives me the comfort and belief that we can achieve great things every day.

### Find out more

For more information about the Grow Your Career in Horticulture series, please visit [ausveg.com.au/grow-your-career](http://ausveg.com.au/grow-your-career).

The Grow Your Career in Horticulture series is funded by the Federal Department of Education, Skills and Employment through the Harvest Trail Services Industry Collaboration Trial.





# Results you can see to believe

**Serenade® Soil Activ is a soil-optimised addition to the Serenade family, developed to achieve superior colonisation of plant roots and improved uptake of soil resources.**

Serenade Soil Activ is a beneficial bacteria, that colonises potato roots, creating a win-win relationship with the plant at the soil interface, improving nutrient availability to the plant and developing tubers. This frequently results in better tuber size, uniformity, and quality.

In replicated strip harvest assessments taken at harvest, Serenade Soil Activ treated plots produced 9.9% higher premium class tubers (by weight) than untreated plots.

For more information on crop performance trials, speak to your Bayer representative today, or **visit [serenadesoilactiv.com.au](http://serenadesoilactiv.com.au)**

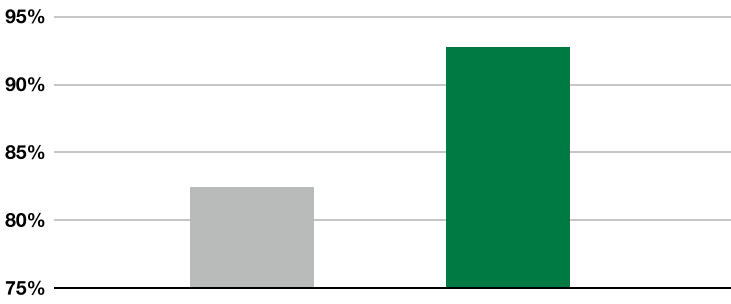
## Increased Marketable Yield

Strip harvest, fresh market potatoes, South Australia



\*Images are a representative sample taken from one replicate dig at harvest.

### Total premium class weight (%)



Untreated  
Serenade Soil Activ 1.4 L/ha

# AUSVEG investigation: specials and promos

Continuing its look at pricing issues within the fresh produce supply chain, AUSVEG has delved into the world of retail ‘specials’ and ‘promotion’ pricing. The dataset provided, thanks to Hort Innovation and NielsenIQ, shows some interesting learnings of the use of ‘specials’ by the supermarkets.

Anecdotally many growers have said that supermarkets will often use specials to assist in clearing stock during an oversupply in the market.

When done properly, this can be considered generally a positive thing as a special can drive greater demand by the consumer – so in that sense it’s a win-win for all.

However, the dataset below and anecdotal feedback from growers tells a different story in that many fresh produce lines are fairly consistent in the percentage of volume which is on promotion.

Across all fresh vegetables there is anywhere between 19-24 per cent of the total volume of produce on promotion at any one time.

This seems quite high.

That is every 1 in 5 fresh vegetable products on the shelf is under a promotion.

While this does vary for different commodities, some such as potatoes can be as high as 36 per cent on promotion. That is every 1 in 3 potatoes on the shelf at any one time is on promotion.

Now the tables below show the total promo volume and non-promo volume based on the total volume on the market.

It should be noted that each supermarket will have varying volumes for each product which is on promotion, and each will have their own percentage of the market.

However, the high rate of promotions across the sector at any one time is no doubt a challenge for the growers. It means that the market is not free to operate solely under supply and demand. The question is how does the rest of the market compete when there is such a large volume of product already sold at a promotional price?

Table 1

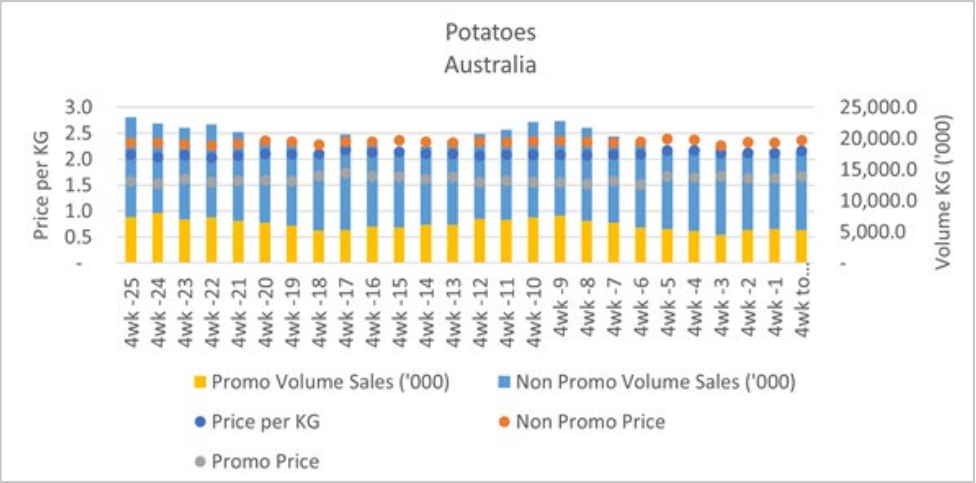
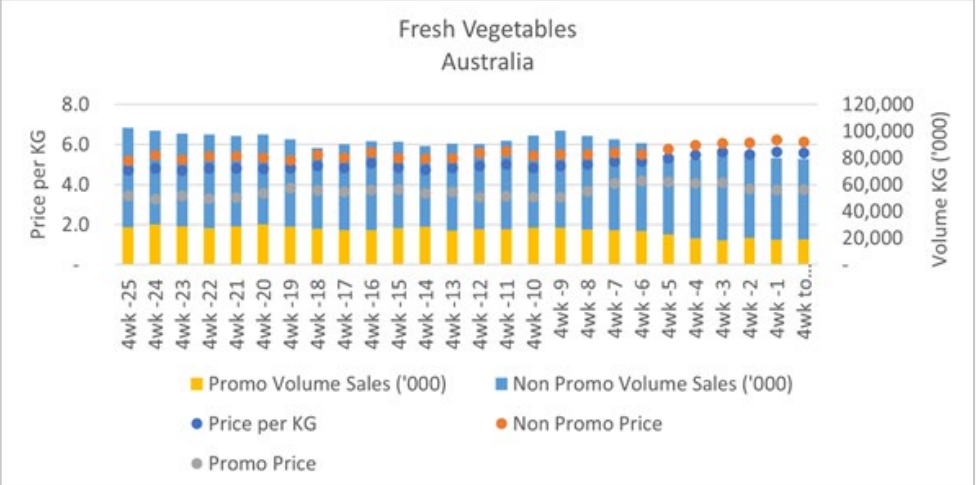


Table 2



*\*Hort Innovation Australia calculation based in part on data reported by NielsenIQ through its Homescan Service for the fresh vegetables category to 24 April 2022, for the Total Australia market, according to the NielsenIQ standard product hierarchy. Copyright © 2022, Nielsen Consumer LLC.*





## Promotion Pricing v Standard pricing

The pricing piece of the above tables also shows a high disparity between the average product price compared with the average promotion price.

The promotion pricing is significantly lower than the non-promo price.

Most would say that's obvious, it's a promotion after all.

However, if the promotion price is significantly lower than the standard price, and there is a high volume of product which is on special, it puts greater pressure on the rest of the market.

Across fresh vegetables the promotional price is regularly 30-40 per cent less than the non-promotional price.

The question is, how high can the market really go when it is competing against 30 per cent of the volume being sold at a significantly reduced price?

AUSVEG is continuing to raise these issues with the relevant stakeholders including politicians and regulators to ensure growers receive a fair price in a competitive market.

## Food and Grocery Code of Conduct

AUSVEG recently met with the Food and Grocery Code of Conduct independent reviewer Chris Leptos who last year published his findings as part of the Food and Grocery Code Independent Review.

As part of the review, supermarkets who have signed up to the code must report on price rise negotiations.

An excerpt of the report published in 2021 is below.

- **Woolworths** received 237 notifications of a price rise request and entered into negotiations with 94 of them. Of these, 75 negotiations were not concluded within 30 days of the initial request being made. The most

number of days Woolworths took to conclude its position on a negotiation, starting from the notification day for the relevant proposed price increase, was 87 days.

- **Coles** received 1,101 notifications of a price rise request and entered into negotiations with 35. Of these negotiations, 32 did not conclude a position within 30 days. The most number of days Coles took to conclude its position on a negotiation, starting from the notification day for the relevant proposed price increase, was 107 days. Coles' reported figures included 724 fresh fruit and vegetable price negotiations.
- **Aldi** received 45 notifications of a price rise request and did not enter into negotiations following the requests.
- **Metcash** appears to have failed to comply with clause 27B of the Code to provide information about price increase requests to the Code Arbiter. Metcash explained that although it had procured new systems to ensure its readiness to comply with the Code, it later identified that the data captured did not exactly correlate with the information required to be provided under clause 27B of the Code. Metcash has since chosen to undertake a separate process for collecting this information but, due to a delay in its implementation, does not expect to be able to comply fully with clause 27B for the 2021-22 reporting period. With the deployment of new systems in late 2021, Metcash have indicated that it will be able to provide at least 9 months of more complete data for the next Code reporting

period.

It should be noted that just because a price rise is requested, it doesn't mean that it will be accepted. However, a request for a price rise can generally be linked to suppliers' need to cover costs.

The full report can be found on the Treasury website (details at the end of the article).

The report and discussion with the reviewer also found that suppliers were not making use of the independent arbiters during their price negotiations.

The independent arbiters are a requirement under the Food and Grocery Code of Conduct and designed to assist with dispute resolutions.

The independent arbiters for the four major supermarkets are listed below:

### Coles

Hon. Jeff Kennett  
03 9421 0977  
jkennett@ausresolve.com

### Woolworths

Helen McKenzie  
0499 885 090  
codearbiter@wowgrocerycode.com.au

### ALDI

Bronwyn Gallacher  
0433 292 777  
bronwyn@cclconsultants.com.au

### Metcash

Martin Shakinovsky  
0416 235 766  
complaints@metcashcodearbiter.com.au

### Find out more

To read the Food and Grocery Code of Conduct independent review, please visit [https://treasury.gov.au/sites/default/files/2021-11/p2021-229034\\_0.pdf](https://treasury.gov.au/sites/default/files/2021-11/p2021-229034_0.pdf).



## Visas available to Australian potato growers

For Australian potato growers there are three common visas that can be used to recruit workers, including the Working Holiday Maker (WHM), Pacific Australian Labour Mobility (PALM) Scheme and the Horticulture Industry Labour Agreement (HILA).

Each of these visas cover different skill levels, occupations, time frames, participating countries and cost. See below for a breakdown of each visa and its requirements. Each of these Visas require employers to either be accredited employers or an approved sponsor. More information on accreditation and sponsorship requirements can be found on each of the visa factsheets.

### Working Holiday Maker (WHM) Program

The Working Holiday Maker Program allows young adults to have a 12-month holiday in Australia whilst undertaking short-term work and/or study.

There are two subclasses in the WHM Program:

- Work and Holiday Visa (subclass 462)
- Working Holiday Visa (subclass 417)

There are a few key differences between these visas, including:

- Different partnering countries.
- The 462 visa has an education requirement, but the 417 visa does not.
- The 462 visa also requires letters of support from governments from certain countries and requires a functional level of English.

Workers on their first year WHM visa can undertake work in any industry and location in Australia. To be eligible for a second- or third-year visa, they must complete either three or six months of 'specified work'. Details on specified work options can be found here > Specified work for Working Holiday visa (subclass 417) (homeaffairs.gov.au).

Specific work roles in horticulture can include the following:

- Harvesting and/or packing of fruit and vegetable crops.
- General maintenance crop work.
- Cultivating or propagating plants, fungi or their products or parts.
- Immediate processing of plant products.

Worker requirements:

- Must have a passport from an eligible country.
- Must not be accompanied by dependent children.
- Allows visa holders to study for up to 4 months.
- Allows visa holders to travel to and from Australia as many times as they want.

From January 2022, WHMs working in any sector anywhere in Australia may continue to work for the same employer or organisation for longer than six months without requesting permission. This arrangement will be in place until 31 December 2022 when it will be reviewed by the Government.

### Pacific Australia Labour Mobility Scheme (PALM)

The PALM Scheme allows employers to hire workers from nine Pacific Islands and Timor-Leste when there are not enough domestic workers available.

On 4 April 2022, the Temporary Work (Internal Relations) visa (subclass 403) Pacific Australia Labour Mobility (PALM) stream was introduced. The new PALM scheme visa consolidated and replaced the Seasonal Worker Program (SWP) and

Pacific Labour Scheme (PLS) into a single visa scheme.

The scheme offers a long-term (up to four years) and seasonal (up to nine months) option.

Worker requirements:

- Hold or obtain a valid passport.
- Be physically fit and healthy for the work specified.
- Have no criminal record.
- Be of good character.
- Have the right qualifications and/or work experience.
- Have an intention to return to their participating country.
- Have a reasonable standard of English (for longer-term workers only).

Under the PALM scheme workers can only undertake specified work within specific industries such as Agriculture. To sponsor a Pacific worker, you must demonstrate that you:

**Table 1: Work and Holiday Visa (subclass 462)**

Cost to employee	Skill level	Time	Age
\$495 (Currently waived)	All skill levels	12-months	Must be 18 to 30 years old.

#### Partnering Countries

Argentina, Austria, Chile, China, Czech Republic, Ecuador, Greece, Hungary, Indonesia, Israel, Luxembourg, Malaysia, Peru, Poland, Portugal, San Marino, Singapore, Slovak Republic, Slovenia, Spain, Switzerland, Thailand, Turkey, Uruguay, USA, Vietnam.

**Table 2: Working Holiday Visa (subclass 417)**

Cost to employee	Skill level	Time	Age
\$495 (Currently waived)	All skill levels	12-months	Must be 18 to 30 years old, except for Canadian, French, and Irish citizens up to 35.

#### Partnering Countries

Belgium, Canada, Republic of Cyprus, Denmark, Estonia, Finland, France, Germany, Hong Kong, Special Administrative Region of the Peoples Republic of China, Republic of Ireland, Italy, Japan, Republic of Korea, Malta, Netherlands, Norway, Sweden, Taiwan, United Kingdom.



**Table 3: Seasonal Stream**

Cost to employee	Cost to employer	Skill level	Time	Age
\$315	\$420	Unskilled and low-skilled	Up to nine months	21+
<b>Partnering Countries</b>				
Fiji, Kiribati, Nauru, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu.				

**Table 4: Long-term Stream**

Cost to employee	Cost to employer	Skill level	Time	Age
\$315	\$420	Unskilled and low-skilled	Up to nine months	21+
<b>Partnering Countries</b>				
Fiji, Kiribati, Nauru, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu.				

**Table 5: Horticulture Industry Labour Agreement (HILA)**

Cost to employee	Cost to employer	Skill level	Time	Age
Nil	\$420	Skilled and semi-skilled	Up to four years	Up to 50 years
<b>Partnering Countries</b>				
All				

- Are an eligible business registered and operating in Australia.
- Are NOT an individual, sole trader or unincorporated company,
- Are an approved employer under the PALM scheme,
- Hold a DHA Temporary Activities Sponsorship (TAS).

## Horticulture Industry Labour Agreement (HILA)

The HILA increases access to skilled and semi-skilled migrant workers for the horticulture industry when qualified Australians are unavailable. The HILA has an age cap of 50 years old and provides pathways for permanent residency.

Under the HILA an employer can sponsor workers under the Temporary Skill Shortage (TSS) (subclass 482) visa for a total of 31 approved occupations.

The HILA covers 31 critical occupations in the horticulture industry including:

- Irrigation Designer/ Manager
- Agronomist
- Horticulture Grower
- Protected Cropping Grower
- Horticulture Research & Development Officer

- Mechanical Engineer
- Horticulture Farm Manager
- Quality Assurance Manager
- Biosecurity Officer
- Facility Plant Manager
- Facility Supervisor
- Maintenance Electrician
- Fitter and Welder
- Agricultural Technician
- Mechanic
- Senior Nurseryperson
- Nurseryperson
- Nursery Supervisor
- Truck Driver
- Mobile Plant Operator
- Forklift Driver
- Irrigationist
- Irrigationist Assistant
- Horticulture Section Manager
- Section Supervisor
- Production Horticulture Supervisor
- Machinery Manager
- Machinery Supervisor
- Cold Storage Manager

To use the HILA, growers must be a Standard business sponsor which assesses businesses to ensure they are fit to sponsor an applicant.

See more information on becoming a Standard business sponsor here: Become



a sponsor Standard business sponsor ([homeaffairs.gov.au](http://homeaffairs.gov.au)).

## The Australian Agriculture Visa (Ag Visa)

AUSVEG has consistently called for a clear commitment from all major parties during the election campaign to continue delivering the Ag Visa to ensure that the industry is able to secure a competent and reliable workforce.

AUSVEG has been heavily involved in the design of the Ag Visa and has been a key driver for its implementation, highlighting its importance to government for a number of years. The signing of Vietnam onto the visa now confirms its willingness to participate in the visa, and also represents a commitment to the visa settings proposed by industry in consultation with government.

AUSVEG will continue to advocate to all sides of politics to commit to and support the Ag Visa. For the most up to date information on the Australian Agriculture Visa, visit [dfat.gov.au/people-people/international-labour-mobility/australian-agriculture-visa](http://dfat.gov.au/people-people/international-labour-mobility/australian-agriculture-visa).

Ensuring the Ag Visa meets the needs of producers is a high priority for the industry. The Ag Visa was designed to be a long-term structural change for the industry to access a more efficient and effective workforce and reduce its reliance on working holiday makers.

It's disappointing the ALP Government has not committed to the Ag Visa. However, AUSVEG will continue to engage with Minister Watt and the Albanese Government to advocate strongly for the Ag Visa, or a reasonable replacement, to increase the pool of workers available to fruit and vegetable growers as a high priority.

### Find out more

Contact AUSVEG on 03 9882 0277 or via email at [info@ausveg.com.au](mailto:info@ausveg.com.au).

# Climate outlook overview from the Bureau of Meteorology

## Summary

- August to October rainfall is likely to be above median for most parts of Australia away from the west, with below median rainfall likely for western Tasmania and part of south-western Western Australia.
- August to October maximum temperatures are likely to be above median for northern, and far southern parts of Australia, but below median for parts of eastern Australia.
- Minimum temperatures for August to October are likely to be warmer than median Australia wide.
- A developing negative Indian Ocean Dipole, along with warmer than average waters around northern Australia, and neutral phase of the El Niño–Southern Oscillation during winter, are likely to be influencing this outlook.

## Rainfall: Wetter August to October likely for most of Australia away from the west

- August to October rainfall is likely to be above median for eastern WA, the NT, SA, Queensland, NSW, northern and central Victoria, and eastern Tasmania (chance of exceeding the median is greater than 60 per cent), with much of the NT, Queensland and NSW very likely to be above median (greater than 80 per cent chance). However, rainfall is likely to be below median in western Tasmania and part of south-western WA (chances of exceeding the median are less than 40 per cent).
- Large parts of northern, central, and eastern mainland Australia (away from

the southern coastline) are around 2 to 3.5 times more likely than average to have unusually high (in the top 20 per cent wettest of all years over 1981–2018) rainfall for August to October.

- The August and September monthly outlooks are broadly similar to the three-month outlook, although the chances of above median rainfall are slightly less emphatic. August has slightly more widespread chances of drier conditions across south-west WA, south-east NSW into south-west Victoria and western Tasmania.
- It should be noted that May to September is the northern Australian dry season. This means tropical northern Australia typically has very low rainfall totals during this time (large areas less than 25 mm for the season), and only a small amount of rainfall is needed to exceed the median.
- Past accuracy for August to October rainfall is moderate to high for most areas of Australia, but low for inland southern WA extending into southern SA, with low accuracy also for southern Tasmania.

## Temperature: Warmer August to October days likely for north and far south, cooler days for east

- August to October maximum temperatures are likely to be above median for the northern tropics, southern WA, south-east SA, most of Victoria extending into south-east NSW, and Tasmania (greater than 60 per cent chance). Below median maximum temperatures are likely for much of southern Queensland and much of northern and central NSW

(chance of exceeding the median is less than 40 per cent).

- There is an increased chance of unusually high maximum temperatures (in the top 20 per cent of historical records) for August to October over the northern tropics, south-west WA, far south-east SA, southern Victoria and Tasmania (1.5 to greater than 4.0 times the usual chance).
- Minimum temperatures for August to October are likely to be warmer than median Australia wide (chances greater than 60 per cent), with the eastern two-thirds of Australia very likely to be warmer than median (chances are greater than 80 per cent).
- There is an increased chance of unusually high minimum temperatures (in the top 20 per cent of historical records) for August to October across almost all of Australia (1.5 to greater than 4.0 times the usual chance). The highest chance of unusually warm minimum temperatures is across the northern tropics.
- Past accuracy for August to October maximum temperatures is moderate to high for most areas of Australia, and very high for parts of the tropical north, south-east, and western parts of Australia. For minimum temperatures, accuracy is moderate to high across most of Australia, with low to very low accuracy across north-west WA; some parts of the tropical north and Tasmania have very high accuracy.

Find out more

Visit [bom.gov.au/climate/outlooks/](https://bom.gov.au/climate/outlooks/)



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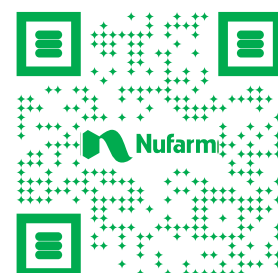


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## Potato yield grows year-on-year with MIRAVIS® Prime fungicide



A season can be a long time for potato growers between planting, the subsequent application of fertilisers and nutrients, before eventually harvest. The appearance of disease can be devastating, with significant impacts on yield and thereby profitability.

In south-west NSW, it takes a program approach to prevent disease from becoming a problem according to Steven Serafin of Yenda Producers Co-operative. Success is realised when the canopy is vigorous and green, ready to accelerate those tonnes per hectare during tuber bulking.

"Our production area is a little bit unique compared to other places. Target spot is a real concern, as is Sclerotinia. But it's target spot that really knocks us about by the end of the season," he said.

Syngenta products have long been at the core of his fungicide programs, particularly AMISTAR® Top fungicide and SCORE® fungicide.

The arrival of MIRAVIS® fungicide in 2018 represented another shift in what Mr Serafin would come to expect of target spot control, when applied at row closure helping to keep his canopy healthy.

"Using MIRAVIS® to start off with gave us target spot control that was more superior to what we had been using up to that point," he said.

Little did he know that there would soon be another Syngenta fungicide, combining the active, pydiflumetofen, in MIRAVIS® fungicide with proven fludioxinol creating the co-formulation MIRAVIS® Prime fungicide. This would bring a powerful new tool to his spray program, controlling all of his major disease issues in one

formulation.

"When applied in a program, by utilising MIRAVIS® Prime, it took pressure off our BRAVO® and AMSTAR® Top applications. Where we saw botrytis and Sclerotinia come in, once applied, MIRAVIS® Prime started to eliminate those diseases and gave us a longer coverage period."

MIRAVIS® Prime fungicide provides specialist protection against Sclerotinia in areas prone to the disease, in addition to target spot and botrytis.

The MIRAVIS® Prime fungicide label allows for a maximum of two applications in a season, which are best applied either early prior to row closure or before the end of leaf drop.

"I didn't rush straight into it, by using two applications with MIRAVIS® Prime," Mr Serafin said.

"We were using alternate options earlier in the year, but by the back end of this season we withdrew these options from the existing program and went back-to-back MIRAVIS® Prime. The current season's crops are in really good shape, late in the season, even with all the rain events that we've had."

Given the tight rotations and the disease pressure Mr Serafin faces, in future he's going to implement a program using MIRAVIS® fungicide early on and MIRAVIS® Prime fungicide later. He said it might be opposite to what works elsewhere but

"our crop rotation is somewhat different to growers in other regions."

"Our disease pressure is very high. We see target spot coming in well before row closure, it actually comes in before hilling up, so it starts very early for us," he said.

"Using MIRAVIS® earlier, gets us through hilling up and into row closure before we consider using MIRAVIS® Prime, which then assists us with target spot, and botrytis-sclerotinia scenarios."

Return on investment is essential and while Mr Serafin hasn't done the sums just yet, the increased tonnages at harvest based on his year-on-year average has already confirmed it for him.

"Our yields are already showing that yield is far superior to last year when we didn't have MIRAVIS® Prime," he said.

### Find out more

For more information please contact your local Syngenta representative or visit [www.syngenta.com.au/miravis-prime](http://www.syngenta.com.au/miravis-prime)

Syngenta is a leading agriculture company helping to improve global food security by enabling millions of farmers to make better use of available resources. Through world class science and innovative crop solutions, its 28,000 people in over 90 countries are working to transform how crops are grown. It is committed to rescuing land from degradation, enhancing biodiversity and revitalizing rural communities.

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# PLANT WITH PRECISION

## HORT Connections

Kubota Australia would like to thank everyone who visited us at this years Hort Connections. We are honoured to be a part of Australia & New Zealand's premiere horticulture conference and trade show.



## VP1000 VEGETABLE PLANTER SERIES

As a competent partner in precision sowing Kubota delivers the technological know-how: the VP1000 Series! The particularly clear structure and the incorporated intelligent technology the machine is extremely

user friendly and highly flexible, from setting to sowing. The VP1000 Series guarantees customised precision sowing for all sorts of vegetable seeds and is thus the ultimate machine for vegetable producers.





## An organic partnership: Kubota is in it for the long haul

Adam Bremner is a sixth-generation farmer at Wombat Forest Organics, near Daylesford in Central Victoria. The 740-acre organic farm primarily produces potatoes, namely Dutch Cream and Sebago, as well as strawberries and carrots.

Organic farming comes with a separate set of guidelines to conventional farming and has different needs and priorities.

Adam Bremner said soil is the foundation of organic farming and all farms must pass stringent testing requirements to ensure the soil is clean, with no chemical residue.

"You have to get everything right in the soil first before you even plant a crop," Adam said.

"In an organic system, it takes time to get the correct soil fertility levels and disease instances down, if you have healthy soil you'll end up with a successful crop.

"In conventional farming, there are a lot of tools available to change nutrient

levels in soil without necessarily changing the soil health – in an organic system you have to work from the ground up," Adam said.

To help manage the health of the farm's soil, Adam purchased a Kubota RM3005V 3 furrow reversible plough, ensuring topsoil remains at the top of the slope, instead of going with gravity and falling underneath.

"I always get the best quality products, because then you only have to buy it once, and Kubota makes the superior product," Adam said.

"In our operation, the reversible plough pays us back in time efficiency. It allows you to start at one end of the paddock and keep going to the end, you don't have to strike out as you go along – which saves time and money.

"The plough turns the sod well and does a nice, neat job. You get good coverage and good burial. It's very solidly built, it's strong, it's the sort of plough you buy that you know is going to last a lifetime."

The product is not the only benefit, the service provided has ensured he's happy to stay loyal.

"While I already knew about reversible ploughs, since I've had one previously,

Kubota still take the time to come out, set it up and run through it to make sure you're happy with it – and then they contact you again to check everything is still going okay and leave the line of contact open," Adam said.

While only new to the brand, Adam already has plans to expand his collection with a small excavator to help out with odd jobs on the farm.

"My Kubota plough is everything I could hope for," Adam said.

### Find out more

Kubota Australia Pty Ltd has been Australia's leading supplier of agriculture, construction, and power equipment for more than 40 years. All Kubota equipment is distributed and serviced through the company's authorised dealer network, consisting of more than 140 dealers Australia-wide.

Visit [kubota.com.au](http://kubota.com.au) for more information on ploughs and to find out where your nearest dealer is.



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Brialey Brightwell.



Ryan Brightwell from Nerrigundah Berries.

## Fair Farms delivers wide-ranging benefits to Australian growers

Growcom's Fair Farms is an industry-led, national training and certification initiative that is cultivating fair and responsible employment practices in Australian horticulture. The team spoke to Brialey Brightwell from Nerrigundah Berries about the business' decision to become Fair Farms-certified and the process behind it.

A family-owned and operated berry farm in Victoria's Yarra Valley, Nerrigundah Berries grows a delicious variety of berries including boysenberry, blueberries, and raspberries.

Nerrigundah Berries has been managed by Brialey Brightwell's family for four generations. The operation made the move to become Fair Farms-certified this year, which was straightforward and simple.

Brialey decided to become certified after finding out about the social compliance program a couple of years ago at an industry event on Queensland's Gold Coast.

"We were at this industry event, and we found out about Fair Farms there and were genuinely interested in it," Brialey said.

"We listened and asked questions, and found it was very relevant to us. We were already with another social compliance program at the time but decided that we would look to Fair Farms after hearing about it at this event.

"Fair Farms just makes sense for Australian growers."

When it came time to audit, Brialey said that the Fair Farms process was easy to understand and the resources available assured them that they were ready for audit when the time came.

"We decided to go with Fair Farms because it just makes more sense – it was more relevant to who we are and how we do things," she said.

"We had been with a previous social compliance program and some of their questions on audit were just not relevant

to us, or to any Australian farmer I know."

### Tailored for business

Brialey said that Fair Farm's emphasis on worker wellbeing aligned with how she treats her employees on a day-to-day basis.

"We're on a first name basis with our employees and I recognise them – in recent times we've got to know our employees better because we have to do daily health checks due to COVID," Brialey said.

The realities of managing a family-owned farm means that Brialey is constantly donning different business hats.

At times, she'll function as human resources and when the farm is short on pickers, you can find her out with her team harvesting. This means being a part of a straightforward program like Fair Farms makes farming life a little easier.

"I love farming, it is a constant challenge of production and the elements," Brialey said.

"We were one of the first farms to start early with hydroponics, which was a game changer.

"Every year we look at what we do and what we want to improve, and Fair Farms has been part of that.

"I would tell people who are thinking about joining Fair Farms that it is a good system and covers everything you should be doing in farming."

Fair Farms National Program Manager, Sachin Ayachit, said that it wasn't a surprise that the program resonated with

farms like Nerrigundah Berries.

"Fair Farms was developed for Australian growers by Australian growers – that is why farms find it so relevant to what they do," he said.

"Fair Farms is also about acknowledging the outstanding work Australian horticulture farmers are already doing.

"Moving forward, we will always keep growers like Brialey at the forefront of what we do."

### Fair Farms: What it offers industry

Recently, Fair Farms was officially endorsed by the National Farmers' Federation Horticulture Council.

Join Fair Farms today to access an Australian-centric training and certification program including online training modules, one-on-one training and over-the-phone support that helps your business showcase ethical employment practices to the supply chain.

For more information, please visit [fairfarms.com.au/news](http://fairfarms.com.au/news).

#### Find out more

To find out more about Growcom's Fair Farms program and any special offers it may be offering, please visit [fairfarms.com.au](http://fairfarms.com.au).

Visit [fairwork.gov.au](http://fairwork.gov.au) and [growcom.com.au](http://growcom.com.au) for more information regarding your obligations as an employer.

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







## Knowledge grows

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## Meet AUSVEG'S potato growing Directors

The AUSVEG Board of Directors is made up of representatives from our state member organisations, as well as Board-appointed skills-based Directors. AUSVEG has four potato growers on its Board: Geoff Moar from New South Wales, Renee Pye from South Australia, Pennie Patane from Western Australia and Michael Radcliff from Tasmania.



**Pennie Patane**  
Western Australia

Pennie Patane and her husband Michael established their vegetable growing business in 1999, commencing with potatoes and moving into carrots, onions and broccoli. Their vertically integrated business supplies the retail sector, export markets and their own wholesale market floor.

Elected to the AUSVEG Board in January 2020, Pennie has a background in banking, and she married into the horticulture sector. Pennie has been a past committee member of the Potato Growers Association of Western Australia, and she is currently a member of the Hort Innovation Potato Strategic Investment Advisory Panel, as well as Chair of the Myalup Coast Growers. Additionally, Pennie is a member of the Harvey Agricultural College Advisory Panel.

Pennie's key interest is how we can get more youth interested in horticulture as a career.



**Renee Pye**  
South Australia

Renee Pye is Marketing Manager for leading potato, carrot and onion packhouse Zerella Fresh.

Renee is involved in a number of key areas of the business, including new product development and marketing, and is an emerging leader in the South Australian industry. She has overseen the development of Zerella Fresh's Spudlite range, which has contributed significantly to the company's recent growth.

Renee is a committed industry representative, sitting on a number of Boards, including AUSVEG SA, the Murraylands Food Alliance and Hort Innovation potato marketing consultation committees.

She regularly works with politicians at the state level and has been the spokesperson for a number of key AUSVEG SA campaigns in labour attraction and securing key infrastructure investments for industry.

As a business, Zerella Fresh is one of the largest potato producers in Australia and it is planning major infrastructure investments in the Mallee and Northern Adelaide Plains regions.





**Geoff Moar**  
New South Wales

Geoff Moar is the longest serving member on the AUSVEG Board. Geoff was elected to the Board in November 2004 and has served as Deputy Chair from 2011 to 2013 and as Chair from 2013 until 2017.

Geoff has grown potatoes since the late 1960s and supplies fresh and processed potatoes to the French fry production, crisping and fresh markets. He is a member of the NSW Farmers Association Horticultural Committee and is also a long-term board member of West Corugan Irrigation.

Currently, Geoff is Chair of the Murray Regional Strategy Group, representing the irrigation organisations in the Southern Riverina (along the Murray River).



**Michael Radcliff**  
Tasmania

Michael Radcliff and his wife Heidi own and run Rhebanvale, a family-farm based in Wesley Vale, Tasmania. The operation produces a variety of vegetable products, including potatoes, broccoli, peas, beans, carrots and onions.

Michael was elected to the AUSVEG Board in December 2019.

Michael has been involved in the vegetable and potato industries for many years, having served on a range of industry committees and associations.

He currently serves on the Pre-farm gate Strategic Investment Advisory Panel, one of two Hort Innovation strategic investment advisory committees for the vegetable industry.

#### AUSVEG Board of Directors

Position	Name	State
Chair	Bill Bulmer	Victoria
Deputy Chair	Belinda Frentz	Queensland
Grower Director	Mitchael Curtis	Northern Territory
Grower Director	Geoff Moar	New South Wales
Grower Director	Pennie Patane	Western Australia
Grower Director	Renee Pye	South Australia
Grower Director	Michael Radcliff	Tasmania
Skills-based Director	Simon Bolles	Victoria
Skills-based Director	Mark Napper	New South Wales

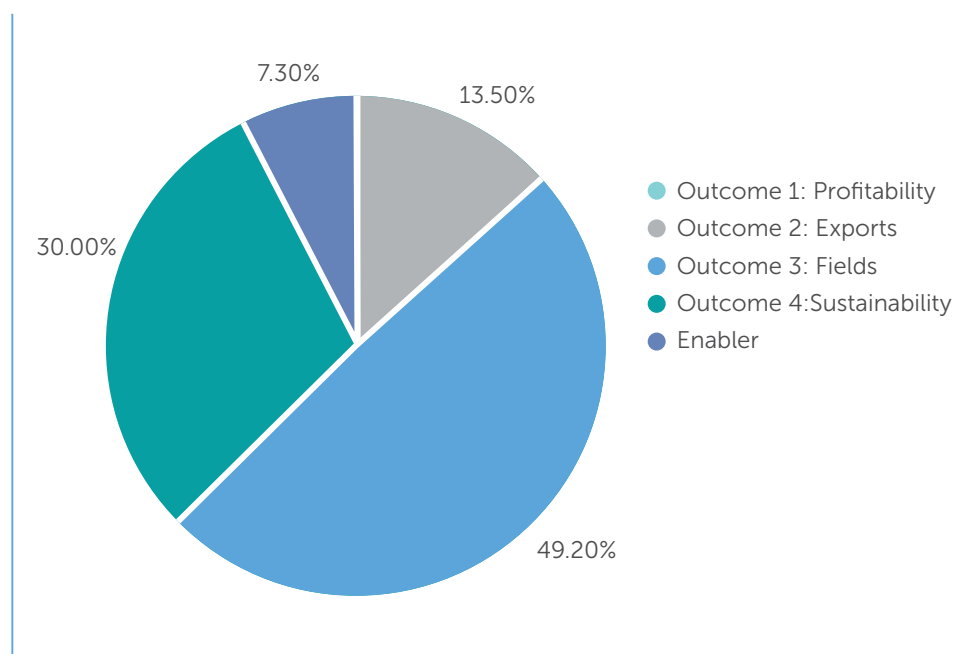


## Fresh Potato Industry Strategic Investment Plan: Performance review results released

Hort Innovation undertook a performance report to review the performance of levy investments delivered against the Fresh Potato Industry Strategic Investment Plan, which was active for the 5-year period from 2016/17 to 2020/21. The plan was developed to strategically guide research and development (R&D) levy investment in accordance with core industry priorities.

The Fresh Potato Industry Strategic Investment Plan (SIP) featured four outcome areas, 19 strategies and 16 key performance indicators (KPIs). A total of \$5.5 million was invested into the Fresh Potato Fund over the 5-year period of the SIP.

Potato grower SIP investment expenditure analysis



### Outcome 1. Profitability

Industry profitability is significantly improved by increasing the value of product sold on the domestic market. *This outcome was not prioritised for investment during the 5-year period of the SIP.*

Strategic Area	Status
Collaborate with retailers to better understand the opportunities to build category value	Not achieved
Build capability in servicing regional and niche market channel opportunities	Not achieved
Develop new fresh potato product concepts	Not achieved
Support development of higher value products	Not achieved
Support R&D around improving waste stream use	Not achieved





### Outcome 2. Exports

Export markets have grown, resulting in increased average returns to growers.

Strategic Area	Status
Develop a five-year export market development strategy covering fresh, processing and seed potatoes	Not achieved
Provide the necessary R&D support for priority market access and market improvement business cases	Achieved
Support exporter capability building and knowledge of prime prospect markets	In progress
Establish improved intelligence for export markets	In progress

### Outcome 3. Yield

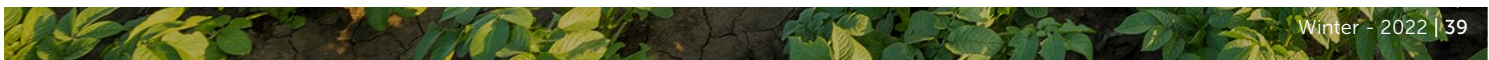
Average yields have significantly improved, resulting in reduced costs of production.

Strategic Area	Status
Run subject-specific professional development workshops for consulting agronomists (jointly with processing program)	Achieved
Leverage the potato extension program into establishing regional grower development groups	In progress
Integrate integrated pest management (IPM) and soil health as core elements of the potato extension program	Achieved
Establish an appropriate prioritised regional program to address pest and disease challenges/threats	Achieved
Support the wider application and adoption of PREDICTA® Pt	Achieved
Support industry-wide efforts to improve the performance of certified seed across the supply chain	Not achieved

### Outcome 4. Sustainability

Increased innovation and agility in potato businesses has resulted in a sustainable industry that can adapt to highly dynamic markets.

Strategic Area	Status
Improve industry engagement with a revised communication program	Achieved
Introduce an annual scholarship to support overseas study tours for young growers	Not achieved
Introduce Next Gen leadership development program, including internships and scholarships for growers, scientists and advisors (in collaboration with the potato – processing SIP)	Not achieved
Develop an IT self-assessment benchmarking tool	Not achieved
Develop an online knowledge database for growers that translates the latest research into practical information	Achieved



# Tolsma sells their 100th CLIMATE CONTROL SOLUTION IN AUSTRALIA

In honour of Frank Rovers purchasing the 100<sup>th</sup> Climate Control Unit from Tolsma, we took the time to sit down with him and discuss his experience in the potato industry, along with his reasons for choosing a Tolsma Climate Control System.

(From L-R) Allan Greenhalgh,  
Maarten van Delden, Frank Rovers

Frank was raised on his family's dairy farm in Victoria's South East. He says that growing up on a dairy farm was incentive enough to find another vocation, and at the age of 17 he found his calling when working for his neighbour growing potatoes. Fascinated with the art of growing and storing potatoes, Frank has never looked back, continually implementing new efficiencies into his business model.

Frank was introduced to Tolsma in 2006 at Potatoes Europe when he joined a Tolsma presentation on storage of potatoes. Despite it all being in Dutch, he found the graphical information on the slides of great interest. The presentation explained how weight loss could be managed by controlling the moisture difference between the product, mechanical cooling, and external air. Introducing fresh air into the store to cool was a completely new concept, and something Australian Farmers were not doing at the time. This information also led to the conversation around CO<sub>2</sub> in the store and the affect it has on processing & seed potatoes.

Frank went on to explain to us what he gained from the

presentation and was very clear on the benefits.

"In particular the Mollier diagram, which very clearly shows the moisture difference between warm and cold air. This helped explain how the crop incurs weight loss and how to limit it. It is simple science really, but until it is presented to you in a way that hurts your pocket, you don't take any notice of it. In Australia, it was always just accepted that if you stored product over a period of time, there was quite a bit of weight loss involved. But we have since realised, that doesn't have to be the case, and storing well puts extra money in your pocket when you sell. If you can get extra product to market and reduce wastage, why wouldn't you".

**"I'll take an extra 5 or 10% revenue any day".**

Tolsma's Climate Control Systems are specifically designed for long-term storage of vegetables. Different vegetables require specific storage conditions such as air speed, airflow, temperature, CO<sub>2</sub>, and humidity. The Tolsma Systems use numerous internal and external sensors in conjunction with product sensors to limit product shock and gently dry or cool, while minimising temperature differentials and issues around condensation.

Frank, you have worked hard throughout your career to increase efficiencies and productivity. When was it that you began to think beyond the growing season and pay closer attention to improved storage conditions?

"The demand for stored potatoes through to September/October increased in the late 90's and early 2000's. When storing longer during this period, we soon realised that what went in



was not the same on the way out, and it got to a critical point where we had to reduce weight loss. We always sent seed off to cool stores, which were designed as apple stores and not the best storage solution. We had a particularly bad experience with black heart, which is a result of high CO<sub>2</sub> in the store, and we became very aware of the need to flush out CO<sub>2</sub>.”

**Frank, what are the benefits of the information that the Tolsma sensors provide?**

“The biggest learning experience was the amount of heat that the potatoes produce, particularly just after harvest. The use of the product temperature probes provides an accurate understanding of how the potatoes are behaving, rather than simply relying on a room temperature gauge, which can fluctuate every time you open the door. The product is what we are storing, not the room, that is why it is important to understand product behaviour by inserting the temperature sensors in the product.

Secondly, when we harvest in particularly wet conditions, the system allows you to dry in store by calculating internal and external moisture differentials. The added benefit of this, is significantly less product movement, saving both time and money”.

- All the seed is at the same stage, with the same vigour and this transfers to emergence.
- From the start of emergence, to what I consider full emergence is under a week. Prior to that you could still have spuds coming up after 3 weeks due to different physiological age, resulting from the poor storage conditions
- Far more stems, so a better tuber set
- Far better and more uniform sample. We now have minimal issue with oversize produce, it simply does not exist for the most part”.

**Given this, do you think a Tolsma store is value for money?**

“There are two main returns on investment with a system of this kind.

1. Weight loss. In the past we would weigh our bins in and out of the store. It wasn't unusual to lose the top board on a four board bin, which is 25%”. With the Tolsma system, weight loss is somewhere between the 3-4% mark. You do the maths, losing a quarter of your product is a massive cost.
2. Uniform size, you end up with less wastage and a higher marketable yield. Much less over size and under size, which is another significant return on the investment”.

**Companies only pay what they have to, regardless of the cost of production. Therefore, you need to be above the average to continue moving forward. “To be above the average, you have to do above average things by progressing in all areas of production”.**

**Frank where do you see the Tolsma solution being beneficial in the Australian market?**

- “For me, good storage offers two things :
- Flexibility around harvest because you know your



QCC Unit

product will keep well in your store

**“You can harvest when you want, not because you have to”.**

- Opportunity to market your produce over a broader range of time. This gives you more flexibility as to when you sell because you have the confidence that they will keep well”.

**Any final advice for our readers Frank?**

**“People are always going to want potatoes; growers should always go with the technology to increase production efficiency”**



Vision control

**Over many years of experience with a Tolsma climate control system, can you discuss the benefits of a Tolsma store?**

“Obviously, huge reductions in weight loss. In terms of seed :



(From L-R) Frank Rovers, CEO Dim-Jan de Visser

For more information get in contact with the local Tolsma team.

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Torquay, VIC, 3228

Email: sales@tolsma.com

Maarten 0468 894 099

Allan 0434 774 430

**TOLSMA**  
AUSTRALIA





## International Farm Management Congress report: Ruby Daly

Attending the International Farm Management Congress in Scandinavia, held from 26 June to 1 July 2022 has completely changed Ruby Daly's outlook on farming in her little pocket on the southeast coast of Tasmania. Ruby Daly reports on her experience.

The two words that were very foreign to me were co-ops and subsidies. Farmers in Scandinavia receive a great deal of assistance from their governments. Also, they receive incentives to become more climate-focused in their farming practices.

### Norway and Sweden

After starting the pre-tour in Bergen, Norway, where we meet around thirty other industry people from around the world, we jumped on a bus and started heading around farms close by.

The one thing that stood out to me was the fact that Norway's farming land is small, but they use every piece of land they have. This is one lesson I believe we can learn from Norwegian people – to utilise every acre we have available to us in Tasmania.

After a couple of days in Norway we crossed the border into Sweden where farming seemed different. We visited so many different farming styles, from three brothers farming 530ha of land to

a vineyard in Sweden that must manage with snow on the vineyard.

What motivated me was their passion to make the most of what they had and then pass their business onto the next generation – for as many as fourteen generations.

### Current Generation Farmers

But the highlight of this experience was meeting fourteen *current generation farmers* from all over the world with completely different farming background and issues but we all found out that no matter how big or small we each farmed our problems and issues are, largely, the same.

These amazing people from all over the world have inspired me to try bringing more of the current generation into the farming world.

We all thought that the phrase 'next gen' did not suit our working group; in fact, we are the current generation of farming. I am inspired to help set up a peer support





Ruby Daly from Daly Farms.



group for our next generation which helps us expand with professional development opportunities in the agriculture industry.

Professional growth and development should be readily available for our next generation farmers, but at the current time there's very little with which we can support each other in a productive social interaction. I strongly believe this will play a huge part in ensuring we make a positive impact on our mental health and well-being into the future.

### Next Gen workshop

At the end of the weekend, for the next gen workshop, our task was to develop a strategy for a Swedish dairy farmer who needed to turn his profit around. Although we were all in diverse groups, we all came to the same conclusions:

- You need to understand the current risks to your business.
- Having a strong leadership with clearly defined roles and responsibility for the future.

- Have a clear plan and review it every 12 months.
- You can farm with your heart, but you must run your farm as a business first.

But my best tip was from an American farmer Jay Smith. His words have really rang true with me and I hope others can experience the same as I did. "Being a farmer is fun, but Ag travel is the most important part of farming".

This is so true; I have been completely overwhelmed with information and data to try and digest within our business, but I have never been more motivated to come home and share all my experiences to help inspire the current generation of farmers to see how they farm around the world.

The IFMA Congress will be in Saskatoon in Canada in July 2024, and I encourage young farmers to take the opportunity to see and learn how others farm around the world.

Find out more

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Topic: Improving gender balance in the industry

Title: ***Raising women to farm: A study of daughter succession in a changing family farm environment***

Author: Katrina Sasse

Supporter: Katrina's Nuffield Scholarship was supported by Grains Research & Development Corporation

Though the Australian agricultural sector is making strides in achieving gender balance, a greater focus must be placed on shifting traditional patterns of family farm succession and the way rural communities perceive daughters who lead, work on and contribute to family farming.

That's according to a report by 2017 Nuffield Scholar and West Australian grain grower, Katrina Sasse, whose research was motivated by own experience with family farm succession and desire to see gender equality and diversity within Agriculture.

With support from the Grains Research & Development Corporation (GRDC), Katrina travelled throughout USA, Canada, the Netherlands, Germany and Denmark, meeting with family farmers, agribusiness consultants, academics and private and public-sector managers, to better understand how daughters are engaging in farm succession planning in advanced agricultural economies.

### Daughter farm successors

Throughout her travels, Katrina interviewed daughter successors to gain an understanding of how women are overcoming barriers to family farm succession, as well as gain insights to the common management and ownership tactics, practices and business structures that are typical of farms with daughter

successors. Her research also provides an understanding of women who did not want to take part in succession but had purchased their own farm in their own right:

"Travelling to Grinsted, Denmark, I spoke with dairy farm owner and 2016 Danish Young Farmer of the Year, Connie Linde, who decided to leave the family dairy farm and purchase her own operation in 2015 at just 26 years old," she says.

"As a role model for change in dairy farm management in Denmark, Connie said you have to be tough and be proud to show that women can excel at both the business and practical side of farming."

"She has maintained the support of her family during this process and continues to upskill through management and leadership courses, focusing on innovation and maximising efficiencies within her enterprise."

### Promoting the benefits of gender equality

In the report, Katrina speaks of how traditionally, daughters often missed out on the opportunity to farm, and she believes this is one of the main reasons for why Agriculture is still fairly male dominated today, however there is change on the horizon with more women taking on the reins in farm management and leadership than ever before.

"Daughters are an untapped resource in family farming. Many of the female successors I met had very strong credentials in terms of higher education, agricultural experience, and business and technological skills, which often set them apart in their industry and local communities," she says.

"For the first time in history we are seeing women take over multi-generational family farms, but there are still discrepancies in the socialisation patterns of boys and girls in farming communities."

"Pigeonholing women into categories such as farmer's wife or daughter-in-law, perpetuates the gender bias in rural communities. There needs to be a paradigm shift in agriculture that involves structural changes to the way people think and make decisions about farm succession at both a home and community level."

"Women bring diversity, innovation and thought leadership to the agricultural sector, and both men and women must continue to promote and validate the achievements of female farmers."

Travelling to Quebec, Katrina met 28-year-old Swiss Canadian dairy farmer and herd manager, Regula Estermann, who spoke about the opportunities in the agricultural sector that opened up when she moved from Switzerland to Canada.

"Regula explained that in Switzerland it was not as common for daughters to participate in farming, and often women are not afforded opportunities to work in the same capacities as men, and mainly manage the family and household domain," she says.

"Regula then went to USA for several years after school to manage a large dairy herd of a corporate dairy company knowing full well she would like to return home to the farm, but felt it was critical to gain invaluable knowledge and expertise in managing cow health and nutrition first."

"She returned to her family farm in Quebec where she has taken over the herd management responsibility from her father, with his understanding that her leadership and skills will benefit the business and boost productivity gains."

### Industry-wide, Industry-led solutions

Katrina concluded that although there are various initiatives across the globe that seek to empower women into agriculture, there is very limited dialogue within



industry with regard to daughters not being able to own and run family farm operations, as they face crippling gender bias.

“To change the way our rural communities think about succession, we need to see more industry-led initiatives that focus on building the capacity of women to remain on family farms and become successors,” she says.

“Then on the home-front, parents need to be challenging gender role stereotypes, recognising unique strengths and capabilities, and ensuring both sons and daughters are given equal opportunities for succession.”

“We need to continually encourage the upskilling and development of young women in our sector, sharing stories of female successors so the younger generation view it as a viable career option and feel empowered to pursue it.”

“To safeguard the success and continuity of family farming enterprises, we need to continue striving for a balanced gender setting on farms and within rural communities across Australia, and ensuring daughter are engaged and empowered in family farm succession planning.”

### Katrina's recommendations following her scholarship report:

#### For Parents:

- Involve daughters in the farm at a young age, teach them farming skills and transfer knowledge early.
  - Get daughters involved in as many experiential learning activities on the farm as possible.
  - To teach, coach and encourage daughters that they are capable farmers.
  - Throw away the notion of “men’s work” and teach daughters the skills.
  - Allow daughters to use tools, equipment and machinery, show them how to make something, to have a go without obligation, and learn by mistakes.
  - Capitalise on different strengths and structure your team so everyone has a role and see diverse skills as an asset.
  - Teach daughters financial skills and how to run a business by giving them ownership of something.
  - Siblings can work in a harmonious business partnership where daughters and sons do not have to work side-by-side on daily tasks but their
- strengths compliment the other.
- #### For Daughters:
- Be proactive. Early planning and management of the succession process is critically important. Have open communication with your family. Discuss returning to the farm and bring up the succession conversation early with your parents.
  - Know your parents’ retirement intentions to understand their expectations and plan for it.
  - Talk to other women about running a farm or find a mentor who will be able to share their journey and help you find yours.
  - Weigh up the pros and cons of a career on the farm, accept some uncertainty, and make a final decision with your gut instinct.
  - If you have a long-term partner, engage with them on ideas as to how it may work, how roles and responsibilities will be shared on the farm and in the household.
  - Call out sexism and unconscious bias. The more women raising awareness about the issue the easier it will be for the next generation.
  - Use social media to spread thoughts on complex issues, and gain community support.
  - Understand that you can manage and tackle farms and their issues solo and seek help when needed. Employing people with differing skills and building a good team ensures a strong business.
  - Understand what women farmers have achieved so far and how things have changed, but steer clear from reinforcing gender stereotypes. Think outside the square as not every farm needs to be managed the same way. Be bold and different.
  - Know your strengths and take note of the work that invigorates you.
  - Talk early to your family farm bank manager about future goals.
  - If you have not been considered as the family farm successor, then have a conversation with your parents about what they can do to support you in your desire to run a farm or have a career in the industry.
  - If succession planning does not go your way, don’t let it set you back. A path can be forged without the family farm by running, owning or managing a different enterprise.
  - Social media pages can assist farmers’

daughters by showing what other daughters are doing on farms, and to see the possibilities for women in farming.

#### For Agricultural Leaders:

- There is little information available to inform government on the economic and social barriers for daughters entering family farming.
- Opening the patrilineal family farm succession matrix and transforming it to be more inclusive to women is a way to correct the systemic gender imbalance.
- Industry should provide policy advice to the Australian government on rural issues pertaining to women, should leverage the feminist perspective on gender equality and discuss how women gaining equal share of decision making and ownership in agriculture is a matter for rural sustainability and progress.
- A workbook on succession management for women successors is needed for use by succession planners and other agribusiness consultants to avoid the typical farm succession language, which too often reinforces unconscious gender biases.
- Successful stories of women successors need to be shared as widely as possible, online and through other forms of media. More incentives and campaigns to encourage youth, particularly women, to view agriculture and related fields as a viable career is vital. Initiatives include:
  - Invisible Farmer Project
  - Australian Women in Agriculture group
  - Women in Farming Enterprises group
  - Country Women’s Associations
  - Rural Edge ‘Inspire Summit’
  - Rural, Regional and Remote Women’s (RRR) women’s network’s
  - AgriFutures Rural Women’s Award.

#### Find out more

To read Katrina’s report *Raising women to farm: A study of daughter succession in a changing family farm environment*, please visit [nuffield.com.au/katrina-sasse-2017](http://nuffield.com.au/katrina-sasse-2017).

For more information, or to read more reports like Katrina’s, please visit [nuffieldscholar.org/reports](http://nuffieldscholar.org/reports).

## Using multiple streams of sensor data to make smarter decisions

A pilot 'Smart Farm' is using novel sensors and multiple streams of data to develop a system to help vegetable growers farm more efficiently, maintain records for certification and better understand their crops. The trial is located in Bundaberg at the property of Australia's largest chilli producer, Austchilli. Ian Thomas reports.



A dendrometer attached to growing chilli to track plant growth cycles. Image courtesy of Henry Hyde from Applied Horticultural Research.

The pilot 'Smart Farm' at Austchilli is a hive of activity, and systems are being developed to deliver information to the farm managers in real time. This replaces the need to manually collect sensor data.

This trial is part of the *Digital remote monitoring to improve horticulture's environmental performance*, a strategic levy investment under the Hort Innovation Nursery Fund with contributions from the Australian Government's Landcare Smart Farming Partnerships program.

The project is a collaboration between Applied Horticultural Research (AHR), Hitachi, Freshcare, Growcom, Greenlife Industry Australia, the Australian Banana Growers Council, Avocados Australia, AUSVEG and Austchilli.

While researchers at AHR are assisting the farm managers with the installation and operation of the sensors, a team of developers at Hitachi are incorporating the data outputs into a unified easy to understand digital dashboard.

The goal of the project to create a system where farm management decisions are not made based on one single metric or source of data. As Austchilli owner David De Paoli says, it's not about any one sensor – but the complete system.

"Each unit plays its part in data gathering to give you the whole picture. This then drives the automation," he says.

Austchilli is one of the pilot farms participating in the investigation and use of various digital monitoring methods, and David and his technical staff have been pivotal in ensuring this project is pointed to deliver commercial outcomes for the avocado and vegetable industries.

### How it works

Current sensors operating on the Smart Farm include soil moisture, pH and electrical conductivity, a weather station, and in-field high-definition cameras to monitor vital crop growth stages. A variety of new sensors have recently been added to measure leaching of nutrients and ground run-off.

New, and sometimes novel, sensors have been integrated into the system since the establishment of the farm. A notable new inclusion is a dendrometer, which typically is used to measure miniscule contraction and expansions in the trunks of tree crops, placed onto a growing chilli fruit.

The data from this sensor will provide a better understanding and record of plant transpiration and growth rates and assist in irrigation and nutrient applications. As the sensor data is collected over multiple crops, the record will provide an invaluable record for understanding yearly differences in crop performance and yield.

### Sustainability focus

The project is also looking into ways of automating recording keeping for certification systems, such as Freshcare Environmental and the Hort 360 Reef Certification.

Automating the complicated process of record keeping for environmental record-keeping will likely become an important cost-saving tool as more growers look to do their part in maintaining Australia's environmental standards.

David is hopeful that the system being developed will begin being used in real-

time farm decision making within the year.

An audit of the efficiency of the pilot Smart Farm inputs will be conducted once all the monitoring system have been integrated into the digital dashboard. However, the project still has a long way to go before reaching its goals.

"My staff are currently using the data now but there is still human decision-making in the delivery of inputs," David says.

"It's now not a guess – it's real data in real time. With the automation controlling the inputs, I can rest easy knowing that if it's Friday afternoon or the weekend, attention to detail will continue and I won't get fruit drop or blossom end rot."

Find out more



Please contact AUSVEG Project Officer Ian Thomas at [ian.thomas@ausveg.com.au](mailto:ian.thomas@ausveg.com.au) or phone 03 9882 0277.

This project is funded by Hort Innovation using the nursery research and development levy and contributions from the Australian Government.

Project Number: ST19024

**Hort Innovation**  
Strategic levy investment

**NURSERY FUND**



## Serpentine leafminer: Sharing knowledge with growers and stakeholders

A multi-industry project is underway to educate horticultural growers about the identification and management of serpentine leafminer. Part of this project is developing an industry communication program, which is being led by AUSVEG and facilitated by Project Officer Cherry Emerick.

*Management strategy for serpentine leafminer*, *Liriomyza huidobrensis* is a strategic levy investment under the Hort Innovation Potato – Fresh, Potato – Processing, Melon, Onion and Vegetable Funds.

This project is developing and delivering targeted R&D specifically for serpentine leafminer in response to the incursions detected in Australia in late 2020. It is building on the initial work of recently completed *RD&E program for control, eradication and preparedness for vegetable leafminer* (MT16004).

Areas of work include:

- Identifying and monitoring parasitoids.
- Refining development and validation of surveillance and diagnostic protocols.
- Using predictive forecasting to manage and assess the risk of serpentine leafminer.
- Delivering an industry communication program.
- Developing an industry management plan, grower guides and industry focused workshops.

AUSVEG is delivering the industry communication component, and recently appointed Cherry Emerick to assist with the project.

Cherry is a former grower and spent over 10 years with one of Australia's largest vegetable producers. She has extensive experience as an industry development officer in the horticultural and natural resource management industries in north Queensland.

### Leafminers: A snapshot

Leafminers are best identified by what they leave behind – tiny snake like trails on the underside of young leaves. The pest leaves white or grey lines on leaves with dampened black and dried brown areas. These are created by the newly hatched larvae that feed by 'mining' into the upper surface of the leaf tissue.

High levels of infestation affect the plant's ability to photosynthesis which reduces plant growth and crop yields.

As outlined in *Vegetables Australia – Autumn 2022*, serpentine leafminer is in New South Wales, Queensland, Western Australia and the Northern Territory, and is causing significant problems for growers in these regions.

Project MT16004 developed a number of potential options for growers to effectively manage infestations. Using an Integrated Pest Management (IPM)



Serpentine leafminer damage pictured on a seedling. Image courtesy of Bahram Fayaz, HM Clause.



A cucumber leaf affected by leafminer damage.

approach on-farm has produced encouraging results. This is combining naturally occurring parasitic wasps and recommended insecticides.

Serpentine leafminer is usually seen from autumn until spring, so it is important to remain vigilant. Good management practices on-farm will assist in minimising any possible future impacts to your crops.

Please visit [ausveg.com.au/mt20005](https://ausveg.com.au/mt20005) for further information and to access useful resources.

### Grower workshops

AUSVEG Project Officer Cherry Emerick will be leading a series of workshops as part of MT20005. These will be targeting growing districts that are vulnerable to serpentine leafminer incursion.

Dates are to be confirmed. However, workshops are planned across three states (see below table). Cherry will work in collaboration with growers and stakeholders to publish three grower guides suitable for on-farm use.

Region	State
Bowen	Queensland
Ayr	Queensland
Mareeba	Queensland
Cairns	Queensland
Carnarvon	Western Australia
Kununurra	Western Australia
Broome	Western Australia
Katherine	Northern Territory
Darwin	Northern Territory
Shepparton	Victoria

### Find out more

Please contact Cherry Emerick on 0418 389 680 or email [cherry.emerick@ausveg.com.au](mailto:cherry.emerick@ausveg.com.au).

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

Project Number: MT20005

**Hort  
Innovation**  
Strategic levy investment



WINTER 2022

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# **SPECIALISED VEGETABLE MACHINERY AND GROWING EXPERTISE FROM THE GROUND UP**



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**POTATO LINK**  
AUSTRALIAN POTATO INDUSTRY  
EXTENSION PROJECT

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**Cover:** Ruby Daly and Lelanie van der Merwe at the WPC field day.

- Photo by J. Ekman





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### World Potato Congress 2022

Held in Dublin in May this year, the world potato congress attracted nearly 1,000 delegates from 60 countries.

Jenny Ekman takes a look at some of the conference highlights, with new results in sustainability, nutrition, breeding and precision ag. There was also a Field Day, and side visits to Sam Dennigan and Co. and TOMRA technologies.

With the next conference to be held in Adelaide, it's a great time to take a look at this major event.





# THE CHANGING NUTRITION NEEDS OF A GROWING CROP

Surging fertiliser prices have put the spotlight on fertiliser budgets. Approaching nutrition through the 4R framework can keep up with crop nutritional needs while taking the sting out of high fertiliser prices.

by Alisa Bryce

The 4R's of fertiliser management means putting the **RIGHT** nutrients on at the **RIGHT** rate, at the **RIGHT** time, in the **RIGHT** place.

Pre-planting soil testing is the best way to gauge the right nutrients and rates to start the season.

In-season tissue testing (Figure 1) can identify which nutrients need a boost, or where the fertiliser program can be scaled back. Using in-season tissue testing can catch deficiencies early, before visual symptoms appear and yield is penalised.

For potatoes, the right time and place are particularly important. For the first few weeks, potato plants get most (but not all) of their nutrition from the seed piece. From stage 2 (stolon initiation)

the plant transitions from using energy reserves in the seed piece to accessing soil nutrients through the developing roots.

Nutrient demand is highest from tuber initiation through to maturity, (Figure 2) so nutrients need to be both available and accessible. Potatoes have shallow, sparse root systems that are poor nutrient scavengers. Ensuring nutrients are within easy reach, especially immobile nutrients like phosphorus, is critical.

Potato nutrition requirements change throughout the season (Figure 5). Matching fertiliser inputs to these requirements helps avoid deficiencies (Figure 3) and maximise yield while avoiding waste of expensive inputs.

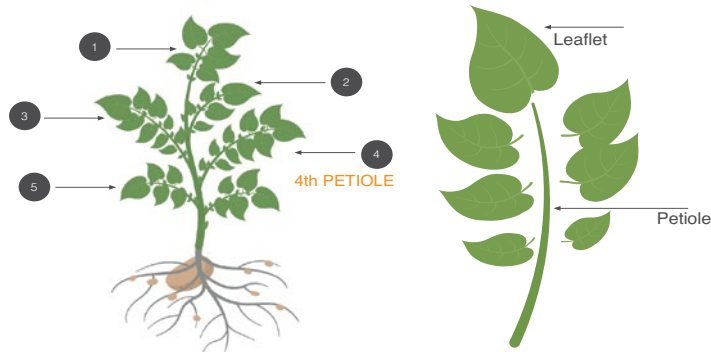
## ROLES OF NUTRIENTS IN POTATOES

**Nitrogen** needs the most management. It is critical for developing tubers and overall crop growth. Nitrogen must be managed carefully throughout the season, as either inadequate or excessive supply can reduce crop quality and yields. In-crop mineralisation can supply some nitrogen but repeat applications are likely necessary.

Only a small amount of nitrogen is needed during establishment and stolon initiation. Crops need enough to encourage leaf growth and help deal with early blight infestations. Conversely, too much nitrogen during these growth stages can delay tuber initiation and maturity, promote excess vine growth, increase risks from disease and potentially result in internal defects in tubers.

Potatoes take up 60 – 70% of their total nitrogen requirements during tuber bulking (Ojala et al. 1990). In contrast, very little nitrogen is taken up during maturation.

**Phosphorus** helps the root system develop, regulates tuber set and promotes tuber maturity. Inadequate



**Figure 1.** Nitrogen status may be assessed by sampling the fourth petiole (from the newest leaf down) from at least 30 plants around the field. Petiole nitrate-N levels during tuber bulking are; <10,000ppm = low; 10-15,000ppm = medium and >15,000ppm = sufficient

phosphorus leads to lower tuber numbers. Because phosphorus is quite immobile in the soil, it should be applied pre-planting, near the seed, where the developing root systems can access it.

**Potassium** optimises tuber yield, size and quality and regulates water balance. It is also essential for root elongation, leaf expansion and photosynthesis. Potassium deficient plants have lower specific gravity and are more susceptible to disease. Being heavy potassium users, in-crop applications of potassium are common. As with nitrogen, potassium requirement peaks during tuber bulking. However, too much potassium late in the season can reduce specific gravity.

**Calcium** creates stronger cell walls which improves skin quality, maximises tuber storage life, and reduces susceptibility to disease. Regular calcium supply is needed throughout the season, but supply is particularly important during tuber initiation and for protection against quality disorders such as internal brown spot.

**Sulfur** is useful for increasing tuber numbers and can help mitigate the risk of Common and Powdery Scab. Like calcium, regular sulfur supply is important.

**Magnesium** is essential for photosynthesis. It is particularly important during tuber bulking for maintaining tuber size and yield.

Although only required in small amounts, trace element deficiencies can restrict root growth, yield, and disease resistance.

**Boron** is the trace element needed most by potatoes. It affects cell wall strength and therefore tuber storage quality, as well as supporting root growth. Boron also helps potatoes absorb and use calcium.

**Manganese** and **Zinc** deficiencies affect yield and skin quality. Low zinc can affect nitrogen metabolism and starch content. Too much manganese can severely reduce yield.

**Copper** and **Iron** deficiencies are rare. **Molybdenum** deficiency is also uncommon, being more likely if the seed piece was grown in low molybdenum soil. Without enough molybdenum, plants can't use nitrogen to make protein; symptoms look like nitrogen deficiency.

## NUTRIENT INTERACTIONS

Nutrient interactions in plants are complex, but important to consider as imbalances can penalise yield and quality. In potatoes, the more commonly recognised interactions are:

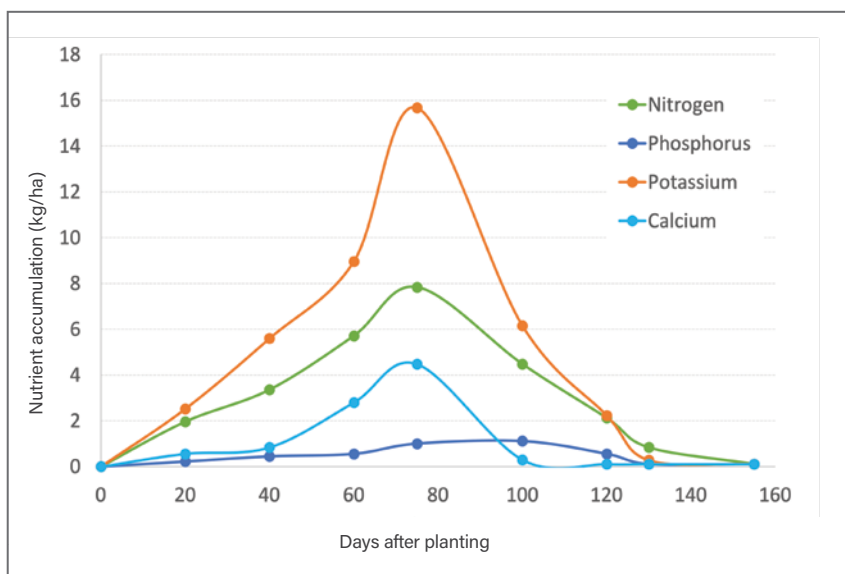
- High rates of potassium fertiliser can induce magnesium deficiency, as potassium and magnesium compete for uptake.
- Boron improves calcium absorption.
- Increased available phosphorus can affect manganese uptake.
- Zinc deficiency can result from excess phosphorus uptake, or phosphorus-induced zinc deficiency.
- Trace element interactions can partition between the shoots and dry matter. For example, increased available soil manganese depresses iron in shoots (Reichman 2002).
- A study by Barben et al. (2011) suggested that balancing zinc and manganese availability – especially avoiding low zinc and high manganese – is vital as these nutrients can have negative impacts on phosphorus, copper and iron.

## READING THE PLANT

The symptoms of nutrient deficiencies or excess vary in where they first appear in the plant. Mobile elements can be relocated from older leaves to growing shoots (e.g. potassium and magnesium), whereas deficiency symptoms of immobile elements will be most obvious in the growing tips (e.g. calcium and sulfur; see Figure 4 for illustration of zinc and sulfur deficiency).

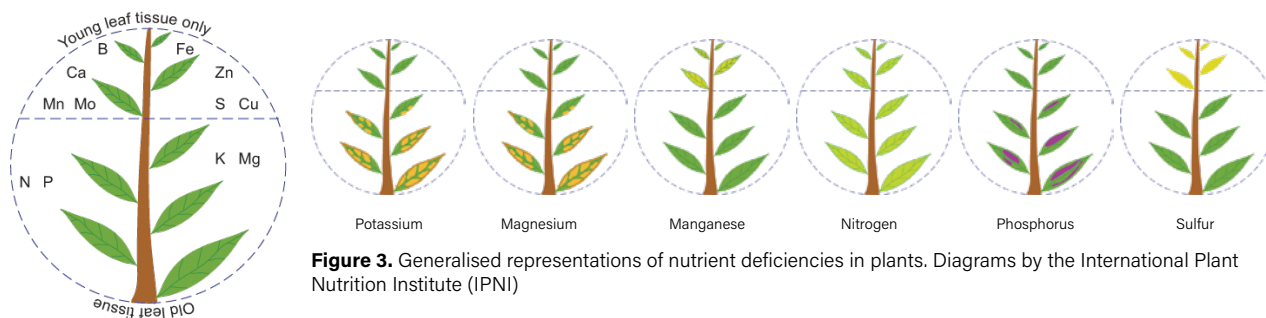
Other ways to fine-tune fertiliser management:

- Remember Leibig's law of the minimum—yield is only as good as the most limiting nutrient i.e. more nitrogen won't help if lack of boron is suppressing growth. Addressing the full suite of nutritional needs gets the most out of the fertiliser budget.
- Match zones in paddocks to fertiliser needs based on soil type and cultivar.



**Figure 2.** Daily nutrient accumulation by Russet Burbank potatoes. Derived from Horneck and Rosen, 2008.










**Figure 3.** Generalised representations of nutrient deficiencies in plants. Diagrams by the International Plant Nutrition Institute (IPNI)



**Figure 4.** Both zinc (left) and sulfur (right) are immobile in the plant, so deficiencies show first in the youngest leaves. Photos by IPNI.

					
	Stage 1 - Establishment	Stage 2 - Stolon initiation	Stage 3 - Tuber initiation	Stage 4 - Tuber bulking	Stage 5 - Maturation
Nitrogen	Too much N risks delaying tuber initiation and internal defects	Too much N risks delaying tuber initiation and internal defects	N needs increasing but don't overdo it	Peak N demand	N uptake drops significantly
Phosphorus	Early shoot development and root elongation	Maximises tuber number set	Maximises tuber number set	Supports tuber bulking	
Potassium	Protection against disease and frost tolerance	Root development and photosynthesis	Root development	Peak K demand	
Magnesium				Mg most important. Maintains tuber quality	
Calcium			Ca most important. Protection against quality disorders	Improves skin finish	
Sulphur		Tuber numbers and disease protection			

**Figure 5.** Key potato nutritional needs across the five growth stages.

## FERTILISER APPLICATION METHODS

Choosing an appropriate fertiliser application method is important

for nutrient timing and placement. Broadcasting or banding granular fertiliser pre-season sets the crop up for a good start. Fertigation and foliar

applications are more common in season as the fertiliser budget gets adjusted in response to tissue testing. Each method has pros and cons.

Method	Pros	Cons
<b>Broadcasting (not incorporated)</b>	<ul style="list-style-type: none"> <li>Fast, easy to apply.</li> <li>Can be done with cheaper equipment than other methods.</li> </ul>	<ul style="list-style-type: none"> <li>Uses more fertiliser than banding.</li> <li>More fertiliser available for weeds.</li> <li>Greater chance of nitrogen loss through volatilisation and denitrification.</li> <li>Requires rain or irrigation to move more mobile nutrients like nitrogen into the rootzone.</li> <li>Less mobile nutrients like phosphorus and traces remain on the surface, away from the roots.</li> </ul>
<b>Banding / side dressing</b>	<ul style="list-style-type: none"> <li>Puts nutrients closer to the roots for better access. Particularly important for phosphorus.</li> <li>Better root growth through more access to nutrients.</li> <li>Less nutrients for weeds.</li> <li>Uses less fertiliser than broadcasting.</li> <li>Less risk of nutrient loss with erosion.</li> <li>Less risk of nitrogen loss from volatilisation and denitrification.</li> </ul>	<ul style="list-style-type: none"> <li>Equipment costs more than broadcasting equipment.</li> <li>Slower than broadcasting.</li> <li>Risks salt damage if fertiliser is placed too close to the seed piece.</li> </ul>
<b>Fertigation</b>	<ul style="list-style-type: none"> <li>Can be precise with fertiliser amounts and timing.</li> <li>Faster nutrient uptake because nutrients are already in water.</li> <li>Flexibility to adjust rates throughout the season.</li> </ul>	<ul style="list-style-type: none"> <li>Troublesome if it's a wet year and the soil is already saturated.</li> <li>Higher risk of leaching nutrients, especially nitrogen if applied early in the season.</li> <li>Uneven applications and wasted fertiliser if windy.</li> <li>Higher risk of N loss from volatilisation on hot, windy days.</li> <li>High calcium and/or magnesium in water can make phosphorus unavailable.</li> </ul>
<b>Foliar applications</b>	<ul style="list-style-type: none"> <li>Fast way to correct trace element deficiencies.</li> <li>Useful if the soil is alkaline and some nutrients are less available for uptake.</li> <li>Useful for in-crop phosphorus applications if irrigation water has high calcium and magnesium.</li> <li>Faster nutrient uptake than fertigation and other soil application methods.</li> </ul>	<ul style="list-style-type: none"> <li>Less useful for macronutrient deficiencies.</li> <li>Risks scorching or leaf burn if rates are too high.</li> <li>Shouldn't apply on moisture stressed plants.</li> </ul>

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# MAKING SENSE OF SOIL TEST REPORTS

Whether it's improving yields, using fertilisers efficiently or monitoring sustainability, regular soil testing can give you the information you need. *By Paulette Baumgartl*

Crop health, yield and quality depend not only on the levels of plant nutrients but also how they interact in the soil. Soil testing is a great tool to help you decide how to manage your fertiliser program for crop and soil health. There are several reasons to conduct regular soil testing, including to:

- **Check soil properties** that influence nutrient availability and uptake, such as organic matter, pH, electrical conductivity, and cation exchange capacity (CEC).
- **Determine levels and ratios of nutrients** in the root zone and required interventions.
- **Prepare a nutrient budget** and management plan based on the yield target and the predicted nutrients removed with the crop.
- **Monitor** changes and trends over time.

## BEFORE YOU TEST

Having an overview of the soil conditions before planning a soil testing program will help you understand what your test results mean. Specific information you should consider include:

- Site history including cropping and fertiliser and past soil test results.
- Soil type and texture, uniformity, and condition of soil surface.
- How deep is your topsoil and are there any compaction layers?

## SOIL TESTING: WHERE, WHAT, WHY, AND WHEN TO TEST

Potatoes are fast growing and high yielding crops, and their demand for nutrients is high. They can remove

large quantities of nutrient from the soil, and it is vital to ensure fertiliser applications are adequate to supply the crop requirement.

Soil testing often focuses on the topsoil, i.e., the top 15-30 cm, and doesn't always capture information about the subsoil or deeper crop root zone. It is important to also measure soil properties and nutrient availability at depth, as these factors can influence plant nutrient uptake and crop health. Subsoil sampling is particularly important for minimum or no till systems, where nutrients and pH can be stratified across the soil profile.

Refer to the Soil Wealth website [www.soilwealth.com.au](http://www.soilwealth.com.au) for a guide to collecting soil samples for testing.

## HOW DO PLANTS TAKE UP NUTRIENTS FROM THE SOIL?

There are three ways that plants can take up nutrients from the soil:

**Root interception** where growing root system comes into direct contact with nutrients in the soil. This is important for immobile nutrients such as phosphorus.

**Mass flow** where nutrients move in the soil water to the roots. Good examples are highly soluble nutrients like nitrate and boron.

**Diffusion** This is where positively



While some soil characteristics can be assessed by sight and feel, soil tests can provide far more detailed information.

- Photo by L. Ketchum



Soil type can vary considerably through the profile

charged nutrients such as potassium (K<sup>+</sup>), calcium (Ca<sup>++</sup>), and magnesium (Mg<sup>++</sup>) diffuse to the soil roots from soil particles.

Laboratory soil tests extract plant available nutrients from the soil. However, understanding the levels of available nutrients is not the complete picture. How well potato plants can use these soil nutrients depends on many factors, including:

- **Soil moisture:** Plants cannot take up nutrients from dry soil, so it is important to keep the soil moist in the entire root zone.
- **Soil properties** such as texture, CEC, and organic matter will impact nutrient uptake.
- **Salinity:** Nutrient uptake and use efficiency is low in salt affected soils, due to negative interactions with nutrients or sodium at high concentrations.
- **Soil-borne disease** can reduce root efficiency and nutrient uptake.

## CHEMICAL AND NUTRITION PARAMETERS - WHAT THE NUMBERS MEAN

### Soil pH

*What:* Soil pH is a measure of the acidity or alkalinity of the soil. Soil pH mainly affects the availability of major and trace elements to plants. Highly acidic or alkaline soils can lead to either nutrient deficiencies or toxicities.

*How is it measured:* Soil pH can be measured in water or in a calcium chloride (CaCl<sub>2</sub>) solution. When soil pH is measured in water, a level of less than 7 is acidic and greater than 7 is alkaline.

Soil pH in CaCl<sub>2</sub> is usually preferred as it is less affected by soil electrolyte concentration, providing a more consistent result. Soil pH in CaCl<sub>2</sub> is typically 0.5 to 1 unit lower than pH measured in water. To optimise nutrient availability, soil pH in CaCl<sub>2</sub> should be maintained at between 5.8 to 7.5 in the topsoil (top 15cm), and above 4.8 in the subsurface (below 15cm). Potatoes generally prefer slightly acidic soils.

*Interventions:* Highly acid soils can lead to toxic levels of aluminium, limit nutrient availability and soil biological activity. Acidity is best corrected using lime, which should be applied between potato crops. Note that fresh lime applied before planting may increase the likelihood of common scab.

Moderately alkaline soils (about pH 7.5) can reduce availability of phosphorus and trace elements. These soils can be corrected by applying elemental sulphur or acidifying fertilisers including urea or ammonium. Highly alkaline soils with a pH >8.5 or more are sodic. This can occur naturally or due to high levels of sodium in the irrigation water. These soils are difficult to manage, and tend to form crusts on the soil surface, restricting water infiltration.

### Soil texture and Cation Exchange Capacity (CEC)

*What:* Soil texture refers to the proportion of sand, silt and clay in a soil.

Cation exchange capacity (CEC) is a measure of the capacity of a soil to hold nutrients such as calcium, magnesium and potassium. Clay soils normally have a high CEC, e.g. 25 meq/100g or more and sandy soils have low CECs, often 5 meq/100g or less.

Low CEC soils do not hold nutrients well. Nutrients can easily leach out with rainfall or irrigation. Low CEC soils therefore need smaller quantities of nutrients applied more frequently than heavier loam or clay soils.

*How is it measured:* CEC is usually expressed as meq/100g or cmol+/kg.

*Interventions:* Adding organic matter is a good way of increasing or maintaining CEC. Some growers have added clay to sandy soils to increase nutrient (and water) holding capacity.

### Organic matter (OM)

*What:* Soil organic matter (OM) is an essential part of a healthy soil. It is a food source for soil micro-organisms and helps the soil hold water and nutrients.

*How is it measured:* Although there is no ideal number, soils with less than 2% OM are often regarded as functionally impaired. The organic matter content of soils used for potato production in Australia ranges from very low (less than 2%) in Mallee sands to high (more than 8%) in peaty soils.

*Intervention:* Planting cover crops, minimising tillage and erosion, spreading organic materials such as composts, manures and crop residues all help to elevate OM levels in soil.



## QUICK GUIDE TO ASSESSING A SOIL TEST REPORT

The following checklist a good way to assess your soil test report and identify areas that need attention. A good soil test report should show the following results:

- Soil pH: 5.5-7.5
- Organic matter 3.5-4%
- Nitrate-N: 40-50 mg/kg
- Phosphorus (Colwell): 75-100 ppm
- Potassium: 5% cations or > 0.5 meq/100g
- Sulphur: 10-20 mg/kg
- Calcium: magnesium ratio = 4
- Micronutrients: within recommended ranges
- Salinity: EC < 1/5 dS/m and chloride < 200 mg/kg
- Problem cations: Sodium < 6% cations (in a clay soil) and Aluminium less than 1 mg/kg.

## PRIMARY CROP NUTRIENTS

### Nitrogen (N)

*What:* Nitrogen (N) is a critical nutrient for crop growth and development of tubers. Too much or



too little nitrogen can have a negative impact on yield and quality. Many factors, including the type of N used, when, how much and how often it is applied all need to be considered when determining nitrogen application rates.

*How is it measured:* Nitrogen levels can be reported as total nitrogen or plant available nitrogen. Total nitrogen is a measure of the total amount of nitrogen in the soil and usually expressed as a % value. Plant available nitrogen is normally expressed as nitrate nitrogen and reported as NO<sub>3</sub>-N in mg/kg. Soil nitrate levels alone are guide only and not a reliable indicator of crop nitrogen requirements.

*Intervention:* Application of fertiliser. The amount and frequency should be based on the soil tests results and knowing the target tuber yield and crop removal rate.

### Phosphorus (P)

*What:* Soil phosphorus (P) is a key essential element for plants, being important in root growth, cell division and tuber initiation.

*How is it measured:* Tests measure extractable phosphorus in mg/kg, which roughly indicates how much P is available to plants. Real available P will depend on root distribution as well as soil type as P is not mobile in the soil.



Test results may also show the PBI value (potassium buffering index). PBI is the soil's ability to 'lock up' P so the crop cannot use it. High PBI soils will require higher rates of P fertiliser.

There are several tests offered in Australian laboratories for soil phosphorus:

Colwell P (mg/kg) is the most commonly used test. Results will vary with soil type however levels less than 30 mg/kg are low; levels 70 - 100 mg/kg are generally adequate to high. Colwell P levels should be higher in heavier soils and high yielding crops where a lot of P will be removed.

Olsen P (mg/kg) is the preferred method for soils with a pH above pH 6, and a must for a pH above 7. For potatoes, less than 30 mg/kg is generally considered low, more than 50 mg/kg is high. However, critical values vary considerably with soil texture.

Mehlich 3 (M3) P (mg/kg) is the preferred method for soils below pH 7.5. Less than 30 mg/kg is low, more than 70 mg/kg is high.

*Intervention:* Fertilisers and/or manures can be used to increase soil P levels. It is important to note that frequent or heavy use of manures can lead to elevated soil P levels and eventually leaching and/or run-off. High P applications reduce zinc uptake and can induce zinc deficiency. However, as zinc helps plants uptake P, a careful balance is required.

## AT A GLANCE - COMMON UNITS USED IN SOIL TESTS

Cmol/kg	Concentrations of cations are expressed in centimoles of positive charge per kilogram of soil (cmol(+)/kg). This measurement is equivalent to the previously used unit meq/100 g. Adding the concentrations of each cation gives you an estimate of the CEC figure.
% CEC	The proportion of a particular cation to the total cations present in a set volume of soil
meq/100g	Milliequivalents per 100 grams of soil. 1 meq/100g = 1 cmol(+)/kg, where cmol(+)/kg is the abbreviation for centimoles per kilogram.
mg/kg	Milligrams per kilogram - describes concentration of an element in a set volume

## Potassium (K)

*What:* After nitrogen, potassium (K) is the most abundant nutrient in potatoes.

As high levels are found in the tubers, it is possible for up to 350kg/ha of K to be removed at harvest. K deficiency can greatly reduce yield and result in plants more susceptible to disease.

*How is it measured:* Available K (in mg/kg) can be measured using several methods including Colwell, Skene, and Mehlich 3. Heavier soils usually require more K, but as a general guide, K should be present in the range of about 0.5 meq/100g or 5% of cations.

*Intervention:* If K is too low, it can be applied pre-planting in heavier soils. Foliar applications are more effective in lighter, sandier soils.



## Calcium (Ca)

*What:* Calcium (Ca) strengthens plant cell walls and helps maintain soil structure. In potatoes

it helps initiate tuber growth, protects against disorders such as internal brown spot, and improves storage and shelf life of tubers.

*How is it measured:* Calcium is usually listed as exchangeable calcium which is potentially available to the plant roots. It may also be recorded as a % of the whole CEC. A good value is between 65-80% of total CEC.

*Intervention:* Calcium is taken up by plants in the xylem (water carrying vessels), so can only move upwards through the plant from the soil. Dry or humid conditions, where transpiration is reduced, limit transport of calcium. Fertilisers with a high soluble calcium content can be used to increase plant access to calcium.



## SECONDARY NUTRIENTS

Although plants do not need so much of the secondary nutrients as the primary, these nutrients are just as important for optimal growth and development. Measuring and monitoring their levels in soils is vital.

### Sulfur (S)

*What:* Sulfur (S) aids in the building of proteins in plants, as well as formation of chlorophyll. For potatoes specifically, sulfur helps increase tuber numbers and reduces the risk of Common and Powdery Scab.

*How is it measured:* Soil test results reveal plant available sulfur in mg/kg. A value of 10-20 mg/kg is adequate; less than 5 mg/kg is low and more than 40 mg/kg is high.

*Intervention:* If additional sulfur is required, add a sulfate fertiliser to soils.

### Magnesium (Mg)

*What:* Magnesium (Mg) generally assists photosynthesis, and the regulation of other elements.

*How is it measured:* Soil tests measure the amount of magnesium that is potentially available to the plant. This can be listed as mg/kg of exchangeable magnesium or %CEC. Magnesium present in the range 10-20 % of total CEC is adequate.

*Intervention:* Low magnesium can be corrected via a range of fertilisers applied to soils or as foliar products.

## MICRONUTRIENTS/TRACE ELEMENTS

### Boron (B), Manganese and Zinc (Mn, Zn), Copper, Iron and Molybdenum (Cu, Fe, Mo)

Adequate trace element nutrition is just as important for vigorous and profitable crops and pastures as the primary and secondary nutrients.

Critical levels for trace elements vary with soil texture and crop. Levels are lower in sandy soils than in loams or clays. Soil testing for trace elements can only be a guide; further investigation through plant testing is recommended.

### GETTING THE TESTING RIGHT

A few simple measures will ensure the test is accurate, reliable and the best reflection of your soil conditions.

- Ensure the lab is using a testing strategy good for potatoes, and make sure you nominate potatoes as the crop type on submitted samples.
- Don't mix samples from different soil types.
- Use the same soil testing laboratory each year to reduce confusion and conflicting recommendations.
- Consider using precision soil sampling approaches to derive zone-based recommendations, enabling variable rate fertiliser spreading technology to be used.
- Use in-crop soil and petiole testing to confirm that your nutrient management strategies are adequately meeting your crop needs.



**Table 1:** Plant nutrients and soil properties: desirable ranges

MEASUREMENT	UNITS	VERY LOW	LOW	TARGET RANGE	HIGH
Soil properties					
pH (in water)		5	5.5	6.5 – 7.0	8
pH (in CaCl <sub>2</sub> )		4.5	5	6	7.5
Cation Exchange (CEC)*	meq/100g	<5	<10	10 – 20	>20
Organic matter	%	<1.0	2	3.5 - 4	>5
Nutrients					
Nitrate – Nitrogen (topsoil)**	mg/kg	<10	20	40 - 50	>60
Phosphorus (Colwell)	mg/kg	<20	30-60	70 - 100	>100
Phosphorus (Ohlsen)	mg/kg	<20	<30	30 - 50	> 50
Phosphorus (Mehlich)	mg/kg	<20	<30	30 - 70	> 70
Potassium (meq/100g)	meq/100g	0.2	0.3	0.5 - 0.7	1
Potassium (%)	% of CEC	<1	3	5	>8
Calcium	% of CEC	50	65	75	>80
Magnesium	% of CEC	<5	<10	10-20	>20
Aluminum***	% of CEC	<0.1	<0.5	<1	>1
Ca/Mg Ratio		<2	3	4	>5
Sulfur	mg/kg	2	5	10 - 20	40
Copper	mg/kg	<0.3	<2	2 - 20	>50
Zinc	mg/kg		<1	1 - 20	>20
Manganese	mg/kg		<5	10 - 20	>50 (toxic)
Iron	mg/kg		<10	10 - 200	>200
Boron	mg/kg	0.1	0.4	0.5 - 4	>5
Molybdenum	mg/kg	0.5	1	2	>2
Salinity					
Conductivity	dS/m	EC 1:5 dS/m			
Sodium***	% of CEC	<1	<3	<4	>6
Chloride	mg/kg	50	100	<200	>200

**Note:** The units meq/100g, meq% and cmol+/kg are all the same

\* CEC is a property of the soil type (clay and organic matter)

\*\* Nitrogen application rates should be based on crop nitrogen levels (e.g. sap), potato variety, fertiliser history and crop performance from the farm or block. Soil nitrate levels alone are **not a reliable indicator of crop nitrogen requirement**.

\*\*\* For sodium and aluminium, the lower the better

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Scott, B (E E Muirs and sons) for providing technical information

Dear Spud GP

Some of my spuds are looking pretty ugly - can you tell me what's going wrong here?

Doug



# ASK THE SPUD GP

Dear Doug

It looks like the symptoms include a sunken region around the apex as well as angled corky lesions. These could potentially be caused by several possible plant pathogens, or even a physiological issue.

For example, a strain of the fungus *Rhizoctonia solani* (AG3-PT) has been shown overseas to cause polygonal lesions (also known as elephant hide) on potato tubers. *Rhizoctonia* infections can cause dimpling of the tuber apex as well as typical 'black scurf' markings on tubers and dark lesions on stolons and roots.

While *Rhizoctonia* sounds a likely culprit, it is a mistake to assume a single cause just from looking at a photo. Netted scab (*Streptomyces* spp.) can cause similar symptoms. Sending a few samples to a plant pathology laboratory is really the only reliable way to identify the culprit.

Some studies have even suggested that elephant hide symptoms can simply be a physiological response to plant stress. Environmental conditions such as excess humidity, or high organic matter around the tubers during development, can trigger the disorder.

But of course, these conditions also favour the growth and infection of fungal pathogens such as *Rhizoctonia* and netted scab!

Preventative strategies for the future include:

- Growing a potato variety that is *Streptomyces* resistant (if that is the cause).
- Making sure tubers or planting holes are treated with an appropriate fungicide.
- Organic matter from previous crops or weeds is well degraded before planting.

- Minimise plant stress caused by too much or too little water.
- Given there are other pathogens that may cause similar symptoms, do a soil test before planting then monitor crops for disease symptoms.
- For example, key symptoms that can help to identify *Rhizoctonia* include the formation of aerial tubers on stems and a dry, white fungal collar at the stem base.

Good luck Doug, and let's hope your next harvest is a lot more attractive!

**Contact the spud GP by emailing**  
[info@potatolink.com.au](mailto:info@potatolink.com.au)



# POTASSIUM, SPECIFIC GRAVITY AND GETTING THE BALANCE RIGHT

Potassium is essential for many processes in both plants and the human body. If people want potassium, they most likely reach for a banana. However, the best source of potassium is actually the potato, with approximately 600mg per medium sized tuber.

*By Marc Hinderager and Paulette Baumgartl*

Potassium (K) in the tubers needs to come from somewhere, so potato plants need a lot of K to thrive<sup>1</sup>. Getting the right amount of potassium into the soil when and where the plant needs it is essential for maximum yield.

Potato plants take up large quantities of potassium with peak daily uptake reaching over 4 kg/ha/day. Supplying potassium is most important during stolon and tuber initiation, although maximum uptake occurs during tuber bulking.

Petiole potassium levels can decrease over time, particularly following the tuber initiation stage, with the rate of decrease dependent on soil K availability and overall potato growth rate.

Potassium plays an important role in converting carbohydrates from the leaves into starch. Increased levels of K can increase tuber size as well as total yield. Even in soils where exchangeable potassium is considered adequate, some authors have reported increases in yield from additional fertilisation.

Excessive potassium can reduce uptake of other nutrients, especially calcium and magnesium, so a balance

is needed. There are also some reports of high potassium reducing specific gravity, but other studies have found no effect<sup>2</sup>.

## SUPPLYING POTASSIUM TO CROPS

There are three main sources of K:

- **potassium chloride** (KCl or muriate of potash)
- **potassium sulfate** ( $K_2SO_4$  or sulfate of potash)
- **potassium nitrate** ( $KNO_3$ )

Among these three, potassium sulfate and potassium chloride tend to be more effective than potassium nitrate in increasing yield.

Potassium sulfate is the more readily plant available form of K, so can speed up the translocation of carbohydrates from the leaves to the tubers. This may potentially increase tuber specific gravity, especially if exchangeable K levels in soil are high<sup>2</sup>.

## MORE POTASSIUM HELPS CANOWINDRA POTATOES

A recent PotatoLink demonstration in Canowindra (NSW) looked at high

rates of potassium that could increase tuber specific gravity, without inhibiting the uptake of magnesium and other essential nutrients. The demonstration was conducted on a paddock low in soil potassium.

Chipping variety Crop 77 was planted in January 2022 following a winter wheat crop (stubble retained). A pre-plant soil test (0 – 15 cm) showed a potassium content of 0.2 meq/100g and magnesium 2.8 meq/100g, which represents a low ratio of K:Mg of 0.07.

In the main crop, potassium was applied prior to planting, using a mix of 1/3 potassium chloride and 2/3 potassium sulfate to deliver 115 kg/ha of K and 42 kg/ha of sulfur (S).

Within the demonstration area, an additional 250 kg/ha of potassium sulfate (100 kg/ha of K + 45 kg/ha of S) was banded on top of the hills in one section immediately after planting, giving a total of 215 kg/ha of K and 87 kg/ha of S on the demonstration crop.

## RESULTS

The additional potassium increased tuber size, and despite a 3% decrease in tuber number, **the extra potassium increased net yield by 2.1t/ha**. There

was no significant effect on specific gravity, which was high in both the control and treated areas.

The additional potassium cost \$400/ha, but the extra yield was worth \$850/ha, **a net return on the investment of \$450/ha.**

## MAGNESIUM TRIALS

In the last issue of the PotatoLink magazine, there was a report on high rates of magnesium sulfate applied

to processing potatoes which found less disease and higher specific gravity benefits. For a report on the magnesium trials, refer to the autumn issue of Potato Link magazine article on magnesium (page 30): [potatolink.com.au/potatolink-magazine](https://potatolink.com.au/potatolink-magazine)

Interestingly, although high levels of K can reduce uptake of magnesium, high levels of soil magnesium do not reduce K uptake (a phenomenon known as unilateral antagonism)<sup>4</sup>.

Potassium fertiliser recommendations should also consider soil magnesium content. Soil K:Mg ratios between 0.3 - 0.5 are considered ideal, where the absorption of both nutrients can be guaranteed. Both calcium and potassium have an antagonistic or inhibiting effect on the absorption of magnesium (Mg).



Site in February (left) and May following harvesting of the demonstration area (right) 2022

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# USING BIOLOGICALS TO SUSTAINABLY MAXIMISE YIELD AND INCREASE RETURNS FOR GROWERS

The rising costs of labour, fuel, power and fertiliser, coupled with a desire to embrace more sustainable practices, are driving the uptake of new biological and biostimulant products among potato farmers.

An agricultural biological is a broad term used to describe naturally occurring materials derived from microorganisms, plant extracts and other organic matter. They have the potential to reduce fertiliser and pesticide requirements, reducing the environmental impact of conventional agriculture.

Functioning both as natural pesticides and biostimulants, biological products can help control disease, enhance growth, improve soil health, improve plant nutrient uptake, and enhance the tolerance of crops to environmental stresses including temperature extremes and drought.

Understanding which biologicals will work in different situations, and the optimum rates needed, is critical to optimising both economic and environmental outcomes.

Julie Finnigan, Technical Agronomist at Serve-Ag / EE Muir and Sons, has been investigating use of biologicals in a range of horticultural crops, including potatoes, on trial sites in Tasmania.

Over the past two seasons, Julie has worked with some unique enzyme products that work to condition the

soil around the root systems of plants. This increases the availability and uptake of nutrients that are otherwise unavailable or difficult for plants to access.

One of her trials investigated the effectiveness of *Nucleon* on potato yields. *Nucleon* is a liquid enzyme additive from Agreva Sustainable Agriculture that contains lipase and mannanase to enhance nutrient uptake in horticultural crops.

Lipase works in the soil, assisting the conversion of lipids contained in soil organic matter into nutrients readily taken up by the roots. Mannanase works in the root zone, helping to break down root exudates around the outer layer (rhizosphere) of root tips. Collectively, these two enzymes help to improve soil conditions, improving plant root growth and nutrient uptake.

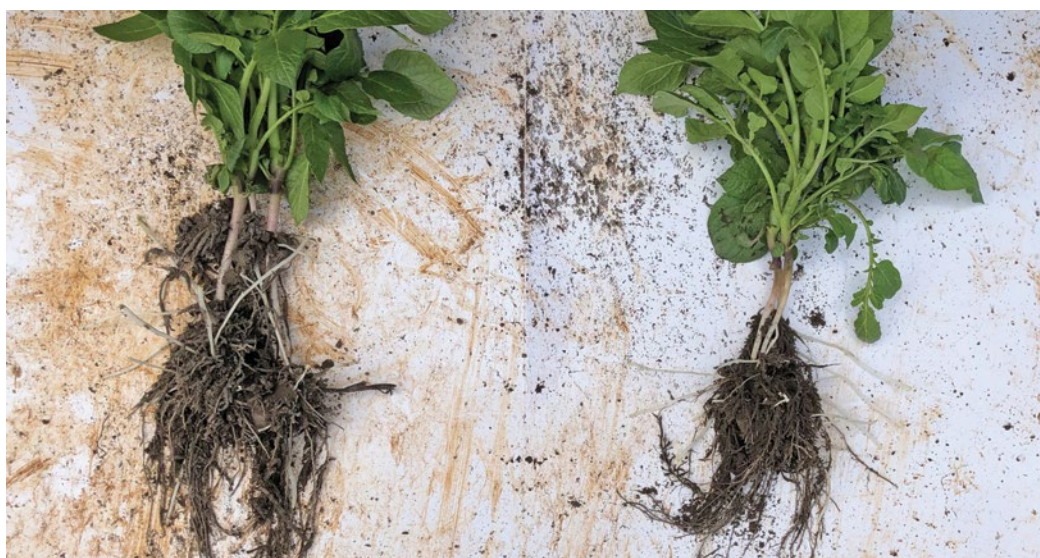
Based on the success of international trials, and the expected benefits in Australian conditions, Julie conducted several trials with both fresh market and processing potato varieties. These examined whether improved plant health, tuber growth and premium yields could be gained in Australian conditions.



Over two seasons, *Nucleon* was trialled at different rates using different methods, but primarily applied in-furrow at the time of planting. This mode of application ensured there are no extra passes or application costs for growers. The addition of only 24 to 75mL/ha of *Nucleon* in a tank-mix with soil-directed fungicides is very straight-forward.

According to Julie "The addition of such a small quantity of liquid to improve plant performance and yield was something of a "must see to believe" type of exercise!"

While early results were variable, more recent results at new rates were more consistent and demonstrate the promising potential of *Nucleon* for



**Figure 1.** Early root development in c.v. Nicola treated with 24mL/ha *Nucleon* at planting (left) or left untreated (right).

- Photo by J. Finnigan.



**Figure 2.** Yield and tuber size of mature c.v. Russett Burbank treated with 50mL/ha *Nucleon* split between two applications (left) compared to untreated controls (right).

- Photo by J. Finnigan.

the potato industry. "In the 2020/2021 potato season, *Nucleon* was trialled at the very low rate of 24mL/ha in processing potatoes along the Northwest Coast of Tasmania, along with fresh market potatoes in the southeast of the state" explained Julie. "For all trial sites, early root development and tuber set was excellent, with healthy fibrous root systems, and noticeably more around the stolons (Figure 1). This is a really advantageous start for good tuber development."

Yield estimates conducted prior to commercial harvest for the trial sites were variable, ranging from -3 T/ha through to +20t/ha compared to

the untreated controls. Site variability and on-site management conditions had a significant impact on these results, including high weed pressure, irrigation breakdowns, early and late harvests, and soil type and potato variety.

Removing the extreme values revealed an average increase in yield in the treated areas (Figure 2). According to Julie "While the gains were variable, *Nucleon* still provided a return on investment for growers. Additionally, there were underlying benefits. Tuber sizes were consistently larger in the treated areas than the control plots, typically putting them into the premium size range."

More recent trials conducted in the 21/22 season trialled *Nucleon* at a rate of 75mL/ha, or 100mL/ha applied over two applications. These trials, conducted in processing potato varieties also along the northeast coast of Tasmania, provided yield increases ranging from 1.6T/ha to 4.1T/ha of premium sized potatoes.

These results are consistent with international potato trials using *Nucleon*, which have also yielded positive responses. "The product therefore seems to show great promise for the industry, environment and – most importantly – growers back pockets" concludes Julie.

For the coming season, *Magno*, a dry enzyme product containing the enzymes mannanase and phosphatase, will also be trialled in potatoes. *Magno* is designed to both improve uptake of phosphate applied in fertiliser, as well as releasing phosphate typically bound in soils.

The results from *Magno* trials in other crops ranging from lettuces to tree crops have been outstanding. Combined with the same ease of use and application as experienced with *Nucleon*, this could be expected to provide sustainable positive outcomes for the potato industry.

**FOR MORE INFORMATION,  
CONTACT JULIE FINNIGAN AT  
SERVE-AG.**



# PATHOGENS – It's all in their DNA

As the sun sets later each day and the soil starts to warm, now is the time to be planning for the coming season, and a key part of that is testing soil and seed for the presence of pathogens.

By Ryan Hall and Jenny Ekman

Healthy soil bristles with activity. Like an endless external gut, it hums with scavenging, predation, parasitism and digestion by its inhabitants, all searching for moisture, nutrients and safe sanctuary from the thrum of life.

Bacteria and fungi dominate life in the soil. Many benefit from the growth of potato plants, or are at least neutral. However, a few are clearly harmful. Such soil-borne pathogens wage war against their host. They impact rotations, reduce yield and quality and, if left unchecked, can destroy the very plants they depend upon.

## KNOWING THE ENEMY

Enter PREDICTA Pt. Developed by SARDI (South Australian Research and Development Institute) this commercial DNA testing service can identify which pathogens are in the soil, or in the skin of seed tubers. In effect, this puts power back into the farmer's hands when managing soil-borne diseases.

PREDICTA Pt testing detects specific areas of pathogen DNA. It provides not just a "detected or not," but also a quantitative result. That is, how much of that DNA is present in the original sample.

For some diseases, the amount of pathogen DNA present can be linked directly to the degree of risk from that specific disease (Figure 1). In other words, a large amount of inoculum in the soil = high risk of disease.

In this way, PREDICTA Pt can provide a risk assessment for powdery scab (*Spongospora subterranea*), black dot (*Colletotrichum coccodes*), root-knot



**Figure 1.** The risk of powdery scab increases if there is a high level of inoculum in the soil at planting, especially if environmental conditions are otherwise not favourable to the disease.

nematodes (*Meloidogyne* spp.) and verticillium wilt (*Verticillium dahliae*) in soils.

The test can also be used to test the skins of seed potatoes and, in certain circumstances, potato plants themselves. The degree of risk of common scab (*Streptomyces scabies*), silver scurf (*Helminthosporium solani*), and rhizoctonia (*Rhizoctonia solani*) on seed potatoes can all be linked to detection and quantification of pathogen DNA in potato peel.

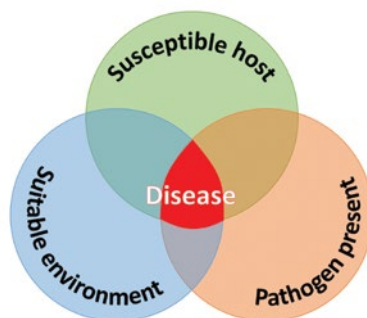
Expression of disease is not just due to presence of the pathogen, but also environmental and plant factors; the

familiar "disease triangle" (Figure 2).

It's a bit like catching a cold; whether there have been twenty people sneezing around you or just one won't necessarily change how sick you feel!

Although the PREDICTA Pt test reports the relative amount of DNA present in soil of pathogens that cause soil-borne diseases such as rhizoctonia, pink rot and sclerotinia, in this case there isn't a clear relationship between population density and occurrence of disease. Other environmental factors, as well as the susceptibility of the plants themselves, is likely to play a major role in whether disease will be expressed or not.

It is also important to understand that getting a negative test doesn't mean the pathogen is not there. Pathogens are not evenly distributed around a paddock, or even within soil. This means that sampling is critical. Testing is a numbers game; the more samples you take, the better the chance of detection.



**Figure 2.** The disease triangle

If only low populations are present, it can be a bit like finding a needle in a haystack. For some pathogens, levels of inoculum (spores or hyphae) that are below the level of detection can still result in high levels of disease if conditions are right.

There are also some serious pathogens – such as *Fusarium* dry rot (*Fusarium oxysporum*) for which no test has been developed.

## WHEN SHOULD PREDICTA PT TESTING BE DONE?

According to SARDI Research Scientist Michael Rettke “PREDICTA Pt testing needs to be done well before planting. Samples should be sent to the lab one to three months prior to planting. Although turnaround of samples at SARDI lab is four to 14 days, you also need time to interpret the results, and decide what actions to take next.”

Testing seed tubers before planting can be particularly valuable. Using only high quality, tested seed is the best way to maximise the chance of growing a healthy, high yielding crop.

## HOW SHOULD IT BE DONE?

Sampling is conducted using a network of accredited providers. These providers have been trained in soil (and peel) sampling techniques, understand key details regarding the different pathogens tested, and can help growers interpret the test results.

A list of accredited providers is available on the [SARDI website](#), simply search for PREDICTA Pt.

The recommended number of PREDICTA Pt soil tests varies according to paddock size. Where one or two tests may be sufficient for paddocks up to five hectares, four or more tests may be advised for paddocks over 10 hectares. The number of tests conducted might also vary depending on variations in previous incidences of disease, soil type and drainage.

Each tested sample consists of 30 combined soil cores collected in a “W” pattern over a one hectare area.

In the case of peel, samples of up to 250g fresh weight can be submitted. A single piece of peel is taken from each of 100 tubers and tested in a single sample. Using correct sampling strategies to obtain representative samples is critical when testing to assess the risk of disease.

## USING THE RESULTS

There are many ways that the results can be used to take informed management decisions. “For example, you might identify that a particular paddock, or part of a paddock, is at increased risk from disease, then take actions to reduce risk” explains Michael.

This could mean improving drainage, targeted fumigation, selecting a resistant variety or choosing to plant a different crop in paddocks where risk is unmanageable. For example, if there is a high risk of black dot, then selecting a less susceptible variety, optimising nutrition, irrigation, haulm and harvest management and pro-actively managing disease risk with fungicides can help reduce risk.

As another example, use of expensive nematicides may be justified if high levels of root knot nematodes are present. Similarly, using a soil treatment where high levels of verticillium wilt are present has been demonstrated to improve crop health.

In the case of seed potato production, growers are using the tests to avoid planting in paddocks where a high risk of disease, particularly of powdery scab, is identified.

“In the longer term, using the PREDICTA Pt test to monitor paddocks provides valuable information to improve soil management and crop rotation, reducing risk for future potato crops”

“Knowledge gained from these tests can be instrumental in developing new approaches to manage potato diseases” commented Michael.

## CASE STUDY - USING PREDICTA PT TO MONITOR THE EFFECT OF CROP ROTATIONS ON SOIL-BORNE DISEASE

This Tasmanian case study describes the use of PREDICTA Pt to monitor powdery scab and rhizoctonia on a commercial farm over a five-year period.

Over the winter of 2015, the paddock was divided into quarters and sown with:

1. Left fallow (commercial practice)
2. Saia oats
3. Caliente + Nemat (brassica biofumigant mix)
4. Caliente (nematode suppression)

In preparation for planting in October 2015, the cover crops were terminated, and samples analysed with PREDICTA Pt. These points were mapped using GPS, allowing sampling from the same points over time.

Each location was resampled:

- January 2016, mid potato crop
- April 2016, after the potatoes had been harvested
- March 2017, following a crop of poppies
- May 2018, after a year under clover-dominated pasture
- April 2019, after two years under pasture
- May 2020, after three years under pasture



Examples of test results, from the SARDI PREDICTA Pt website





Corer used to extract soil samples for testing. Image from SARDI

## POWDERY SCAB (*Spongospora subterranea*)

Interestingly, poppies increased soil populations of powdery scab (Figure 3). Following the poppy crop, powdery scab was higher in the areas previously planted with a cover crop or biofumigant, compared to the area left fallow.

Although levels of pathogen DNA declined under pasture, they once again increased following a wetter than usual autumn in 2020.

It has not been confirmed whether or not infected poppy supports the production of *Spongospora subterranea* long-term resting spores.

## RHIZOCTONIA (*Rhizoctonia solani* AG2.1)

Detections of Rhizoctonia DNA increased in areas planted to caliente or caliente + nemat (Figure 4). Levels declined during cropping with poppies and fell below detectable levels after a year or more under pasture.

Black dot was also tested. However, levels of DNA remained relatively low and constant over the entire testing period, regardless of cover crop used.

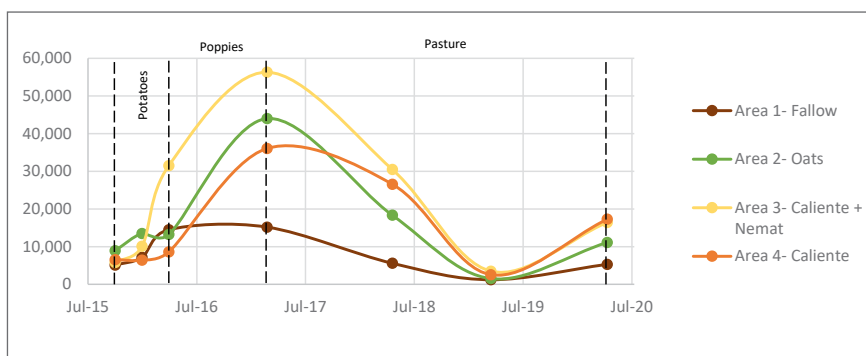
## CONCLUSIONS

The results demonstrate how populations of soil-borne diseases fluctuate over time. In this case, planting a cover crop tended to increase levels of certain diseases compared to simply leaving the area fallow.

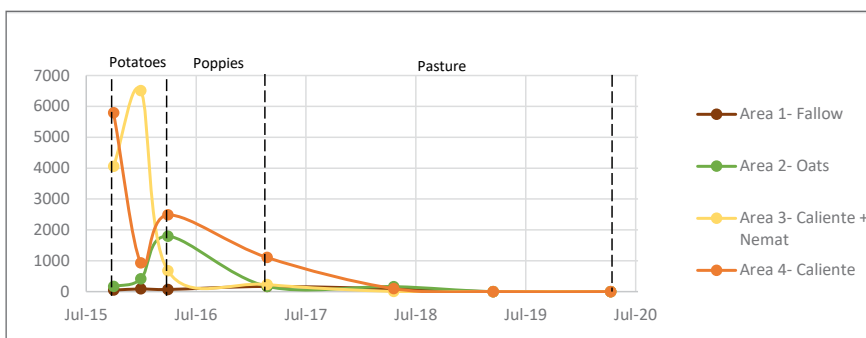
Of course, there are many benefits of cover crops in terms of improving soil health and structure, increasing soil organic matter, and preventing erosion.

However, the results suggest that brassica biofumigants should not be used if Rhizoctonia is known to be an issue. They also indicate that poppies are an alternate host to powdery scab, so are likely to increase levels of this pathogen within the soil.

*Disclaimer: These results are observational only and have not been evaluated in a replicated scientific study.*



**Figure 3.** Relative amounts of powdery scab DNA in areas of a paddock initially planted with a cover crop or left fallow, then used to grow potatoes, poppies and finally pasture.



**Figure 4.** Relative amounts of rhizoctonia DNA in areas of a paddock initially planted with a cover crop or left fallow, then used to grow potatoes, poppies and finally pasture.



From top: PREDICTA Pt can provide an estimate of risk from black dot (*C. Hutchinsonii*), Rhizoctonia (*A. Hussein*) and root knot nematodes (*G. Holmes*, Bugwood.org)

# WORLD POTATO CONGRESS 2022

Ireland, considered by many to be the potato's natural home, was host to the 11th World Potato Congress, held earlier this year. Over 1,000 delegates from 60 countries came to Dublin to enjoy an extensive trade show and talks ranging across every aspect of production, processing and consumption.

*By Jenny Ekman, with help from Georgia Thomas*



Left to right: Michael Hoey (President IPF, Ireland), Georgia Thomas (Potatoes WA), Dr Tom Arnold (Chair, Irish 2030 Agri-Food Strategy Committee), Lauren M Scott, (Chef Strategy Officer, International Fresh Produce Association), Romain Cools (President / CEO WPC Inc.) Tara McCarthy (Chief Executive, Bord Bia), Cedric Porter (Managing Editor, World Potato Markets)

With Adelaide set to host the next Congress (23-26 June 2024), it was an excellent prequel for the 16 or more Australian growers, researchers, agronomists and suppliers who were able to make the trek to the Emerald Isle, with its rolling hills, rich soil, high quality potatoes and tasty pints of Guinness.

The Congress was formally opened by Charlie McConalogue, Ireland's minister for Agriculture, Food and the Marine. The plenary session that

followed featured many distinguished speakers, including Dr Qu Dongyu, Director General of the FAO (Food and Agriculture Organisation) and Mr Janusz Wojciechowski, Commissioner for Agriculture in the EU.

## POTATOES TO FEED THE WORLD

According to Mr Wojciechowski, "As a staple food, the potato carries deep social and historical significance in Ireland, as it does in my home country

of Poland, and continues to nourish populations around the world today."

Indeed, food security was a consistent thread throughout the congress, with many speakers noting the potato's importance as a productive, nutritious and sustainable food. There was much talk of expanding populations, shrinking resources, and the ways that potatoes could help to avert calamity.

World consumption of potatoes already provides some jaw dropping



figures. In 2020, 360 million tonnes of potatoes were produced worldwide. Divided by a world population of 7.7 billion, this suggests that each person on the planet eats around 130g, or one small-medium potato, daily. Belarusians are the champions, consuming around 175kg annually per person; Australians need to lift their game – a mere 18kg!

While China is far and away the world's largest potato producer (782 billion tonnes), followed by India (513 billion tonnes), the next two largest producers are Ukraine and Russia. While both produce large volumes, these are mostly from small, relatively low technology family farms.

According to Professor Damien McLoughlin (UCD Smurfit Business School), it can cost five times more to grow a hectare of potatoes than a hectare of wheat. Despite this, potatoes are more carbon, water and land efficient than almost any other food.

Potato production in western Europe, like Australia, generally averages around 40t/ha. The USA and New Zealand are even more productive, averaging around 50t/ha. However, average yields globally are closer to 20t, with many countries only achieving around 17t/ha (including Russia, Ukraine and China).

Moreover, gains in productivity have not kept up with other crops. "Since 1960, wheat yields have increased 220%, corn by 195%, rice by 150% but potatoes have only increased by 80%," commented Professor McLoughlin.



Left: Lauren Scott (Chief Strategy Officer, International Fresh Produce Association); Tara McCarthy (Chief Executive, Bord Bia) and Georgia Thomas (WA Potatoes) at the conference opening

Bottom: DUG potato milk promotion (we preferred the creamy potatoiness of the 'Barista' blend)



Professor McLoughlin also discussed sustainability, and what that means. "Consumers demand all sorts of things, but are often unwilling to pay for it. They have been conditioned to expect that food is cheap," he said. "While there is widespread eco-anxiety, most are looking to industry to take a lead. This means we need to find ways to resonate with consumers so that they will pay for sustainability goals."

## POTATOES TO NOURISH THE WORLD

Potatoes do not provide calories alone, but also nutrients vital to health.

In a fascinating presentation, Dr Gabriela Burgos from the International Potato Centre (IPC) in Peru explained how they have been developing a high iron potato. Iron deficiency is extremely common in women around the world, and a particularly serious problem in less developed countries.

Iron is more bioavailable in yellow fleshed potatoes than many other foods, meaning it is readily absorbed by the body.

The IPC breeding programme has developed biofortified potatoes with 40 -70% more iron than common varieties. Lines have been selected that are also productive, disease resistant and tolerant of heat and dry conditions.

These fortified potatoes have been promoted in Rwanda, Ethiopia and Peru. "Mothers of young children visiting health clinics were given vouchers they could exchange for the

### 5 things for the future

- Proactive consumers
- Sustainable consumption
- Digitised agriculture
- Food Systems
- New Capital



### Of the major carbon producing sectors, agriculture might be the only industry to survive

- Where are the opportunities?
- What are the potential benefits of faster and bigger commitments to carbon reduction?



Slides by Professor D. McLoughlin



Biofortified seed potatoes. Photo by World Potato Centre, Peru

high-iron variety potato seeds. We also made cartoon videos promoting high-iron potatoes to children,” explained Dr Burgos.

“So far, there has been good acceptance of the varieties. The next step is to conduct a follow-up study to demonstrate improvement in health status for these women,” Dr Burgos added.

There seems little doubt that high-iron potatoes would have great appeal for many women, not just those in less developed countries. Increasing iron content seems particularly timely as many people seek to reduce their red meat intake, adopting a more ‘flexitarian’ diet.

This presentation was followed by what was surely one of the conference highlights – our own Georgia Thomas from WA Potatoes outlined some of the findings from the Hort Innovation funded project, PU19002 *Educating health professionals about Australian potatoes*.

The project was developed to address the perception that, unlike other vegetables, potatoes are fattening due to their carbohydrate content. Diabetics, in particular, may avoid potatoes due to concerns about blood glucose spikes.

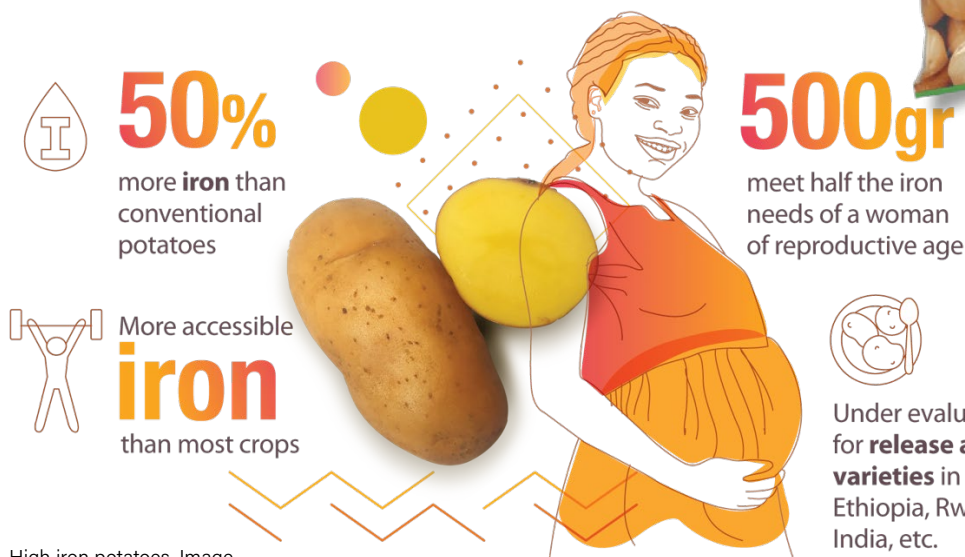
However, tests of six different varieties have shown that they are an excellent

source of fibre, as well as potassium and other nutrients. Analysis also demonstrated that cooling cooked potatoes promotes conversion into resistant starch. Resistant starch has been shown to have significant benefits for gut health and glycaemic control as well as helping people ‘feel full’. If cooled potatoes are then reheated, resistant starch levels rise even higher, further reducing their GI (glycaemic index) value.

Georgia also mentioned the low GI certified Carisma potatoes, a variety which appeared new to many in the audience.

The PU19002 study showed that nutritional value was maximised by:

1. Keeping the skin on
2. Choosing coloured varieties
3. Steaming or microwaving
4. Eating cooked potatoes after cooling.



High iron potatoes. Image by the International Potato Centre, Peru



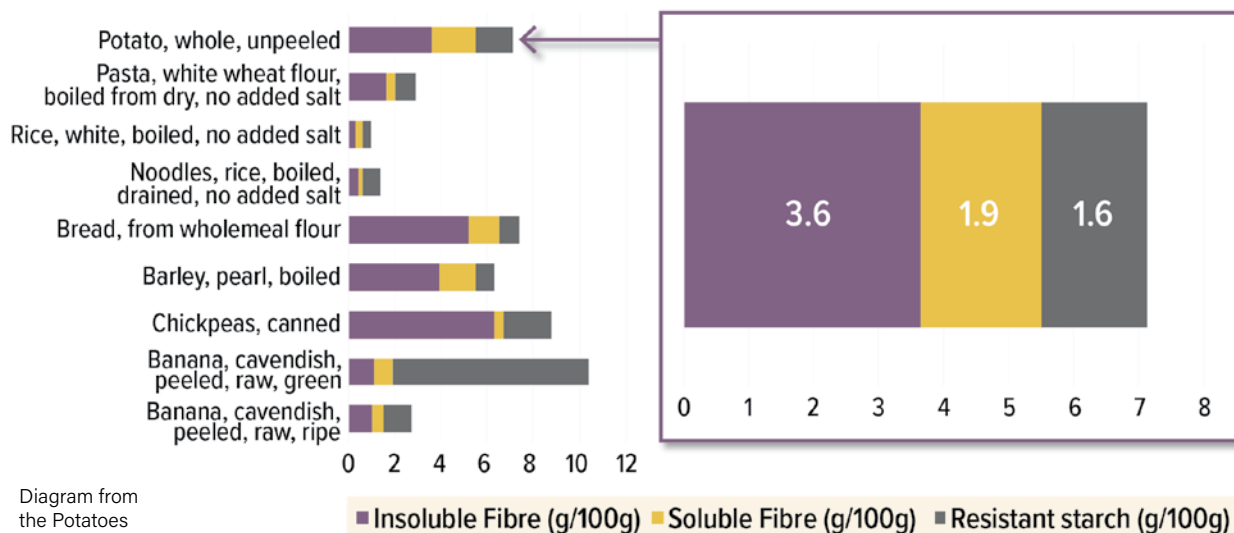


Diagram from the Potatoes and Resistant Starch fact sheet (PU19002)

Data source for foods other than potatoes: Food Standards Australia New Zealand (FSANZ)  
The project data was tested using cooked, then cooled whole, unpeeled potatoes.

"We have been using these results to promote potatoes through a website, social media and in schools," explained Georgia. "Providing potato seeds and growing guides for school gardens has proven incredibly popular. It has really improved understanding of, and liking for, potatoes, thanks to WA grower investment."

The sea of hands for questions following Georgia's presentation attested to the interest in her findings, particularly, achieving so many outcomes for a local industry with such a limited marketing budget.

## BREEDING A BETTER POTATO

Breeding new potato varieties is a key component in responding to consumer preferences, climate change and pest and disease pressures. Unfortunately, producing new varieties has been slow and imprecise, often taking 10 years or more to reach commercial reality.

However, according to Dan Milbourne (Teagasc), "Potato breeding is in the midst of a sea change that will transform the speed and precision with which new varieties will be developed. Genomic techniques

similar to those that have transformed cattle breeding are now widely used by potato breeders."

Central to this is the development of diploid potato varieties. Current potato varieties are tetraploids – that is, they have four copies of every gene. Diploids have only two copies. Using diploids makes breeding a lot easier, as the outcome from crossing two varieties is far more predictable.

Diploids are produced by using the pollen from a true-to-type, desired variety to fertilise a flower of the same variety. This means that the true potato seeds produced are essentially 'fatherless'.



Diploid potato varieties are created by crosspollinating flowers of the same variety.

The true potato seeds produced are an 'F1' hybrid, which often increases vigour as well as meaning all seeds are essentially the same. However, they still often need to be inbred to ensure they are genetically uniform. One major advantage of using true potato seed is that most potato pathogens are not internalised, so the chance of disease transmission is reduced by around 95%.

The other breeding method much discussed related to CRISPR (clustered regularly interspaced short palindromic repeats). CRISPRs are stretches of DNA which act like molecular scissors. They can selectively remove, or duplicate, parts of the plant genome.



Potatoes on Prince Edward Island

Because CRISPR techniques do not introduce foreign DNA, the resulting plants are not considered 'genetically modified' in most countries of the world, including Australia.

Essentially, CRISPR just means that breeding can be faster and more targeted than breeding using traditional techniques – "like GPS for DNA," explained Dr Haven Baker.

Dr Baker, co-founder of the biotech company Pairwise, gave a fascinating presentation on the applications of CRISPR technology. Examples included corn with 22 kernels around the diameter instead of the normal 16, increasing yield by nearly 38%. They have also developed thornless, seedless blackberries and salad leaves with the texture and flavour of lettuce but the nutritional qualities of kale.

"Three years ago, it took us a whole year to make three gene-edited berry plants, none of which was commercially viable. Now we can create 100s of new varieties in only

six months, including several with commercial promise," explained Dr Baker.

But it's not that easy for potatoes. "Potatoes are more challenging than other crops. It is difficult to assess traits below ground. Moreover, trials must be done in the field rather than in greenhouses. And starting with tetraploid varieties makes the process more technical and more time consuming as testing requires a minimum four years rather than 6-12 months for other crops. All this makes potatoes a difficult commercial prospect."

However, factors in potatoes' favour include the good genomic data already available. This helps them to be transformed relatively efficiently with excellent potential to breed for higher yields and disease resistance. Combining CRISPR with diploid varieties could also speed the process.

With billions being poured into CRISPR research, high acceptance of

the technology (especially by young people), and major potential advances in variety improvement, expect a CRISPR potato near you soon!

## **GROWING POTATOES SMARTER**

It has already been noted that potatoes are an expensive crop to grow. With input costs rising sharply around the world, it's no surprise that there were numerous presentations on precision agriculture. These focussed on variable rate planting, precision spray equipment for weeds and disease, as well as improved efficiency of fertiliser application.

One standout presentation by agronomist Evan MacDonald described trials on Prince Edward Island in Canada. Intensive mapping of soil, water, topography and EC at three very different sites was combined with different planting rates. Areas were classed as low, medium or high productivity, then planted at normal density +/- 15%.



## Crop value/acre including seed costs and size profile

Trial site	Productivity index	Seed spacing		
		tight	normal	wide
Site 1	low	\$3,610	\$4,726	\$4,473
	medium	\$4,035	\$4,341	\$4,232
	high	\$4,878	\$4,412	\$4,726
Site 2	low	\$5,933	\$6,618	\$6,885
	medium	\$6,788	\$6,414	\$6,445
	high	\$6,695	\$6,713	\$7,917
Site 3	low	\$5,417	\$5,307	\$6,026
	medium	\$5,023	\$4,231	\$4,840
	high	\$5,019	\$4,842	\$4,744

Data presented by agronomist Evan MacDonald on the effects of seed spacing in different productivity zones of the paddock on total profitability at three different sites on Prince Edward Island, Canada

What set this work apart was the focus on net returns, rather than simply yield and quality.

While results were highly variable and, it was noted, relate to only one season, the value of changing planting density according to productivity index was quite site specific.

**Site 1.** Planting seed more densely in the most productive areas of the paddock increased returns, whereas increasing density in the low productivity areas of the paddock significantly reduced returns.

**Site 2.** The normal planting density may be too tight; returns tended to increase by spacing seed more widely, regardless of productivity index.

**Site 3.** Profitability could be maximised by reducing planting density in the low productivity areas and increasing density in the medium and high productivity areas.

The take home message from this was that there is no one-size-fits-all approach to increasing or reducing seed planting density, and that only by monitoring yield by productivity index can growers make informed decisions about optimising plant spacing.

To give a commercial perspective, Mark James from John Deere presented an overview of some of the new spray technology that the company is developing.

While it is common for spray systems to have GPS based sector control, the new units also feature individual nozzle control. These recognise when the boom is turning and compensate by changing flow rate, thereby

reducing underspray/overspray on headland areas. These systems also reduce overlaps on the boom width and allow spot spraying of individual areas.

"Images made using a drone or robotic scout can be put into the controls on the tractor. This can be used to target weeds selectively, or address areas of high pest pressure," Mark said. "We also attach an additional nozzle at



See and Spray unit from John Deere

the end of each boom, which ensures there are no gaps in crop coverage."

While the gains from reduced overspray are relatively slight (around 1%), increasing costs increase their significance. Other trends noted were:

- Reduced nozzle spacing from 50cm to 25-35cm, allowing lower height settings while reducing drift.
- 'ExactApply' nozzles with remote control of droplet size and pressure.
- 'See and Spray' with high-definition cameras installed on the spray boom:
  - Identifying plants vs soil as well as plants vs weeds and adjust

spray accordingly, all while travelling at 19kph.

- Estimates of up to 77% reduction in herbicide use across an average crop with medium weed density.
- Available now for corn, soybeans and cotton, still under development for potatoes.
- Cost is approximately double a normal spray unit.

## THE FIELD DAY

With our brains full after more than two days of talks, field trips were the focus of day three. The key attraction was the 'Potato Field Event' at Maple Lodge farm just outside Dublin. Maple Lodge Farm not only grows potatoes, but is home to one of the best

collections of vintage farm machinery in Europe, all lovingly restored to showroom condition.

Field displays included plot trials of growth stimulators, showcasing of potato varieties and an impressive display of gleaming new farm machinery. A neighbouring field was used to demonstrate the machinery in action, to the delight of onlookers, equipment reps and large numbers of gulls.

It was interesting to see that many of the planters, harvesters, balers and other machines were self-propelled. This is because field conditions in Ireland are often wet, limiting use of tractors, particularly at harvest.

In fact, most Irish potato farms do not use irrigation at all, water being supplied regularly from the sky. Despite this, local yields average 40-45t/ha and sell for approximately €265 to €300/tonne (AUD 390-450).



Ruby Daly and Lelani van der Merwe examine potato varieties, and other images from the potato field day



## WORLD POTATO CONGRESS 2024

The next World Potato Congress is to be hosted by Potatoes Australia in Adelaide from 23-24 June 2024.

This congress gathers potato professionals from all over the world to meet and share ideas and knowledge, promoting the potato.

### Get involved

Potatoes Australia are calling for Expressions of Interest from those who would like to be involved. Please contact:

Liz Mann  
Executive Officer Potatoes  
Australia 0427 857 578  
[liz@potatoesaustralia.com.au](mailto:liz@potatoesaustralia.com.au)

POTATOES AUSTRALIA  
The Voice Of The Potato Industry Value Chain





# SAM DENNIGAN AND CO.

*With the support of partial funding from PotatoLink (PF20000), a small but select group of growers and agronomists, together with the author and AuSPICA board member Jonathan Eccles, conducted some pre-conference investigations.*



Left to right: Jenny Ekman, Lachlan Heyson, Anna Young, Ruby Daly, Lelanie van der Merwe, Joe Dennigan, Tom McDonnell, Jonathan Eccles.

At Sam Dennigan and Co. we were hosted by co-owner Joe Dennigan, together with manager Tom McDonnell.

Dennigans handle 50,000t of potatoes annually, mainly sourced from local growers. The ware potatoes they were packing on the day of our visit (30 May) had been stored since last September. Stored at 3°C, the potatoes are then warmed to 10-12°C before packing. They had been treated with the new anti-sprouting treatment 1,4Sight (dimethylnaphthalene) due to the withdrawal of CIPC (chlorpropham) by the EU.

The Irish industry is dealing with the same personnel issues as we are in

Australia and is similarly seeking to automate wherever possible. To my eye, the packing lines were so clean they looked almost brand new! They also featured the latest high tech vision systems for automatic grading and bagging. Impressive.

Dennigans does not just pack potatoes; they also act as a distribution centre for all fresh and frozen produce for a large Irish supermarket chain. Their 35,000m<sup>2</sup> storage and cold rooms hold everything from bananas to cheese and meat to icecream. A fully computerised pick and pack system feeds a fleet of refrigerated trucks which service the whole of Ireland.

One of the key challenges facing the business is finding ways to reduce its carbon footprint. This is not just an altruistic move to help meet the EU meet its goal of a 50% reduction in emissions by 2030; a carbon tax is in place and increases every year.



Dennigans have a large solar array in place, which provides 20% of the distribution centre energy needs – clearly the Irish sun has more power than we thought! There are also plans for a wind farm. However, there is still no viable alternative to diesel, so trucks represent a real challenge.

The company has made progress on reducing waste. Cardboard and soft plastics are all accumulated and recycled. While there are labour costs involved, sale of materials has made this cost neutral or even slightly profitable.

Another aspect the company is very proud of is its wastewater treatment system, which was designed by VESI Environmental. After initial treatment, wash water and sewage is fed through a series of three ponds. These artificial wetlands have been planted with reeds, sedges and other species selected for their capacity to remove nutrients from the water.

The water is tested for nitrates, phosphorous, etc., before flowing into the local creek, and demonstrated clean. While this system was the first of its kind in Ireland, its success has seen it adopted more widely.

With abundant birdlife, it even makes a pleasant picnic spot for employees to have lunch!

Anti-clockwise from top: Lelanie Van der Merwe, Ruby Daly, Anna Young and Tom McDonnell examine packed spuds; the company's wastewater treatment ponds; Joe Dennigan explains their recycling program

# TOMRA

At TOMRA the group was generously hosted by Marco Giovanni Colombo (Global Category Director Potatoes), together with John McGloughlin (Head of Innovation), and Eamonn Cullen (Market unit manager).

TOMRA was founded in Norway on April 1, 1972 by brothers Petter and Tore Planke. After seeing a local grocer struggle with the manual collection of empty bottles in their store, the brothers developed the first fully-automated reverse vending machine (RVM) in their family's garage. This means TOMRA is now celebrating its 50th Anniversary!

The sorting technology they developed for collection and processing of recyclables, as well as for the mining industry, has proven readily transferable to food. Although involved for only 10 years, TOMRA already represent around 25% of food processing technology.

Potatoes are a key area with the company making sorting, grading and processing equipment.

For example, 85% of peeling worldwide is now done using TOMRA equipment. Their new steam peeling technology was previously featured in PotatoLink (Spring 2021).

However, on this visit we were most interested in their new optical sorters.

TOMRA is currently developing a portable optical sorter which could be fitted to a harvester. A row of LEDs analyses the potatoes as they fall from a top belt onto a 'trampoline' belt below. Clods and rocks are flicked out the back using a bank of 'fingers'.

Although the unit is limited by 'seeing' only one side of the potato, it still has potential to be used to reject green or rotten tubers. It could also be used to estimate yield in real time, while removing the need for human sorters on the back of the harvester.

A similar device developed for packing lines has two banks of LEDs, thus 'seeing' all sides of each tuber. Again, analysis occurs – impressively – as the tubers fly through the air. In this case they can be sorted three ways: Good;

Repurpose e.g. green, marked, small rot; or Full rejection e.g. clods, foreign objects (see image below).

The units are 90-95% efficient and can process up to 100t/hour, reducing labour requirements by as much as 70%. Adding NIR (near infrared) detectors could potentially allow the machine to detect internal defects, such as blackspot or hollow heart.

Videos showing the operation of the TOMRA 3A for both washed and unwashed potatoes, and other sorting technologies, can be viewed at <https://video.tomra.com/tomra-3a-potato-sorting>



Marco Combo explains air sorting technology to Anna Young and Lelanie van der Merwe, and the new TOMRA 3A air sorter at their Dublin development facility.





Packing potatoes at Sam Dennigans and Co. Dublin. - Photo by J. Ekman