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| Autumn - 2022



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PotatoLink

Flip over the magazine to read *PotatoLink*.

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Editorial

Did you know that Australia grows enough potatoes to fill the Melbourne Cricket Ground twice every year?

Everyone involved in the potato industry knows that it is a significant industry, but the industry traditionally has not told this story very well to the broader public.

The latest edition of the *Hort Innovation-funded Horticulture Industry Statistics Handbook* has been released, which highlights the contribution of the potato growers and their economic impact.

Potatoes were one of the horticulture industry's strongest performers in 2020/21, with a growth in production volume of five per cent to 1.46 million tonnes and farmgate value increasing by 13 per cent to over \$800 million.

According to the Handbook, potatoes make up over 38 per cent of vegetable farmgate production volume, 70 per cent of total vegetables for processing by volume and over 20 per cent of fresh supply into the retail and food service

sectors by volume.

This is a good news story that demonstrates the success of the industry while growers have faced tremendous hardship with the pandemic, supply chain disruptions, labour shortages and rising input costs.

Towards the end of 2021, AUSVEG used its media and social media channels to educate the public on the Australian vegetable and potato industries. The aim was to raise awareness of the sector's hard-working growers and the substantial contribution that the industry makes for the national economy, the livelihoods of its workers and the health and wellbeing of every Australian.

AUSVEG engaged with key media outlets, as well as posted engaging content across social media to highlight the significant contributions of the vegetable industry encouraging industry and the broader public to *#knowyourAUSVEG*.

Given the modest scale of this

campaign, the media engagement that resulted from the media and social media content was positive, and there was significant interest in the potato industry-specific campaign content.

You can find out more about this campaign at the upcoming Hort Connections conference, held in Brisbane from 6-8 June. The event will be the best opportunity to meet with people from across the country to reconnect with peers, as well as other growers and supply chain members at many networking opportunities held during the event.

AUSVEG will have a much larger presence at the Trade Show, and we are looking forward to meeting with you all and speaking with you about the issues that are important to you, your business and your industry.



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Message from the Chair

AUSVEG is supporting growers on issues that are impacting their businesses and their livelihoods.

AUSVEG joined more than 300 people at the steps of Victoria's Parliament House for a tractor rally to protest the Western Victoria Transmission Network Project plan, which – if the planned route for the project proceeds – will irreversibly impact prime agricultural land in the Ballarat and threaten the future of potato production in the region.

The event was organised by the Moorabool and Central Highlands Power Alliance representing local landholders, residents and farmers. It was well-coordinated and well-attended, with potato growers forming a big part of the protest, driving more than 20 tractors around Parliament House in protest.

It's situations like this, which have a much broader impact on the country's food production and food security, that highlight the importance of a strong national grower group that can work with growers to advocate for their interest on important issues.

Therefore, AUSVEG – as the national industry body that represents the interests of 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.

In the lead-up to the 2022 Federal Election, we have increased our investment in advocacy, public affairs and representations on behalf of growers, culminating in the development of our 2022 Federal Election Priorities.

These priorities have been developed with input directly from growers, as well as in consultation with our state and territory grower associations and reflects a unified vision for the future success of our industry. They include:

- Driving increased demand of Australian vegetables and potatoes through a dedicated, well-resourced behavioural change campaign.
- Securing a productive workforce.
- Protecting the future of vegetable and potato production through biosecurity and sustainable growing practices.
- Future-proofing the industry through upgraded infrastructure and attracting the next generation of skilled workers to the industry.

As the Chair of AUSVEG, and a grower myself, we are facing some of the most difficult conditions in living memory. Whether it is the COVID-19 pandemic, ongoing supply chain disruptions, ever increasing input costs or ongoing labour issues, growers all around the country are doing it tough.

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.

The AUSVEG Board is looking forward to seeing a large number of growers and the wider industry come together for Hort Connections in June. There will be many opportunities to meet us and the AUSVEG team at the AUSVEG Trade Show stand and at the many other networking events for growers integrated throughout the program. I look forward to seeing you all in-person to speak about the issues that are important to you, your business and your industry.

A handwritten signature in white ink that reads "Bill Bulmer".

Bill Bulmer
Chair
AUSVEG

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AUSVEG's 2022 Federal Election priorities

AUSVEG is pleased to release its Federal Election priorities for the upcoming 2022 Federal Election.

Throughout the latter half of 2021 and in early 2022, AUSVEG has consulted and engaged with its growers and State Members to produce a comprehensive set of policies to support our growers and industry. We have made a conscious effort to construct both short- and long-term policy goals that will assist growers into the future.

It is essential to lay out a clear set of priorities that strongly reflects the needs of our industry. These will help to form the basis of AUSVEG's advocacy agenda for the next government term – and beyond.

Throughout the development of AUSVEG's Federal Election priorities, we made sure to 'truth test' many of the policy asks to ensure it would meet the needs of growers nationally.

It was also important to think longer term in how we want the industry to look – not just beyond the COVID pandemic, which has dominated our lives for the last two years – but to think how we want the industry to look and operate in five- and 10-years' time.

The development of a unified position provides the vegetable and potato sector with the best chance of a policy result.

Our priorities circulate around three core themes including:

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

Driving increased consumption leads to both domestic and overseas opportunities. Increasing domestic consumption requires bold new thinking to tackle a persistent and worsening problem. Data from the Fruit & Vegetable

Consortium (FVC) indicates that vegetable consumption is too low and declining over time. However, the FVC outlines the benefits of increasing vegetable consumption, with an increase of just one serve of vegetables per day conservatively generating an incremental increase in industry returns of \$1.3 billion per year. On the export front, the vegetable industry is just getting started. Increasing trade and market access to countries such as Singapore, UAE, Malaysia, South Korea, Hong Kong and Thailand will further enhance our selling opportunities for growers.

Developing more efficient businesses

starts with access to a more efficient, reliable and competent workforce. While the Australian Agriculture Visa and Pacific Island programs are significant pieces of that complex puzzle, other pieces include affordable and reasonable accommodation options for workers and greater skilled career opportunities for the domestic workforce. Improved business management and negotiation skills are critical for farm businesses to become more prepared to effectively negotiate with their buyers and their banks. While greater market transparency will increase grower knowledge of pricing fluctuations and give them access to the free, timely and accurate market information, they need to make more informed decisions for the benefit of their business.

Becoming a more resilient industry

is about planning for the future. This includes better understanding our customers' expectations and preparing for the constant challenges that the climate brings. From fires, floods, droughts and COVID, our growers have dealt with a wide range of issues outside of their control, but they can prepare to mitigate the impacts on their businesses and on our future food security. It also includes improved management for food safety and how the uptake in new technology can assist in ensuring Australia's fresh produce is safe for all consumers. These central themes are the core of the development of the vegetable and potato sector as it strives to become an \$8 billion sector by 2030.

From here, we divided our priorities into nine pillars including: increasing domestic consumption, workforce, regenerative systems, biosecurity, emergency preparation and prevention, competition

and business, international trade, infrastructure, and the next generation.

Our top policy requests include:

\$100 million to develop and execute a national strategy and behavioural change program.

Australians consume an alarmingly low number of vegetables a day. The declining servings is now a multi-billion-dollar problem that is impacting the economic, health, social, and environmental wellbeing of all Australians. Although this is critical for the health of Australians, it is also dire for our industry. A national strategy has the ability to improve the health of Australians, as well as stimulate the vegetable and potato industry with jobs and improve regional communities.

Delivering a fully operational Australian Agriculture Visa.

An Agriculture Visa will help growers access an efficient, reliable and competent workforce. It will also give businesses the confidence to grow and improve, knowing they have a competent workforce to back them up.

Deliver a National Labour Hire Licencing Scheme.

The implementation of a National Labour Hire Licencing Scheme would give greater confidence for growers and workers that the labour hire providers are operating legally and ethically. They can simply present a licence to a grower upon arrival.

The COVID-19 pandemic has shone a light on many issues within our industry and created consistent challenges. We will continue to work through these challenges to support our industry; however, these policies are not solely focused on COVID recovery.

These policies look to create long-term change well after the pandemic has subsided, helping our industry become stronger and more resilient to future challenges.

These priorities will help our industry strive towards the goal of being a \$8 billion sector by 2030, and simultaneously have immense flow-on effects to the broader Australian and international community.

The process

AUSVEG has been hard at work developing these priorities to strongly reflect the needs of our industry.

The development process began in early August 2021, where we held comprehensive discussions with our State Members to identify core issues. Following these discussions, we released an Australia-wide survey to our growers to help truth test the policy asks and provide further input.

AUSVEG has already begun its advocacy in the lead-up to the Federal Election briefing key ministers, MPs and departments in December 2021. AUSVEG briefed key ministers and members including Agriculture Minister David Littleproud, Member for Wright Scott Buccholz, Member for Forrest Nola Marino, Member for Mallee Anne Webster, and many others.

AUSVEG has also briefed the Department of Agriculture, Water and Environment (DAWE) and Federal Treasury. We will continue to advocate these policies throughout 2022 and beyond.

Overall, we received very positive feedback and look forward to meeting with more politicians this year.

The next stages of our Federal Election process will be developing a Pre-Budget Submission with more detailed points on each of our priorities to submit to Treasury. Following this, AUSVEG will be doing more face-to-face meetings (pending COVID restrictions) with politicians around the country.

AUSVEG welcomes growers and members to provide feedback on our Election Priorities. Please don't hesitate to email or call our advocacy team on the details below.

You can also view the full 2022 Federal Election Priorities document online at ausveg.com.au.

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Driving efficiency and sustainability in horticulture

The Bayer Researcher of the Year award recognises a leading agricultural researcher who has helped to advance the industry through their work, and actively encourages growers to implement research outcomes on-farm.

“Driven by our purpose ‘Science for a Better Life’, and with research at our core, our goal at Bayer is to contribute to the sustainability of agriculture. The Bayer Researcher of the Year award recognises leading individuals driven by similar aspirations to advance horticulture in Australia,” Bayer’s Anthony De Monte said.

“Bayer is proud of our long association with this prestigious award. Our partnership with AUSVEG is part of our ongoing commitment to collaborating with industry to strive together for efficiency and sustainability in farming.”

Bayer continues to work alongside growers, industry bodies and researchers to develop new solutions tailored to Australian farming.

“We look forward with anticipation to celebrating the announcement of the 2022 Bayer Researcher of the Year at this year’s Hort Connections event,” Mr De Monte said.

In this edition of *Potatoes Australia*, past winners Paul Horne and Calum Wilson reflect on their research, and how it is making a difference to Australian horticulture – particularly in the potato sector.

Hort Connections 2022 will take place at the Brisbane Convention and Exhibition Centre from 6-8 June. The National Awards for Excellence is on 8 June. Please visit hortconnections.com.au for further details.

Researcher of the Year 2012 Professor Calum Wilson University of Tasmania



Calum, you won the Researcher of the Year award at the Awards for Excellence in 2012. What are you up to now? What is your current role?

I am Professor of Plant Pathology at the Tasmanian Institute of Agriculture at the University of Tasmania. I have teaching and research roles there, and currently lead a team of very talented postgraduate students and scientists.

Can you please provide a short overview of your career as a researcher (to date)?

My research career and interest in plant pathology began in 1986 in my Honours year at Canterbury University in Christchurch, where I examined fungicide resistance in the *Rhizoctonia* pathogens that cause sharp eyespot of wheat.

I completed my master’s degree in 1988 also at Canterbury University, helping in the development of a commercially successful biological control agent for control of the New Zealand grass grub, a major pasture pest.

I then had the opportunity to move to Australia to undertake my PhD at the University of Western Australia in 1989, studying resistance in potato to important virus pathogens. On completion of my degree in 1992, I moved to Tasmania and initially worked with the Tasmanian State Government Department of Agriculture in a research and disease diagnostics role, before taking up an academic position at the University of Tasmania (UTAS) in 1994.

I have remained with UTAS for the past 28 years, progressing through the ranks to Professor. Since my PhD days, I have retained a strong affinity for

the potato crop and have led a large number of research projects addressing problems facing the potato industry.

As I mentioned, you received the Researcher of the Year award at the National Horticulture Convention in 2012. What did winning the award mean to you at the time?

It was a great honour. Most pleasing for me was that the award was given by my industry clients and peers, those for whom my work aims to make a difference in their businesses.

I have always enjoyed working within this great industry and feel humbled that the members of the potato industry valued my work so highly. I was also fortunate to receive the Premier’s Tasmanian STEM Research of the Year award in 2016, which recognises outstanding contributions to science, technology, engineering and mathematics.

How long have you worked in the potato/horticulture field?

As mentioned, I first commenced my research with potatoes during my PhD back in 1989. This was with a project looking at resistance to potato virus diseases and virus interactions. I have continued my love affair with potatoes ever since, having worked on a diverse range of projects and a wide range of potato pathogens including viruses, bacteria, fungi, and protozoa.

What type/s of potato research have you conducted since 2012?

My potato research portfolio is relatively diverse with work across a

range of pathogens and pathogen types.

My major research interests include development and characterisation of resistance in potato and elucidation of the epidemiology and ecology of potato pathogens. My group has more widely contributed toward the basic studies of crop genetics, physiology and chemistry associated with disease development and resistance, and notably, the novel development of disease resistant varietal clones.

Through strategic collaborations, I have also had the opportunity to work in a wider range of science disciplines all with potato linkages including plant physiology, biochemistry, plant and microbial genetics, epigenetics and genomics, organic chemistry and medical research. Some more recent examples from our lab include the important diseases powdery scab and pink rot, where we have studied pathogen diversity and novel disease controls. We have also had projects looking at potato greening – the greatest cause of fresh market potato loss in the retail sector, elucidating mechanisms for greening resistance and impact of in store lighting systems.

What is the most challenging aspect/s of your work?

Many of the problems we deal with are quite 'tricky', and rightly so – if they were easy to overcome then we wouldn't be needed.

Developing novel system to study pathogens can be challenging, especially those that live beneath the soil. Understanding the myriad of interactions that occur within the soil environment remains one of the great challenges for all working with plants.

I would also say, recruiting and maintaining the best people is critical to success in research. I have been fortunate to work with some truly talented researchers, many whom have gone on to forge amazing careers. A constant challenge is securing the necessary resources needed to support our work.

What research are you conducting at the moment (if any)?

Powdery scab is arguably the most important disease facing the potato industry in Australia and certainly in Tasmania.

It is also a highly recalcitrant and difficult problem. The pathogen lives in the soil, cannot be cultured and persists for decades only to wake up and attack potato crops after they have been planted into infested soils.

There is a lack of effective control strategies for this disease. We are currently working on novel approaches to disease management that are starting to look promising, using a more ecological approach to disrupt the pathogen and break the disease cycle.

Another potato disease key people in our lab have been working on is pink rot, which is becoming an increasingly important disease in Tasmania in the wetter seasons. These studies are looking at pathogen detection, major sources of the pathogen, and novel controls.

What do you enjoy most about being involved in potato research?

The industry – locally and internationally – comprises a great bunch of people with a love for the crop and its development. It continues to be a pleasure to work with these talented and passionate people.

Potatoes are also one of the most important horticultural crops globally and a fascinating plant. Did you know potato is one of the best crop plants at converting sunlight into starch? And therefore, is critical for current and future global food security.

Is there any particular potato or broader horticulture research project that stands out to you as one that was successful/interesting, or that can be built upon?

There have been a large number of important research projects over the past decades that have added significantly to horticultural production and profitability. The PREDICTA Pt program certainly springs to mind.

One of our project areas that has amazing potentially broad application is the induction of non-GMO variants within elite potato varieties. This enables retention of all the important traits of the commercial cultivars, while adding new features of importance to improve the variety. This might be disease resistance, improved yields, and better tuber quality – we are gaining a better understanding of the basic science behind generation, and selection of these changes and how these

might be best obtained.

Where do you think more potato research needs to be undertaken?

I am clearly biased, but there are still major deficits in knowledge relating to soil-borne pathogens, soil microbial ecology and soil health in general.

A much better understanding of how pathogens interact with the potato plant and other soil microorganisms including other pathogens is desperately needed to aid in development of sustainable controls.

There is also a great need for further work on genetic selection and induction of beneficial traits in potato such as disease resistance. New tools are opening real opportunities for major advancements in generating better potato cultivars.

Do you have any future plans in research – is there a particular subject or area you'd like to pursue?

I believe more ecological approaches to disease management are not only possible, but likely to be more effective and sustainable than traditional pesticide approaches into the longer term.

Understanding soil and root rhizosphere ecology and how this influences pathogen biology is critical. The use of soil microbes for biological suppression of disease and enhancement of plant health will be very important into the future.

We will also remain active in novel breeding approaches to disease management and will be looking to use the latest approaches to generate potatoes with better qualities to meet grower and market demands.

Is there anything else that you wish to add that may be of interest to potato industry members?

Just to say thank you for welcoming me into the potato family. It has been a privilege to work with, and for, you. The potato is an amazing plant, and they taste pretty good too.

Find out more

To get in touch with Calum Wilson, please email calum.wilson@utas.edu.au.

Researcher of the Year 2009

Dr Paul Horne

IPM Technologies Pty Ltd



Paul, you won the Researcher of the Year award at the Awards for Excellence in 2009. What are you up to now? What is your current role?

Just as in 2009, I remain working as an entomologist with IPM Technologies Pty Ltd, based in Victoria.

Can you please provide a short overview of your career as a researcher (to date)?

I have worked as an entomologist in agriculture since 1987, when I started with the Victorian Dept of Agriculture as a research scientist.

In 1996, I founded IPM Technologies Pty Ltd and have worked there ever since. My work commenced with developing an Integrated Pest Management (IPM) strategy for Australian potato production, and I have kept refining it and helping industry to adopt it.

In addition to potato crops, my work has involved developing, and helping farmers of a wide range of crops to adopt IPM strategies. Crops include many vegetable crops, berry crops, protected cropping, tree crops, nurseries, broad-acre crops and pastures.

In recent years, I have focused more on implementation of research.

As I mentioned, you received the Researcher of the Year award at the National Horticulture Convention in 2009. What did winning the award mean to you at the time?

The award meant a great deal to me, as it was recognition that the work that I do is of value to industry.

How long have you worked in the potato/horticulture field?

My work with the potato industry commenced in 1997.

What type/s of potato research have you conducted since 2009?

Since 2009, my work has been in two parts. One has been a research project that I led (funded by the Australian potato industry) to conduct work in New Zealand with Plant and Food Research (NZ) to find out an IPM compatible way to deal

with tomato-potato psyllid if it arrived in Australia.

The other part has been to help the potato industry to adopt an IPM approach nationally, and I have just completed a five-year project that achieved this.

What is the most challenging aspect/s of your work?

One difficulty is getting people to trust that biological control agents – that they cannot see – are capable of having a significant impact on pests.

I overcome this by showing people in their own crops, and of course this means being able to travel. The last two years have made this difficult.

What research are you conducting at the moment (if any)?

I continue to work with growers and advisors in the potato industry but have no formal research projects in this area.

I am involved in ongoing research into pests of berries and vegetable crops, particularly pests that are new to Australia or that I expect will arrive at some stage. I am also involved in some IPM work with the cotton industry.

What do you enjoy most about being involved in potato research?

It has been very pleasing to see a strategy that I developed being implemented by Australian potato producers and now seeing growers, advisors and researchers in other parts of the world interested to see what is going on here with IPM. The Australian potato industry should know that so far as pest management goes, I believe that we are leading the world in adoption of IPM.

Is there any particular potato or broader horticulture research project that stands out to you as one that was successful/interesting or that can be built upon?

The five-year project that I have just completed has been extremely successful and has changed the way most of Australian potato production deals with insect pests, including those that are dealt with using pesticide-based approaches overseas.

This could be used as a model for other industries but should also continue to evolve and develop.

Where do you think more potato research needs to be undertaken?

In the field of pest management, I think there should be more research effort on local issues, pests that are not of national importance but are serious pests locally.

Do you have any future plans in research – is there a particular subject or area you'd like to pursue?

I will continue to help IPM to be understood, developed and adopted.

To this end, I am now presenting short online courses in applied entomology for those wanting to know more about pest management approaches.

Find out more

Readers can get in touch with Dr Paul Horne by emailing paul@ipmtechnologies.com.au.

A successful collaboration

Dr Paul Horne isn't the only IPM Technologies team member to be honoured at the National Awards for Excellence.

In 2018 – nine years after Paul was recognised – his colleague Jessica Page took home the Researcher of the Year award, sponsored by Bayer.

Paul and Jessica have worked together for over 25 years on a range of horticultural crops in Australia and abroad.

Like Paul, Jessica is an entomologist, and she has worked closely with potato and vegetable growers to reduce their insecticide use and improve control of insect pests by using Integrated Pest Management (IPM) practices.

Jessica's dedication to the horticulture industry and her enthusiasm for working with growers was recognised at the Hort Connections 2018 National Awards for Excellence Gala Dinner.

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In February, Syngenta hosted a local field walk in Launceston as part of its Potato Partners Academy for 2022.



Syngenta Technical Services Lead Brandy Rawnsley speaks to guests at the Potato Partners Academy Site, Launceston, about the MIRAVIS® family of fungicides.

Local field walk provides Syngenta pipeline insights

The Syngenta Potato Partners Academy 2022 was not the national event first planned, but the local field walk that went ahead in February was exceptional.

In February, Syngenta hosted a field walk at the Forthside Vegetable Research Facility in northern Tasmania.

The site at Forthside Vegetable Research Facility in northern Tasmania was managed by the Syngenta technical services team in collaboration with Doug Clarke, Tasmanian Institute of Agriculture.

"After two years of restricted activities, we were delighted to have a group together again – discovering the latest Syngenta innovations first-hand," Tasmanian Syngenta Territory Sales Manager Wayne Richardson said.

The site was set up to showcase each of the MIRAVIS® products: MIRAVIS®, MIRAVIS® Prime and MIRAVIS® Duo*.

"MIRAVIS®, with the active ingredient pydiflumetofen, has become the industry standard for control of target spot, and many growers this season have had great success with MIRAVIS® Prime to control *Sclerotinia*," Syngenta Technical Services Lead Dr Brandy Rawnsley said.

"With the MIRAVIS® Duo launch scheduled for later this year, it has been really worthwhile using all three products in the same location to see how they might fit within a program."

Sclerotinia, or white mould, occurs in potatoes at early pre-row closure when the plant is young and relatively weak, or later in the season when shoots come in contact with infected. It has been a particular problem this season with ongoing wet weather.

"The growers were really keen to see how MIRAVIS® Prime is going to fit into their program given all of the issues we've had with *Sclerotinia* this year," Wayne said.

"It's really important to get the early timing right and then plan out the entire program when you're also using MIRAVIS® later in the crop."

MIRAVIS® Prime was registered last year in a range of crops. In potatoes, it is used to control *Sclerotinia* as well as botrytis and early blight. MIRAVIS® Prime contains two actives: pydiflumetofen, like MIRAVIS, as well as fludioxonil – extending its disease prevention spectrum. This combination of active ingredients attacks fungi at multiple sites, offering excellent protection for superior quality potatoes. The dual mode of action also helps delay the onset of resistance.

TERVIGO® nematicide was also used on site, demonstrating how to use the product on a potato crop.

"Nematodes are an often-overlooked issue in potatoes" Brandy said.

"We are very happy to announce the recent registration of TERVIGO® in potatoes and sweetpotatoes."

Throughout Australia, root-knot nematodes are considered to be major pests. Direct feeding damage restricts the uptake of water and nutrients that inhibits tuber development and thereby yield potential. Nematodes are identified by galling on roots, with severe infestations including egg masses on feeder roots. Above ground signs include stunted plants, delayed flowering, yellow leaves and wilting under stress, and in severe cases plant death.

TERVIGO® nematicide provides effective nematode control through a formulation developed in-furrow application at planting followed by a broadcast

application up to 30 days later, so as to protect tubers as they develop. With a nil withholding period and no plantback restrictions, growers can confidently use TERVIGO®.

Days like this field walk, under the umbrella of the Potato Partners Academy and the Syngenta Learning Centres, are a crucial part of what Syngenta does; bringing growers and agronomists into the product development process ensures open dialogue that benefits both ways.

"The interaction among the group and the questions and points raised by the growers and agronomists alike was great," Wayne said.

"The input has given us quite a bit to consider when looking at our development program for future projects and I trust that they benefitted from one-on-one interaction with our technical staff as well."

**MIRAVIS® Duo fungicide is not registered. An application has been submitted to the APVMA. ® Registered trademarks of a Syngenta Group Company.*

Find out more

For further information on these products or to become a Syngenta Potato Partner, please contact your local Syngenta representative.

Syngenta is a leading agriculture company helping to improve global food security by enabling millions of farmers to make better use of available resources.

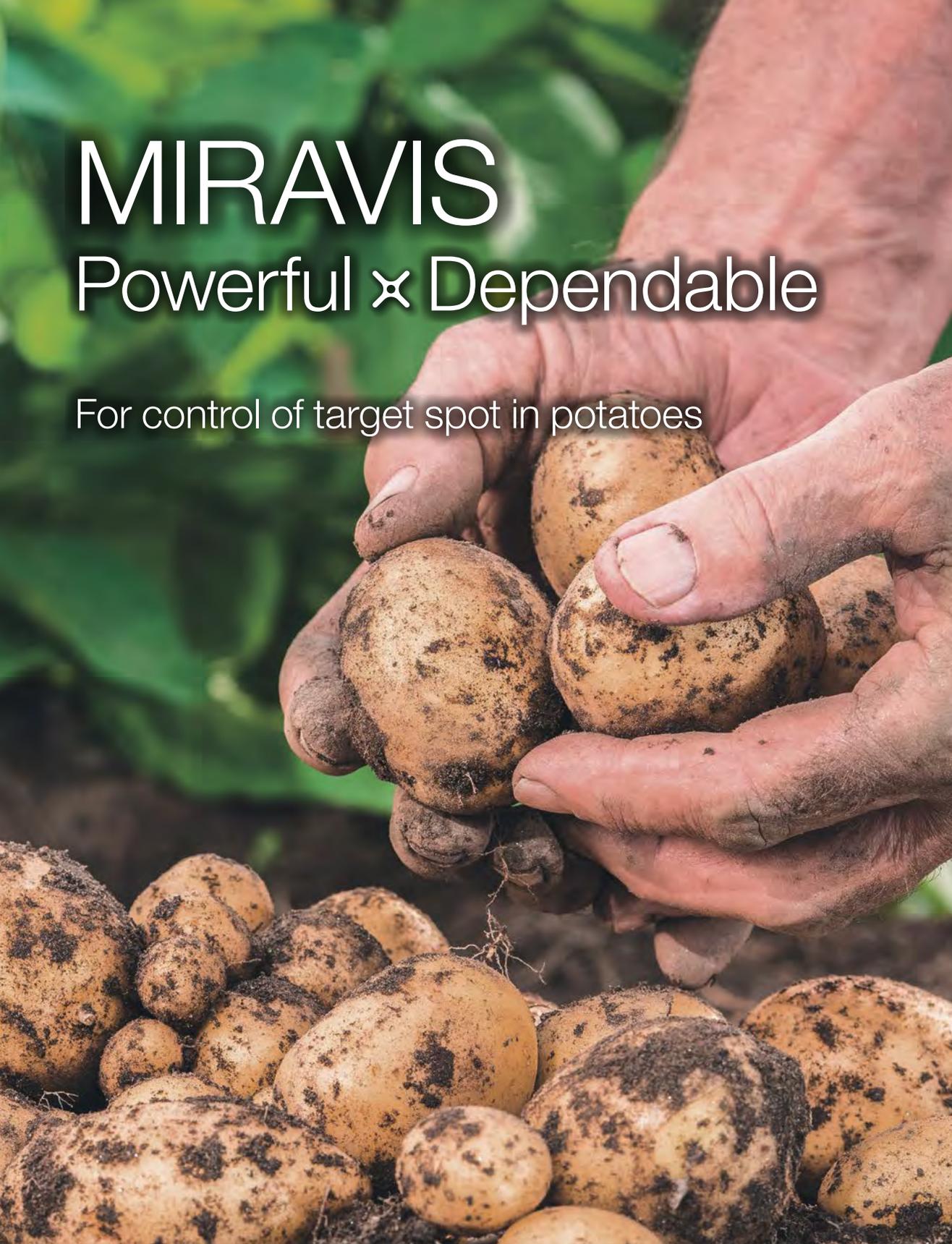
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®

Growing together in 2022: Save the date for Hort Connections!

Hort Connections returns to Brisbane this year with several key changes, including a fresh website and more streamlined processes for delegates. Australia's biggest horticultural conference and trade show will be held at the Brisbane Convention and Exhibition Centre from 6-8 June, and we're excited to welcome delegates back to an action-packed, rejuvenated program.

This year's conference and trade show returns to the Brisbane Convention and Exhibition Centre and follows a successful COVID-safe delivery of the event in 2021.

The theme for Hort Connections 2022 is *Growing Together*, which highlights the importance of unity within the horticulture industry, as well as supporting each other and building a stronger, more resilient food system to feed local and international consumers.

Hort Connections is also excited to announce several process improvements ahead of the 2022 event that have been implemented to enhance the attendee experience.

What's new for delegates?

Hort Connections website

This is your one-stop-shop for all things Hort Connections! The website has undergone a makeover, complete with interactive web pages and easier to access forms such as registration, exhibitor and award nomination. Scan the QR code below to check it out.

On-site improvements

The on-site registration process will become easier for delegates in 2022. The Hort Connections team has been collating feedback and working to

The on-site registration process is set to become easier for Hort Connections delegates.

improve check-in systems.

There will also be a re-designed Trade Show floor plan to create more networking spaces and greater ease of access for all exhibitors. You will be able to search for exhibitors and speaker sessions more easily, with information desks situated within the Trade Show.

This year's Trade Show is sponsored by Australia's Fresh Produce Markets.

Key networking events return

Hort Connections 2022 will see the reintroduction of the much-anticipated Welcome Reception, which will take place on Monday 6 June at 4:30pm.

Also making a return this year is the Women in Horticulture event, and this will be joined by Diversity and Inclusion Sessions. These will take place on Tuesday 7 June. Keep an eye out for further announcements about these events once details are confirmed.

Delivering value for growers

The horticulture industry has endured many challenges over the past couple of years, and Hort Connections recognises the tough times faced by growers.

In light of this, growers have the opportunity to purchase an all-access pass for the special early bird rate of \$500, which includes entry to the National Awards for Excellence on Wednesday 8 June.

There will also be an exclusive grower networking event, to be held after the Trade Show Happy Hour on Tuesday 7 June. Further details will be made available to growers in the coming months.

Early bird – don't miss out!

Early bird registrations close Friday 29 April. If you're looking to showcase your business to the largest number of horticultural growers under one roof, exhibition booths are still available to purchase.

The National Awards for Excellence will take place at the Hort Connections 2022 Gala Dinner on Wednesday 8 June.

The Trade Show is a popular place to connect and network during the three-day event.

Acknowledging horticulture's leaders

The National Awards for Excellence will be presented at the Hort Connections 2022 Gala Dinner on Wednesday 8 June. The Gala Dinner is the capstone event of the three-day convention, and it recognises the outstanding contributions and leadership of individuals and companies to Australian horticulture.

This year's Gala Dinner is sponsored by the Costa Group.

Award nominations are now open, and you can visit hortconnections.com.au/hort-awards for further details. Nominations close Friday 15 April.

Find out more

Please visit hortconnections.com.au. For further enquiries, email info@hortconnections.com.au or phone 03 9882 0277.



Hort Connections 2022: Join the conversation!

This year, exhibitors and delegates are encouraged to use #HortCon22 when following along on social media. To keep up to date with important event announcements, you can follow Hort Connections on these channels:
Facebook: @hortconnectionsconference
Twitter: @HortCon_
LinkedIn: @hortconnectionsconference
Instagram: @hortconnections
Highlights from previous years can be found on YouTube by searching 'Hort Connections.'

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John Deere Australia/ New Zealand Production Systems Manager, Ben Kelly.



John Deere Managing Director Australia/New Zealand, Luke Chandler.

John Deere announces first autonomous tractor for large-scale production

The unveiling of John Deere's first entirely autonomous tractor for large-scale use at the prestigious CES® 2022 Awards in Las Vegas has placed autonomous technology at the farmgate, with the machine on course to be available to farmers in the US as early as this year.

The tractor combines John Deere's popular 8R Tractor, TruSet™-enabled chisel plough, and GPS guidance system to deliver the next iteration of farming innovation in a product that will be ideally suited to meet the demands of broadacre cropping in Australia, with unprecedented efficiency.

John Deere Managing Director Australia/New Zealand, Luke Chandler, said the tractor was the culmination of industry-leading technology and a dedicated vision to provide farmers with tools to produce safe and nutritious food and fibre to a growing global population.

"With the world population forecast to increase to nearly 10 billion people by 2050, global food demand is predicted to grow by 50 per cent – which means farmers will need to be as efficient and sustainable as possible in every phase of production," Mr Chandler said.

"To assist in bridging that gap, John Deere is continually advancing technology to help farmers meet this challenge. We're doing so while working with reduced access to land and skilled labour, changing climate and weather conditions, variations in soil quality and the presence of weeds and pests.

"This autonomous tractor is an extremely exciting innovation that will help to ensure Australian farmers have the opportunity to adopt era-defining ag-tech to address these challenges and to support high-performing and sustainable farm businesses," Mr Chandler said.

Automated technology

The autonomous tractor operates within less than 2.5 centimetres of accuracy and is continuously checking its position relative to a virtual geofence.

Six pairs of stereo cameras enable 360-degree obstacle detection and calculate distance, with the images captured by the cameras passing through a neural network that classifies each pixel in approximately 100 milliseconds. This determines if the machine continues to move or stops, depending on if an obstacle is detected.

John Deere Australia/New Zealand Production Systems Manager, Ben Kelly,

emphasised the transformative nature of the technology to farming operations.

"Globally, Australian farmers have always led in the adoption of ag-tech, and as they continue to be faced with limited availability of skilled labour, access to autonomous machinery for large-scale production has never been so important," Mr Kelly said.

"With this new tractor, it is as simple as transporting the machine to a field and configuring it for autonomous operation. Then, using the John Deere Operations Center, farmers can swipe from left to right to start the machine and can leave the field to focus on other tasks, while monitoring its status from their mobile device."

John Deere Operations Center™ provides access to live video, images, data, and allows farmers to adjust speed, depth and more from the mobile app.

In the event of job quality anomalies or machine health issues, farmers are notified remotely and can make adjustments to optimise the performance of the machine.

"The tractor will be available to a limited number of US customers for purchase this year, before it is rolled out gradually to other countries, including Australia, over the next few years," Mr Chandler said.

"As the first commercially available autonomous solution for large-scale farming operations in the industry, we are excited to see the real-life impact these machines will have on the way we farm – and, ultimately, feed the world."

Find out more

Speak with your local dealer or visit John Deere's CES website: [JohnDeere.com/CES](https://www.johndeere.com/CES).





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**



Untreated 
Serenade Soil Activ 1.4 L/ha 

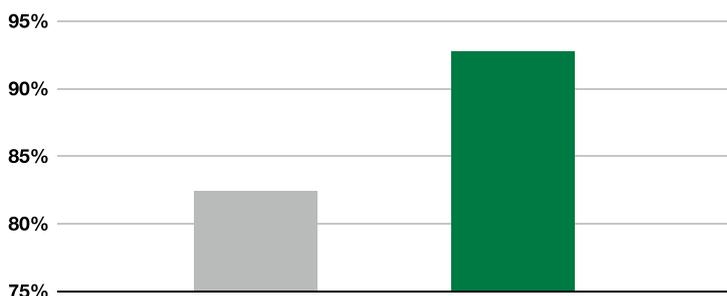
Increased Marketable Yield

Strip harvest, fresh market potatoes, South Australia



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

Total premium class weight (%)





Robin Tait is a Soil First Tasmania committee member. Robin is coordinating the technical, on-the-ground activities that are taking place during the soil amendment trials.

Putting soil first in Tassie potato crops

Soil First Tasmania is a farmer-led organisation that focuses on the sustainability and regeneration of soil and water resources. It supports a community of farmers across Tasmania who want to conduct on-farm trials to find out how they can keep their soils in good conditions and reduce inputs such as fertilisers and pesticides. Importantly, the group provides a platform to share what they have learned on their own farm discuss new ideas and develop networks. Michelle De'Lisle reports on the group's latest activities that involve soil amendment trials in potato crops. Potatoes, which can damage soil structure, are grown in rotation with other crops, especially vegetables – so it is vital to look after soils during the potato crops.

The grower group

Former Soil First Tasmania President and current committee member, Dave Roberts-Thompson is a flower bulb and bulb crop grower. Dave established Soil First Tasmania in 2016 with potato grower Darren Long, flower grower Jeremy Robinson and Serve-Ag Technical Agronomist/Project Lead Julie Finnigan.

Soil First Tasmania has been running on-farm trials in potato crops during the 2021/22 season. Trials are focused on organic soil amendments and biological products and how yield and quality as well as soil health are affected.

"At the moment, potatoes are one of the major crops in northern Tasmania for farmers. They're one of the few crops where people can earn a significant amount of money and are partly keeping a lot of farmers in the area going – they're a critical income stream for a lot of cropping farmers, even beef and dairy farmers in the area," Dave says.

"Because potatoes are such an important crop to farmers, we saw that they were reluctant to pull back on inputs for growing, especially on fertiliser. At the same time, there is an increase of soil-borne disease affecting yields of potatoes in the north of the state, and we suspect that poor soil health is being partly driven by overapplication of some fertilisers."

Dave said many farmers are putting on too much high acidic and high salt index fertilisers, which could be leading to root

burning and lowered potential yield.

"It would have been ideal to do a full-blown study on this, but we had to keep within the scope of this organisation. So, we chose to look at some alternative fertilisers or organic-based fertilisers to add to the regular fertiliser program to help reduce that acidity and salt load, as well as improve soil health," Dave explains.

"There are some good studies in our area that show improved soil health leads directly to improved yield. Anything that's reducing your soil health is theoretically reducing your yield in the paddock."

Another Soil First committee member, Robin Tait is coordinating the technical, on-the-ground activities with growers.

Robin has an agronomy background, having worked for 10 years as a production agronomist (growing pyrethrum) at Botanical Resources Australia. She completed a Nuffield Scholarship in 2018, and produced a report entitled *High value cropping: Maximising soil health to minimise synthetic inputs*.

Robin hopes that these potato trials can culminate in recommendations for further research and sees them as a positive step for potato growers in the regenerative ag space.

"What growers get from the trials is that involvement from Soil First and further discussion with all of us who are involved in it," Robin says.

"We'll be running 'Farmer Fridays' at some of the paddocks, which gives them the opportunity to have broader discussions as there will be different



Photography by Prime Perspectives.

people on their farm, and they can share their experiences. The growers are quite proud of their trials.”

The trials are being partly funded by Landcare Tasmania and the Tasmanian Landcare Fund.

The trials

There are six potato growers in Tasmania’s north participating in the organic origin fertiliser trials. They are using composted chicken manure variations including Neutrog pellets, as well as humate-based products.

“We’re using granular humate products to try and complex some of the fertiliser nutrients so that they would release over a longer period. The theory is, that we can reduce the input of mineral fertilisers by up to a third by adding humates. People have been suggesting this for a long time, but we have to test it,” Dave says.

The team has been flexible with growers and allowing them to trial differing types and levels of amendments.

“If their risk appetite was high, we were happy to support them doing some more extreme cutbacks on fertilisers and higher rates of organic amendments,” Dave says.

“Whereas we have growers whose risk appetite is lower, and they were keen to just substitute out a small percentage of their fertiliser for something else.”

At the time of writing, the Soil First team – assisted by three agronomists – have

taken some stem counts.

“Next we’re taking sap tests on all sites – two sap tests across all the treatments on each site, which should give us the initial data,” Dave says.

The sap from petiole samples will be analysed by a local commercial lab with high precision instrumentation, and that has data in desirable ranges for each nutrient.

“So, we might be able to look back at a treatment where we put down composted chicken manure pellets or something like that, and say, ‘That one didn’t yield quite as well as the conventional treatment but if you look back on sap analysis, you can see it was short or had an excess of a mineral in the plant that might have been detrimental to the yield.’”

The next stage will be yield assessment, with measurements being undertaken in April. Results should follow in June.

The grower

Michael Heyes is a potato grower in Ringarooma, located in Tasmania’s north-east. He farms alongside his brother Richard and father Peter. He is a member of the Soil First group.

The Heyes family’s operation contract harvests around 15,000 tonnes of potatoes as well as growing cereals – including wheat and barley – and lupins. The farm also manages 200 Angus breeders. Michael is passionate about soil health and

the regenerative farming concept. He also believes that the heavy use of fertilisers and crop protection products creates quality issues, and these can be linked to disease incidence in potatoes.

Michael’s currently hosting three trial plots using straw pallets and fertiliser, chicken manure pellets and a vermicast biological in-furrow liquid. He became involved with Soil First Tasmania because the group’s research aligns with his on-farm activities.

“We’ve been into cover crops for almost 10 years. We’ve put on compost and pig manure. I’ve tried combination crops and I’ve been using fish kelp and humates for five or six years now,” Michael explains.

“We don’t use any fungicides or insecticides on the farm, and we try to limit our herbicide usage. We do multi-species cover cropping. So, that’s what we’ve been involved in – regenerative farming before it was called regenerative farming.”

Soil and animal health has improved for Michael through his on-farm trials, but an increase in potato yield remains to be seen.

“I grew a trial plot with no fertiliser last year and noticed that the quality improved. The size was better, but my paddock yield dropped off (but there was less waste) – which is to be expected,” he says.

“But if I can work on different aspects and introduce biology and trace elements, and do a bit of sap analysis, then maybe





Michael Heyes is a potato grower in Tasmania's north-east. Michael is passionate about soil health, and is part of the Soil First Tasmania grower group.



the yield can pick up.

"That's the great thing about these trials – we're using chicken manure, straw pellets, natural fertilisers and carbon sources that might show to improve yield."

Michael identified another potential long-term benefit for growers.

"This Soil First trial looking at reducing fertiliser usage and that just happens to tie-in with a huge increase in input costs. There's some handy information that could come out of it."

There's a lot of enthusiasm within the Soil First Tasmania group, and it connects like-minded growers who are learning from one another in a field where, Michael says, knowledge is limited.

"Soil First is a group of people that is great to bounce ideas off. You can learn from those who have a tried a lot of different things."

Industry collaboration

The VegNET – Tasmania project team has provided technical information as requested by Soil First Tasmania, as well as supported some of the administration, grant application and other events over the last few years. It also assisted with a strategic planning session. VegNET 3.0 is a strategic levy investment under the Hort Innovation Vegetable Fund.

"The relationship came about during Theresa Chapman's time as VegNET – Tasmania Regional Development Officer (RDO). Theresa shares a passion for soil science with the group, which has been the driver for her involvement," current VegNET – Tasmania RDO Ossie Lang explains.

"The group is focused on preserving and rebuilding the fantastic soils we have in Tasmania. With most of the growers in the group including vegetables in their rotation – and their guiding principle of applying research at a paddock scale – it was a natural fit for VegNET to support Soil First where it was welcome."

Other grower groups similar to Soil First can get involved in VegNET, which is a nationally-coordinated, regionally-delivered project.

"Growers can benefit from active involvement in VegNET through the national network that is at the core of the project," Ossie says.

"While each region has its own priority areas, the strength of VegNET is in the shared network of RDOs and the contacts they have with regional and national research projects. This ensures that growers can tap into best practice from around the country and find out how to best use it in their production systems. They can also contact their RDO with specific questions and ideas.

"Based right around the country, the RDOs are really keen to work with grower groups and support them as they work towards their goals."

Find out more

For further information about Soil First Tasmania activities, please contact Dave Roberts-Thompson on 0467 771 977 or email dave@vdqbulbs.com.au. You can follow Soil First Tasmania on Facebook: @soilfirsttasmania and Twitter: @soilfirsttas.

Robin Tait's Nuffield report can be found at nuffield.com.au/robin-tait-2018.



Knowledge grows

Improving productivity needn't cost the earth.

Quality nitrate fertilisers from Yara can optimise the yield and quality of crops without costing the earth. We've already reduced the carbon footprint of our nitrate fertiliser production by 40% by making our production plants and processes among the most energy-efficient in the world. Our ongoing development of 'green' ammonia technology and climate-smart agricultural practices means we're on track to reduce emissions by another 30% within a decade and carbon neutral by 2050. Contact Yara and find out how our integrated crop nutrition programs can deliver better agronomic, business and environmental outcomes for your farming business.



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Shannon Moss from Mulgowie Yowie.

Overcoming pandemic challenges with Growcom's Fair Farms

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 program provides support and training to farm employers and a pathway to independent third-party audit and certification. Additionally, the program has played an important role in helping growers during the COVID-19 pandemic. *Potatoes Australia* reports.

Mulgowie Yowie is in the process of obtaining Fair Farms Certification, and the business recently spoke candidly about how it has been dealing with the effects of the COVID-19 pandemic.

Mulgowie Yowie farm owner and Growcom member, Shannon Moss, is – like many farmers – dealing with the harsh reality of COVID restrictions. Shannon said the hardest thing to deal with due to the pandemic – besides the economic problems – was staffing.

In addition to ensuring he had enough staff for harvest, Shannon said he knew he needed to ensure compliance with any requirements to do with payroll and workplace health and safety, particularly with COVID constantly threatening disruptions to the workplace.

"Staffing is my number one problem," Shannon said.

"From a business point of view, as an owner I get nervous when there's staffing issues. We don't have a real population of workers to fall back on."

Mulgowie Yowie Salads will usually have a good mix of overseas and local workers, but during the pandemic has had to rely heavily on local workers.

"I'll get a few of the local boys when they finish school to work here. Even my son is here now working while on a gap year," Shannon said.

"I'll end up with enough staff and I work really hard at that."

Lending a hand

While staffing has been hard, Shannon said he has been able to get through it by focusing on staff retention and engaging with Growcom's Fair Farms program to ensure he was doing everything he possibly could to ensure his employees and business were safe.

"This year we did a lot of work on workplace, health and safety," Shannon said.

"We have set procedures on training, the induction process and the VEVO checks (identity checks). We've already done that without Fair Farms, but Fair Farms gives us a better checklist.

"I think that's where Fair Farms comes into it – it's a checklist, what you need to do to get through an audit.

"Fair Farms is a local form of SEDEX."

Fair Farms offers training through its online learning platforms, which has modules that cover everything from understanding labour hire risks to how to properly induct a new employee.

Shannon acknowledged it was incredibly important to look after his staff for business continuity and their own wellbeing. He credited his decision to register for certification with Growcom's Fair Farms program as just good business sense.

"I know it's important to have all these things to make sure the business

is protected – for work cover and insurance – and I don't want to work in a business where it isn't a happy working environment too," Shannon explained.

"At the end of the day, I've got to put my business hat on and I'm in the business of selling product. It's all about dollars and sense."

Next steps

Mulgowie Yowie Salads has completed the first initial steps towards receiving Fair Farms Certification, which includes completing an online self-assessment to identify training needs, and Shannon plans to go through audit as soon as his farm manager is back from holiday later this year.

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.

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

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



Beyond Soil Moisture

Real data helps with irrigation management decisions in potato production

Multi-sensor soil moisture probes have been used in the potato industry for the past 30 years. Measurements every 10 minutes at multiple soil depth levels are presenting much deeper insights than just the current soil moisture status for irrigation management. In 2013, Adelaide based Sentek Pty Ltd launched its cloud platform IrriMAX Live, a user interface, where potato growers can access data from their in-field probes including soil moisture, salinity and temperature, coupled with a seven-day weather forecast and frequent NDVI images showing the health and vigour of the potato crop.

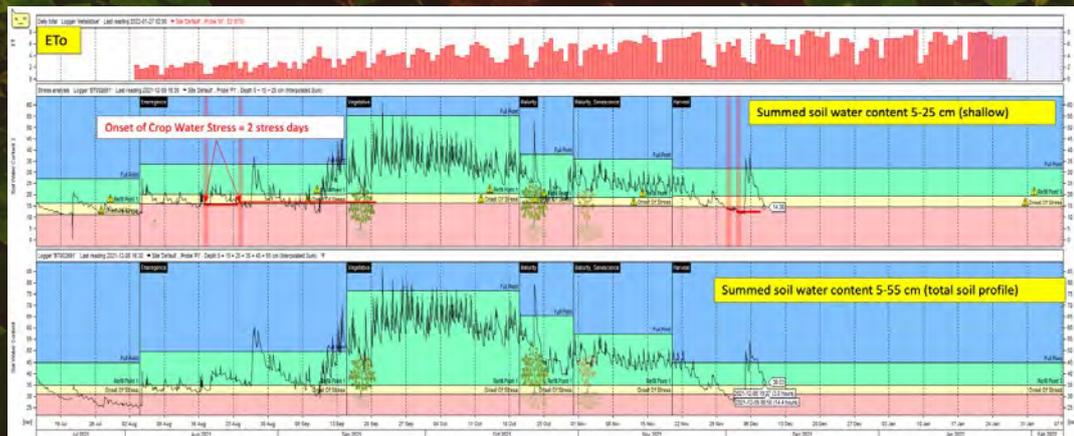
But it does not stop there. A new algorithm using real, not modelled data, combining soil moisture and weather data helps agronomists and growers to detect more easily the first day of the onset of water stress by the potato crop. This point in time is then used to set the threshold of soil moisture at which water stress occurs (Red zone) and when the crop is not under any water stress (Green Zone).



Potato roots grow deeper throughout the growing season. To prevent over- or under irrigation, the active root zone depth needs to be taken into consideration when applying irrigations.

Another algorithm in IrriMAX Live using real time measured data, rather than modelled data, detects the advancing root activity of the growing potato crop and the applied depth of irrigation. This is a useful tool to prevent over- and under irrigation by matching the depth of irrigation to the depth of the advancing potato root zone.

For more information on Sentek products including IrriMAX, scan the QR code below:

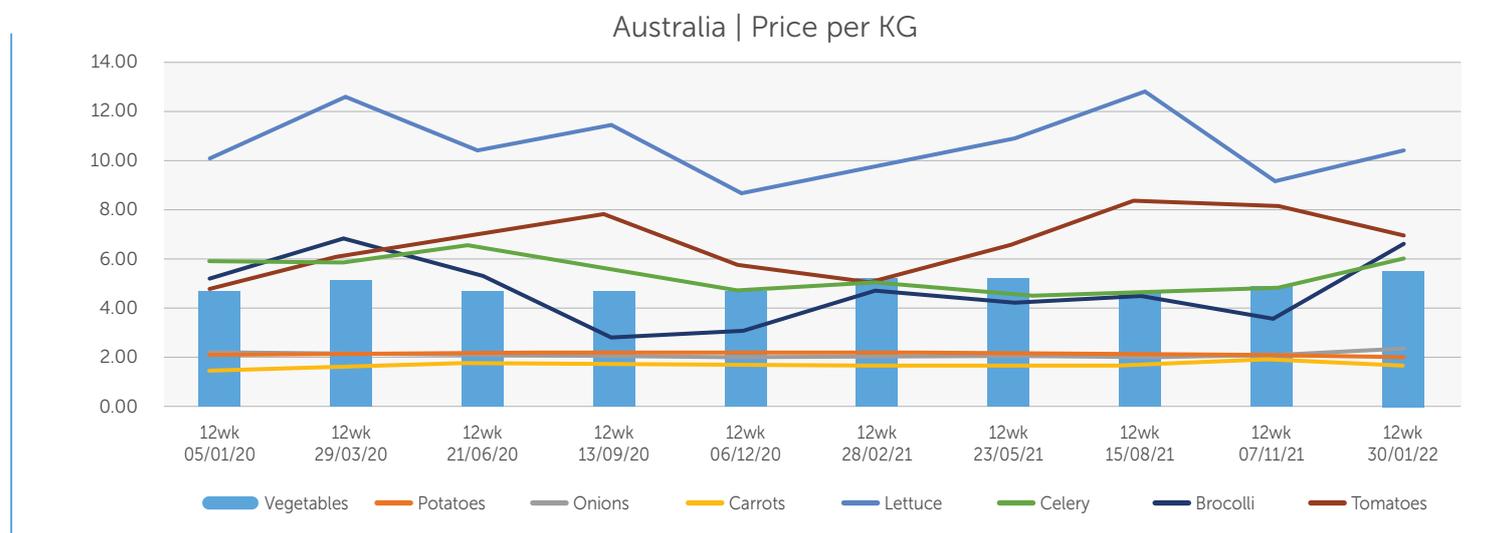


Growers continue to feel price squeeze

Vegetable and potato prices have remained stable over the last two years despite record rises in farm input costs. The latest data from Harvest to Home indicates that retail prices for produce have remained at pre-pandemic levels while growers face increases of more than 40 per cent in fertiliser, chemical and fuel costs, and increases by more than 20 per cent in wages and even airfares.

Table 1

AUSVEG calculation based in part on data reported by NielsenIQ through its Homescan Service for the Vegetables category for Total Australia, according to a client defined product hierarchy. Copyright © 2022, Nielsen Consumer LLC.



For growers to receive a fair price for their produce, vegetable and potato prices must increase. AUSVEG is calling on retailers and buyers to ensure that farmgate prices that growers receive for their produce better reflect the current economic climate to ensure the financial viability of vegetable and potato producers. (Table 1)

The table below demonstrates that, while there is some seasonal variation in prices of some vegetable commodities over the last two years, the percentage change in retail price is not matching input cost increases. This shows that growers are taking the hit. (Table 2)

The below table also highlights the significant disparity between the change in vegetable prices over the last two years when compared with other agricultural commodities that are also facing cost increases. (Table 3)

It is important to note, that while each agricultural commodity is different and the scale of which farmers use fertiliser, chemicals, fuel, labour etc varies, they still all use these farm inputs, and they have all risen substantially.

The comparative data represents a vastly different trend between the commodities.

Vegetable prices have seen the lowest percentage increase in price across all the agricultural commodities, at an average of just 7.5 per cent across the subset of vegetable crops highlighted above.

This is well below the average percentage of agriculture commodities of about 59.2 per cent, and also well below the average percentage increase of the input costs at a massive 110.3 per cent.

These are alarming numbers and go to the heart of the supply chain issues within the fresh produce industry.

Many growers have contacted AUSVEG

highlighting their frustration and the challenges their businesses are facing to remain viable during this difficult time.

The message from AUSVEG is clear – growers deserve a fair price. The current price challenges cannot continue and AUSVEG will continue to highlight these issues to government and other relevant stakeholders.

Table 2

Commodity	January 20 price (\$/kg)	Current Price (\$/kg)	Percentage Change
Revenue			
Potatoes	AUD\$2.07	AUD\$2.16	4.34%
Onions	AUD\$2.19	AUD\$2.41	10%
Carrots	AUD\$1.59	AUD\$1.73	8.8%
Lettuce	AUD\$10.08	AUD\$10.35	2.67%
Celery	AUD\$6.13	AUD\$6.15	0.3%
Broccoli	AUD\$5.44	AUD\$6.75	24%
Average	AUD\$4.58	AUD\$4.92	7.5%
Cost			
Urea	AUD\$300/mt	AUD\$815/mt	171.7%
Diesel	AUD\$1.35/lt	AUD\$1.65/lt	22.2%
DAP/MAP	AUD\$312.4/mt	AUD\$699.4/mt	123.9%
Fertilisers	AUD\$73.2/mt	AUD\$200.6/mt	174%
Crude Oil	USD\$57.34/bbl	USD\$91.590/bbl	59.7%
Average			110.3%

Table 3

Commodity	Jan 2020	Current price	Percentage change
Vegetables	AUD\$4.58/kg	AUD\$4.92/kg	7.5%
Wheat (APW)	USD\$569/bu	USD\$795.50/bu	39.80%
Canola	CAD\$478.3/t	CAD\$1011.30/t	111.4%
Cattle (EYCI)	477c/kg cwt	1,127c/kg cwt	136.3%
Trade Lamb	702c/kg cwt	828c/kg cwt	17.9%
Milk	USD\$17/cwt	USD\$20.88/ cwt	22.8%
Cotton	USD\$70.3/lbs	USD\$121.93/lbs	73.4%
Average			58.4%

Overview

Towards the end of 2021, the price of fertiliser was starting to drop slightly, which was a result of the falling price of gas and oil. However, there are reports that Australian fertiliser suppliers were not passing these reduced prices to farmers this financial year as they are still trying to offload inventory purchased at a higher price.

As a result, growers have begun to delay purchasing and rationing their fertiliser supply, which could lead to production shortages and higher food prices. Some growers have also begun looking into alternatives such as nitrogen fixing pulses

and manure; however, the supply of these is heavily dependent on location and availability.

The effects of China closing its doors on exports has left a gaping hole in supply of fertilisers around the world. Russia, which was supplying some of Australia's ammonium nitrate fertiliser, is also now concerned for the supply for their domestic farmers and has banned exports as a precaution.

Luckily Russia is not a major supplier in the Australian market, so this should not have as big an impact on Australia's supply as the decision from China.

Ag chemical industry news

The ag chemical industry is facing problems with the cost and unreliability of shipments. Many essential ingredients for crop protection products are not being produced or shipped by key countries.

Strike Energy's Project Haber has been awarded Major Project Status by the Federal Government. The project has the potential to offer major downstream opportunities and significantly reduce Australian farms' carbon output.

The plant could supply Australia with 96 per cent of local urea needs. The Federal Government has contributed \$225 million towards the \$4.3 billion plant. The plant will produce two million tonnes of granular urea fertiliser per year and will help to create a secure supply for Australian growers.

Find out more

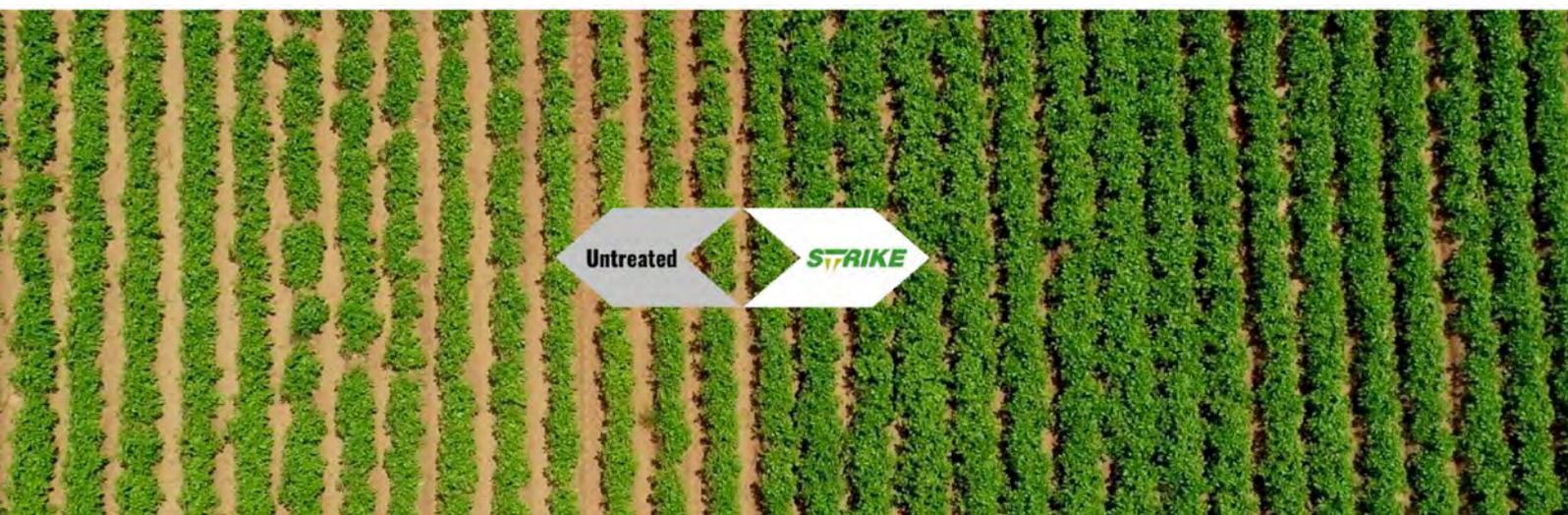
Please contact: AUSVEG on 03 9882 0277, or email: info@ausveg.com.au.

Data presented in this article was sourced from an AUSVEG Advocacy Update and was accurate at the time of original publication in February 2022.

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Hort Connections 2022 in Brisbane will follow on from a successful 2021 event held in the Sunshine State. The conference theme - "Growing together" - symbolises the industry adaption and growth post-pandemic in the Australasian region. The entire event will focus on how and where the horticulture world can connect and grow our great industry.

Why attend Hort Connections 2022?

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Recognition: Celebrate the outstanding achievements of horticulture's National Awards for Excellence 2022.

Trade Show: Grow your connections and supply contacts at the largest trade show in A-NZ horticulture, with exhibitors from more than 200 industry-leading companies showcasing the latest products and services.

We're pleased to
announce our first
confirmed speakers for
Hort Connections 2022



Jane Bunn
Meteorologist



Justin Dry
Chief Executive
Vinomofa



Tony Maher
CEO
National Farmers
Federation

hortconnections.com.au



Raising awareness of mental health

Events in Australia over the past two years – such as bushfires, floods and the COVID-19 pandemic – have taken their toll on many people's mental health. Therefore, it is important to look after yourself and each other. Knowing where to go for information on mental health can be a hurdle for many people, so AUSVEG has compiled this list of resources that may help to navigate this sensitive space.

In 2020/21, the Australian Bureau of Statistics conducted the first cohort of the National Study of Mental Health and Wellbeing – a component of the wider Intergenerational Health and Mental Health Study.

The figures are startling, with 3.4 million Australians seeing a health professional for their mental health in 2021/21.

- 13% of people saw a GP for their mental health.
- 8% saw a psychologist.
- 15% of Australians aged 16-85 years experienced high or very high levels of psychological distress.
- Women were more likely to experience high or very high levels of psychological distress than men (19% compared with 12%).
- One in five (20%) Australians aged 16-34 years experienced high or very high levels of psychological distress, more than twice the rate of those aged 65-85 years (9%).
- Suicide was the 15th most common cause of death overall (down from 13th in 2019), accounting for 1.9% of deaths.
- Suicide was the most common cause of death for adults aged 15-44.

The ongoing COVID-19 pandemic and traumatic events such as floods can lead to long-term psychological distress. Therefore, it is vital that we start talking more openly about the importance of discussing mental health and seeking

help if you or someone you know is experiencing difficulties.

There are organisations available for people who are looking for more information about mental health and they can give advice on how to deal with personal mental health issues or those that arise in your workplace, communities, friends or families.

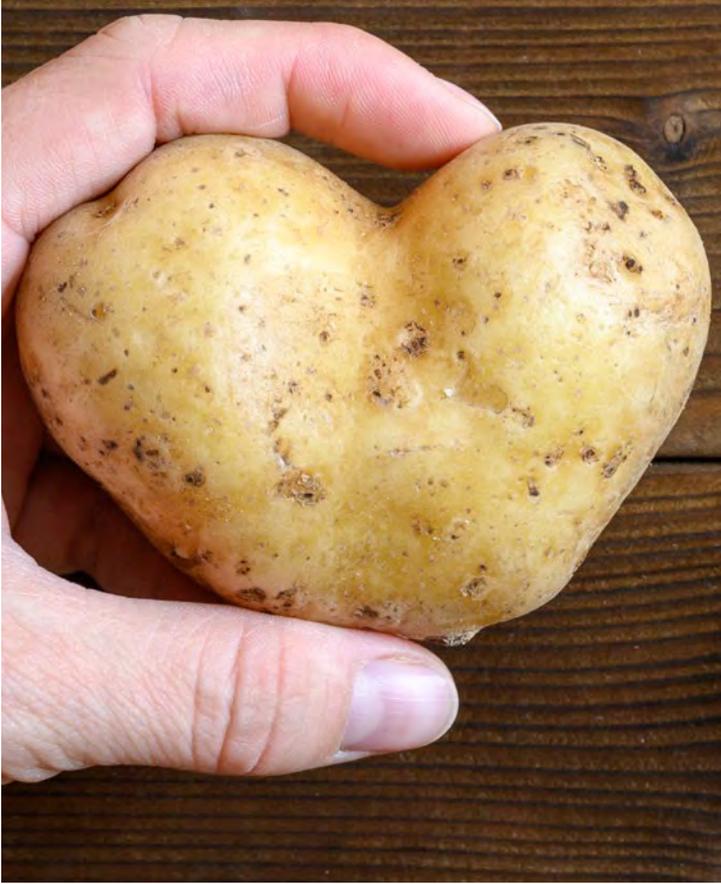
Beyond Blue

Beyond Blue has been providing supports and services to people in Australia for 20 years.

Beyond Blue works with the community to improve mental health and prevent suicide, so that all people in Australia can achieve their best possible mental health.

Through its Beyond 2020 Strategy, it's working across three strategic priorities:

1. Promoting mental health and wellbeing so people have greater knowledge, feel safe to talk openly about their issues and are supported to ask for help when they need to.
2. Being a trusted source of information, advice and support so we can all better understand how to maintain our mental health and take steps to recover from mental health conditions.
3. Working together to prevent suicide by playing a lead role in the national effort to prevent suicide through research, information, advice and support, and advocacy.



Someone is threatening self-harm. What can I do?

Lifeline has developed a range of free toolkits to provide information and assistance during challenging times. These include a self-help resource to help people cope with natural disasters; a self-harm factsheet; a toolkit for helping someone at risk of suicide, and much more.

Browse and download Lifeline's range of toolkits and factsheets here: lifeline.org.au/resources/toolkit-downloads/

Still unsure about what to do or need a debrief? Those who are worried about a loved one or community member who is threatening self-harm can contact Lifeline on 13 11 14 for 24/7 crisis support and further advice.

For further information on anxiety, depression or suicide visit beyondblue.org.au or call 1300 22 4636 (24 hours/7 days a week).

To chat to a trained mental health professional, please visit beyondblue.org.au/get-support/get-immediate-support.

Black Dog Institute

Black Dog Institute is a proudly independent not-for-profit medical research institute affiliated with The University of New South Wales.

Its focus today has expanded to address new challenges and opportunities in mental health – suicide prevention, digital innovation, lived experience, youth and workplace mental health. Its work in mood disorders continues through investigation of new and better ways to treat and prevent conditions like anxiety and depression through digital tools and novel treatments.

For more information visit blackdoginstitute.org.au.

Lifeline

Lifeline is a national charity providing all Australians experiencing emotional distress with access to 24-hour crisis support and suicide prevention services. It is committed to empowering Australians to be suicide-safe through connection, compassion and hope.

For 24/7 crisis support and suicide prevention services, call Lifeline on

13 11 14.

The online Crisis Support Chat service is also available every night at lifeline.org.au/crisischat.

MensLine Australia

MensLine Australia is the national telephone and online support, information and referral service for men with family and relationship concerns. The service is available from anywhere in Australia and is staffed by professional counsellors, experienced in men's issues.

For more information, visit mensline.org.au or call 1300 78 99 78.

MindSpot

MindSpot is a free service for Australian adults who are experiencing difficulties with anxiety, stress, depression and low mood. It provides assessment and treatment courses or can help find local services that can help.

The MindSpot team comprises experienced and Australian Health Practitioner Regulation Agency-registered mental health professionals including psychologists, clinical psychologists and psychiatrists who are passionate about providing a free and effective service to people all over Australia. It has a dedicated IT team to ensure that this happens as securely and efficiently as possible.

For more information, please call 1800 61 44 34 or visit mindspot.org.au.

SANE Australia

SANE Australia is a national mental health charity making a real difference in the lives of people affected by complex mental health issues through support, research and advocacy.

Counsellors are available via phone, web chat or email from 10am to 10pm Monday to Friday AEST/AEDT.

For more information, please call the SANE Helpline on 1800 18 SANE (7263) or visit sane.org.

Suicide Call Back Service

Suicide Call Back Service offers free professional 24/7 telephone counselling support to people at risk of suicide, concerned about someone at risk, bereaved by suicide and people experiencing emotional or mental health issues.

It also offers free professional 24/7 online counselling support.

Call 1300 659 467 or visit suicidecallbackservice.org.au.

Further resources

These are just some examples of the mental health services available in Australia. More can be found at ausveg.com.au/mental-health-industry/resources-2/

If you require emergency assistance, please contact 000.

Slight come back on fresh potato exports, but frozen potato imports on the rise

Fertiliser, chemical and fuel costs have increased by at least 40 per cent during the last two years. With cumulating pressure from rising farm input costs, labour shortages, operational constraints, international shipping backlogs and expensive freight costs, Australian potato grower-exporters continue to ship fresh potatoes to international markets while the imports of frozen potato have increased as well. AUSVEG International Trade Specialist Andrea Lin reports.

Based on the latest *Horticulture Statistics Handbook* released in January 2022, Australian horticulture production reached \$15.2 billion, and production has topped 6.6 million tonnes in 2020/21. The vegetable production output has increased to \$4.9 billion at over 3.8 million tonnes, representing one third of the total horticultural output. Potatoes were the top performing vegetable categories with over 1.4 million tonnes of potatoes produce in 2020/21, worth \$807 million.

Despite the strong domestic potato production and with 975,000 tonnes

of Australian potatoes being sent for processing locally, frozen potato imports to Australia are accounted for almost 20 per cent of the total Australian potato production.

Australian fresh potato exports overview 2021

Total fresh potato exports have seen a modest increase compared to the same period in 2020. Based on data from the Global Trade Atlas, there was a two per cent increase in export value, from \$32.9 million to \$33.4 million and total export

volume grew by seven per cent from 39,211 tonnes to 42,092 tonnes.

The top five markets for fresh potato exports were South Korea, Philippines, Singapore, Malaysia and Hong Kong. Fresh potato trade to the top three markets has increased substantially in trade value and volume in 2021 (refer to Table 1).

South Korea remained to be the top Australian fresh potato export market and recorded an increase in export value by 24 per cent from January to December 2021, from \$7.7 million to \$9.6 million; export volume increased by 26 per cent, from 13,061 tonnes to 16,512 tonnes.

Table 1

Change in fresh potatoes exports by top 10 destinations January to December 2020-2021 (Source: Global Trade Atlas 2022).

Trade partner	2020		2021		% ▲ 20-21	
	AUD\$	Tonnes	AUD\$	Tonnes	AUD\$	Tonnes
World	\$ 32,924,168	39,211	\$ 33,494,060	42,092	2%	7%
South Korea	\$ 7,748,869	13,061	\$ 9,642,314	16,512	24%	26%
Philippines	\$ 4,376,350	7,369	\$ 5,075,084	8,605	16%	17%
Singapore	\$ 3,951,220	2,441	\$ 3,987,860	2,659	1%	9%
Malaysia	\$ 3,802,226	3,391	\$ 3,729,778	3,341	-2%	-1%
Hong Kong	\$ 3,592,668	2,860	\$ 3,390,563	2,073	-6%	-28%
United Arab Emirates	\$ 2,085,324	1,555	\$ 2,120,886	1,717	2%	10%
Indonesia	\$ 2,875,176	4,656	\$ 1,673,434	2,977	-42%	-36%
Taiwan	\$ 1,773,303	1,650	\$ 1,629,710	1,600	-8%	-3%
Thailand	\$ 15,600	4	\$ 932,874	1,553	5880%	38725%
Qatar	\$ 1,818,588	1,540	\$ 351,270	245	-81%	-84%



The Philippines recorded an increase of 16 per cent in value from \$4.3 million to \$5 million and an increase of 17 per cent in volume from 7,369 tonnes to 8,605 tonnes. The increases in 2021 have overtaken Australian fresh potato exports to Philippines in 2019 pre-COVID trade level (\$3 million at 5,002), making Philippines the fastest growing market for Australian fresh potato exports.

Indonesia recorded a decrease in value by 42 per cent from \$2.8 million to \$1.6 million and export volume to this market has decreased by 36 per cent from 4,656 tonnes to 1,600 tonnes. Thailand has recorded a strong increase in export value from \$15,600 to \$932,874 and export volume has grown from 4 tonnes to 1,553 tonnes (refer to Table 1).

Frozen potato imports overview 2021

According to the data from Global Trade Atlas, there was a six per cent increase in frozen potato import value from January to December 2021, from \$147 million to \$156 million. Import volume also increased

at a similar rate of seven per cent, from 106,323 tonnes to 113,268 tonnes.

Netherlands, Belgium, New Zealand, United States and South Africa are the top five markets for frozen potato imports. Frozen potato imports from the Netherlands recorded an increase of 13 per cent, from \$35 million to \$40 million; import volume grew by 21 per cent, from 26,888 tonnes to 32,599 tonnes.

New Zealand and Germany continue to experience a decrease in its frozen potato exports to Australia. Frozen potato imports from New Zealand have dropped 20 per cent from \$44 million to \$35 million and import volume from New Zealand has decreased by 24 per cent, from 39,807 tonnes to 30,058 tonnes. Germany has recorded significant decrease in its frozen potatoes export to Australia by 74 per cent from \$7.5 million to \$1.9 million and export volume dropped by 84 per cent from 3,373 tonnes to 54 tonnes.

On the other hand, Argentina and India have seen strong growth in its frozen potato exports to Australia. Argentina has recorded an increase of 768 per cent in its frozen potato exports to Australia, from

\$391,814 to \$3.3 million and the frozen potato export volume have increased nearly 10 folds, from 285 tonnes to 3,055 tonnes. Frozen potato imports from India have grown by 211 per cent from \$496,198 to \$1.5 million and volume has increased at a similar rate of 200 per cent, adding additional 680 tonnes of frozen potatoes to Australia (refer to Table 2).

Find out more R&D

Growers interested in identifying export events or discussing export opportunities can contact the AUSVEG Export Development team on 03 9882 0277 or email export@ausveg.com.au.

Table 2

Change in frozen potato imports by top 10 destinations January to December 2020-2021 (Source: Global Trade Atlas 2022).

Trade partner	2020		2021		% ▲ 20-21	
	AUD\$	Tonnes	AUD\$	Tonnes	AUD\$	Tonnes
World	\$ 146,750,542	106,323	\$ 155,576,234	113,268	6%	7%
Netherlands	\$ 35,340,858	26,888	\$ 39,963,485	32,599	13%	21%
Belgium	\$ 33,898,960	20,999	\$ 38,903,583	25,581	15%	22%
New Zealand	\$ 43,959,727	39,807	\$ 35,226,801	30,058	-20%	-24%
United States	\$ 17,512,924	10,440	\$ 24,783,945	15,199	42%	46%
South Africa	\$ 4,320,898	2,258	\$ 5,939,075	2,427	37%	7%
Argentina	\$ 391,814	285	\$ 3,399,514	3,055	768%	972%
Germany	\$ 7,585,939	3,373	\$ 1,945,552	547	-74%	-84%
India	\$ 496,198	340	\$ 1,543,596	1,020	211%	200%
China	\$ 1,993,483	1,516	\$ 1,122,358	685	-44%	-55%
Canada	\$ 19,968	4	\$ 903,028	1,399	4422%	34875%



Protesters gathered on the steps of Parliament House in Melbourne to oppose AusNet's plans.

Tractors head to Spring Street to protest energy project

Farmers, residents, landholders and industry representatives – who are concerned about AusNet's Western Victoria Transmission Network Project (WVTNP) plan – marched along Spring Street to the steps of Melbourne's Victoria's State Parliament on Tuesday 8 March. The group staged a tractor rally and demanded the Victorian Government reject AusNet's plans for the Western Victoria WVTNP. AUSVEG National Manager – Communications Shaun Lindhe reports.

More than 300 people gathered on the steps of Victoria's Parliament House in Melbourne to protest against the Western Victoria Transmission Network Project (WVTNP) plan, a major energy project that could see above-ground transmission lines cutting through the major Victorian potato growing region.

If the planned route for the project proceeds, prime agricultural land in the region will be irreversibly impacted and the future of potato production around Ballarat will be severely threatened.

Impact on Ballarat's potato growers

Ballarat Potato Growers Association Chairman Chris Stephens said the restrictions on machinery and irrigation near easements and under transmission

lines will make production in the region untenable and will have flow-on consequences for the broader industry.

"The WVTNP means the loss of over 1,000 hectares of the most productive land in Australia," he said.

"The loss of our overall efficiency and profitability – we're going to lose several highly productive industries.

"If there is one thing the pandemic would have made clear it's that food doesn't magically just appear on supermarket shelves or in the window at the drive-through.

"In Victoria, we have some of the best dirt, the best climatic conditions, the cleanest water and the most dedicated farmers in the world – why would we want to risk our food sovereignty or our ability to provide for ourselves?"





Concerns on national precedent

AUSVEG attended the rally and echoed the calls from growers about the impact that this project will have on the future of potato production in the region.

According to AUSVEG CEO Michael Coote, the region is a major production region for potatoes, particularly for the processing industry, and is a critical economic contributor to the local economy.

"Local growers feel their concerns have not been taken seriously and that the impact of the project on the region's potato production is an afterthought," Mr Coote said.

"Potato growers operate on increasingly tight margins and have been impacted by significant increases in the price of farm inputs over the last 12-months and the ongoing impacts of the COVID-19 pandemic – this is yet another disruption that growers do not need.

"The region is home to rich volcanic soil that is ideal for growing potatoes, but there is only a limited amount of it available for producers; you can't just pack up your farm and move it to another region and expect the same soil and conditions.

"We are also concerned that this project will set a dangerous precedent where high voltage powerlines can be installed through other highly productive irrigation districts, and impact growers without considering the broader impact on the country's food production and food security.

"The industry is calling on the State Government to listen to the concerns of growers, landholders and residents in the region and consider the implications of this project on the future of food production, and Australia's food security – once this land is lost, there won't be any way to get it back."

Find out more

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Potato industry statistics now available

The *Australian Horticulture Statistics Handbook* (Hort Stats Handbook) is the leading resource for Australian horticulture statistics and market information. It is an analysis that combines all available data on production, international trade, processing volumes and fresh market distribution to produce statistics on more than 70 horticultural categories. The latest edition of the Handbook was released in February 2022, unpacking the sector's performance during 2020/21.

Horticulture

The latest Hort Stats Handbook has officially been launched, offering the most comprehensive and contemporary data available on all sectors of the Australian horticulture industry in one easy-to-read guide.

The Handbook, developed by FreshLogic and funded by Hort Innovation, features more than 470 pages of information drawn from several supply chain sources, including international trade statistics and industry peak bodies. It includes data on more than 70 horticultural products including fruit, nuts, vegetables, nursery, turf and cut flowers.

Top 3 highlights

- Despite the ongoing impacts of COVID-19, production volume and value remained relatively stable in 2020/2021.
- Fresh export value decreased by 14 per cent and fresh export volume decreased by eight per cent, which can be linked to the impacts of COVID-19 and global trade disruptions from key markets for some commodities.
- Fresh supply into the retail and food service sectors accounts for around 59 per cent of farm-gate volume.

Highlights for 2020/21



Horticulture

Year ending June	2021	2020	▲ %
Production (t)	6,629,506	6,532,853	+ 1%
Production (\$m)	\$15,236.6	\$15,156.1	+ <1%
Fresh Export (t)	761,538	825,475	- 8%
Fresh Export (\$m)	\$2,368.3	\$2,749.0	- 14%
Fresh Supply (t)	4,050,975	4,047,771	+ <1%
Fresh Supply Wholesale Value (\$m)	\$15,633.2	\$15,524.6	+ <1%
Supply per capita (kg)	157.32	156.89	+ <1%



Potatoes

Year ending June	2021	2020	▲ %
Production (t)	1,458,991	1,388,859	+ 5%
Production (\$m)	\$807.3	\$716.4	+ 13%
Processing volume (t)	975,000	904,936	+ 8%
Fresh Export (t)	37,274	40,249	- 7%
Fresh Export (\$m)	\$31.1	\$33.6	- 7%
Fresh Supply (t)	446,717	443,674	+ <1%
Fresh Supply Wholesale Value (\$m)	\$522.8	\$496.6	+ 5%
Supply per capita (kg)	17.65	17.5	+ <1%



Carrots

Year ending June	2021	2020	▲ %
Production (t)	335,527	330,145	+ 2%
Production (\$m)	\$256.0	\$222.1	+ 15%
Fresh Export (t)	108,356	103,868	+ 4%
Fresh Export (\$m)	\$97.0	\$91.1	+ 6%
Fresh Supply (t)	206,545	205,982	+ <1%
Fresh Supply Wholesale Value (\$m)	\$202.3	\$168.7	+ 20%
Supply per capita (kg)	8.02	7.98	+ <1%



Onions

Year ending June	2021	2020	▲ %
Production (t)	271,930	265,162	+ 3%
Production (\$m)	\$203.2	\$243.9	- 17%
Fresh Export (t)	44,885	36,480	+ 23%
Fresh Export (\$m)	\$30.4	\$30.2	+ <1%
Fresh Supply (t)	206,538	211,975	- 3%
Fresh Supply Wholesale Value (\$m)	\$209.6	\$261.9	- 20%
Supply per capita (kg)	8.02	8.22	- 2%

Potatoes

Hort Innovation Head of Data and Insights Adam Briggs said the rise correlates with Aussies also buying more spuds when they visit retailers, and their use in food service has climbed year-on-year.

"The humble spud has become a bit of a vegetable superstar," he said.

"From the year ending June 2020 to the year ending June 2021, we've seen the value of potatoes climb by \$90.9 million, and the tonnes produced rise by five per cent."

Mr Briggs said the data showed 87 per cent of Australian households purchased potatoes, buying an average of 1.7kg per shopping trip.

Top 3 highlights

- Potatoes were one of the horticulture industry's strongest performers in 2020/21, with a growth in production volume of five per cent and farm-gate value increasing by 13 per cent.
- The growth in potato production volume was driven mainly through processing volume for potatoes (eight per cent), which experienced stronger growth than fresh supply volume (less than one per cent) and fresh export volume (a reduction of seven per cent).

- Potatoes make up over 38 per cent of vegetable farmgate production volume, 70 per cent of total vegetables for processing by volume and over 20 per cent of fresh supply into the retail and food service sectors by volume.

Case studies

Top 3 highlights (Carrots)

- Carrots were a strong performer in 2020/21, with production volume increasing by two per cent and value increasing by 15 per cent. This is a different story compared to other vegetable crops where the volume produced increased, but the overall farm-gate value decreased.
- Carrot exports continued to grow, with over 100k tonnes exported in 2020/21 at a value close to \$100 million.
- The supply of carrots into the retail and food service sectors remained relatively stable, but the value of this produce increased significantly (approximately 20 per cent).

Top 3 highlights (Onions)

- Onion production increased slightly in 2020/21 by three per cent, but farm-gate value decreased by 17 per cent.
- Onion exports increased in volume by 23 per cent, but the value of total onion exports remained relatively steady.
- Onion supply into the retail and food service sectors reduced in volume and value in 2020/21.

Find out more

To access Hort Innovation's Australian Horticulture Statistics Handbook, please visit horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/HA18002/

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

Australian Horticulture Statistics Handbook 2018- 19 to 2020-21 is a whole-of-horticulture project that has been funded by Hort Innovation using industry levies and contributions from the Australian Government.

Project Number: HA18002

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AUSVEG uses social media to help consumers #knowyourAUSVEG

Towards the end of 2021, AUSVEG delivered the #knowyourAUSVEG campaign to educate the public on the Australian vegetable and potato industries and raise awareness of the vegetable and potato sector’s hard-working growers and the substantial contribution that the industry makes for the national economy.

Did you know that in the last year Australia’s hard working vegetable producers grew enough potatoes to fill the Melbourne Cricket Ground and enough carrots to fill more than 300 Olympic-sized swimming pools?

Through November and December 2021, AUSVEG used its media and social media channels to deliver a modest campaign to educate the public on the Australian vegetable and potato industries, raising awareness of the vegetable and potato sector’s hard-working growers and the substantial contribution that the industry makes for the national economy, the livelihoods of its workers and the health and wellbeing of every Australian.

AUSVEG engaged with key media outlets, as well as posted engaging content across Facebook, Instagram, Twitter and LinkedIn to highlight the significant contributions of the vegetable industry encouraging industry and the broader public to #knowyourAUSVEG.

“The vegetable industry should be considered one of strongest performers of Australia’s agriculture industry given its growing value of production, its prominence in retail and market settings across the country and its rising exporting presence,” AUSVEG National Manager – Communications Shaun Lindhe said.

“The vegetable industry is highly technical, advanced and growing sector. It is a major contributor to agricultural employment and provides economic benefits to all businesses throughout

the agricultural supply chain – it is the lifeblood of many regional and rural communities that rely on a thriving agriculture sector.

“Vegetables are the biggest sector in the Australian horticulture industry with a farmgate value of nearly \$5 billion, which according to ABARES data is larger than a number of other agriculture sectors, including most domestic meat markets (except cattle and calves), all fisheries and forestry industries, all pulses and oilseed crops, and is comparable to our milk and the combined fruit and nut industry.

“The vast majority of vegetables that are sold in Australia are grown in Australia. This tremendous effort is possible because of the hard work and determination of our vegetable growers and the support from the broader supply chain to assist in the supply vegetables for Australian and international consumers.

“This campaign was designed to highlight the valuable work of growers and underscore the significant contribution of the industry for the national economy and health and well-being of every Australian.”

Campaign results

Given the modest scale of this campaign, the media engagement that resulted from the media and social media content was positive.

“The campaign itself was syndicated in many national, metro, regional and rural news networks, both in print and online,

which meant that messages promoting vegetable growers and the hard work they undertake was spread far,” Shaun said.

“The #knowyourAUSVEG campaign generated over 200 media mentions and had the potential to reach most of the Australian public either online or through print publications.

“Overall engagement was strong across social media, with overall engagement across all four platforms – that is, the times a social media user interacted with one of the campaign’s posts – rating at nearly 10 per cent, which considering the scale of the campaign was pleasing.

“One of the key objectives was for the campaign to reach politicians in the lead-up to the upcoming Federal Election. We did this through directly tagging politicians across all channels, with Agriculture Minister David Littleproud, Scott Buchholz, Stuart Robert, Susan McDonald and Damian Drum all interacting with the campaign on at least one channel.

“The campaign performed particularly well on LinkedIn, which will help inform us about where to target for future social media campaigns.”

Find out more

Please contact AUSVEG National Manager – Communications Shaun Lindhe on 03 9882 0277, or email: shaun.lindhe@ausveg.com.au.



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Veggies and fruit the 'Pick of the Crop' in pilot program

A pilot program that has been rolled out across three Queensland regions is proving a hit with students, teachers and parents. The 'Pick of the Crop' program is focused on creating a love of nutritious vegetables and fruit in schools across Queensland and was established as a Health and Wellbeing Queensland signature program to tackle the ongoing and persistent low intake of vegetables among children. *Potatoes Australia* reports.

In July 2019, Health and Wellbeing Queensland was created by the Queensland Government to increase the focus and emphasis on health promotion in Queensland, particularly around healthy weight through nutrition, physical activity and wellbeing, as well as addressing health inequities across the state.

Although it is an independent organisation, Health and Wellbeing Queensland works in partnership with government and the broader community to reduce risk factors that lead to chronic diseases. It has been given a mandate to develop a new way of working that requires innovation, partnerships and an element of risk taking that government is not well-placed to deliver.

The organisation is also one of 12 key partners of the Fruit & Vegetable Consortium, which exists to provide

the strategic direction and collaborative action required to achieve a significant and sustained increase of Australian consumers' fruit and vegetable intake.

One of Health and Wellbeing Queensland's programs is 'Pick of the Crop', a primary school-based, whole-of-school healthy eating program that focuses on improving children's vegetable and fruit intake.

Community collaboration

The original idea for Pick of the Crop was to provide opportunities for children to be exposed to vegetables and fruit, particularly throughout the school day.

It then progressed to connecting schools and students to local producers, as Health and Wellbeing Queensland Principal Lead – Public Health Nutritionist Mathew Dick explained.

"Growers in Queensland were having a difficult time because of the drought, so it was a way for us to bring together a number of different portfolio areas – health, education and agriculture – and centre that around what's happening in the school grounds," Mathew said.

"We consulted with bodies such as Growcom and the Queensland Department of Agriculture and Fisheries to work out where we'd deliver Pick of the Crop. From those consultations, we identified growing areas of Bowen and Bundaberg, but we also needed to implement the program in a dense, urban environment.

"The Logan area was an obvious choice for us – a high population, lots of schools and a culturally diverse food scene."

While fruit intake is important,

vegetables are seen as a more crucial component of this program. Consumption figures are critically low – with just six per cent of Australian primary school-aged children meeting the recommended daily intake of vegetables.

School connections

Pick of the Crop is a locally designed program, and each school sets its strategic direction with positive results.

"Each school is very individual, and it's based on what they're doing at the moment – what's in their capability and capacity," Health and Wellbeing Queensland Senior Public Health Nutritionist Charlotte Morrison said.

Education and sustainability are key to program activities.

"The stories that are coming back to us now are diverse, and it's great to see the actions. We have Gardening Grannies, where a local community member comes in to one Bundaberg school and helps support the garden. She talks to the students and helps to make sure they are planting the right crops," Charlotte said.

"We've also linking in with local community groups; in Logan, there's community centres that may be based on-site at the schools working with the parents to host cooking or education sessions."

Participating community groups also take on other programs that may be run by different organisations.

"We didn't want to just come in as another program – it's identifying what schools can use that's already out there," Charlotte said.

"For example, there's the CSIRO Taste &



Learn program and the OzHarvest FEAST program. The schools may contact a local nutritionist who comes in and hosts parent sessions or classroom work. It's looking at what's out there, and we at Health and Wellbeing Queensland support schools to find those initiatives and organisations that fit with their current activities."

Children on farms

Matthew, Charlotte and the Pick of the Crop team have been working with Bundaberg Fruit and Vegetable Growers and Bowen State School to organise farm excursions for school children, which has proven successful when integrated with the teaching and learning components.

"When the kids visit the farm, it's not all about fruit and veg – it's also showcasing how it is produced and the process, including packing and transportation," Charlotte said.

"The kids really valued that, and some

of those schools that we're working with have children who will enter the agriculture sector. It's integrating the healthy eating with giving children the skills, confidence and knowledge of what agriculture is all about."

Anecdotally, program feedback has been extremely positive.

"A lot of the teachers have reported that children have asked if they could go to the garden to pick some lettuce for their sandwich, or they're bringing in better packed lunches with more fruit and vegetables," Charlotte said.

"Kids are willing now to try the different vegetables. Teachers are seeing the kids engaged and those are the stories that really help us who are planning and working on this program know that it's doing its job."

What's in store

The Pick of the Crop program is expanding

within Bundaberg, Bowen and Logan in 2022.

"We've expanded from the original set of schools that we had. We started with 60 that were eligible, and we're increasing that to 100 this year," Charlotte explained.

"We'll continue to work with the schools that have been with us in 2021, and we've got knowledge from 12 months of implementation that we can bring into this year."

Vegetable growers interested in hosting students in one of the Pick of the Crop regions can contact Mathew Dick on 07 3234 9929 or email mathew.dick@hw.qld.gov.au.

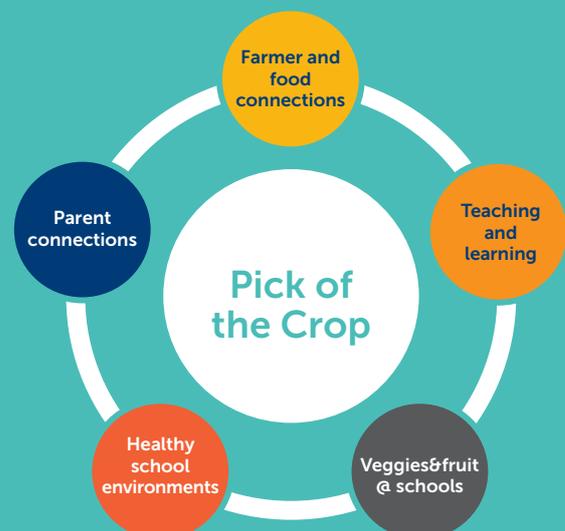
Find out more

For further information or to check out school resources, please visit hw.qld.gov.au/pick-of-the-crop.

Pick of the Crop

Health and Wellbeing Queensland has developed the Pick of the Crop program based on five priority components:

- Establishing farmer and food connections.
- Teaching and learning about vegetables and fruit.
- Introducing fruit and vegetable snacks in schools – for example, through Munch & Crunch/Brain Breaks during the day.
- Identifying and involving the whole school environment – for example, canteens or tuckshops and school gardens.
- Establishing parent connections.



American serpentine leafminer in-focus

Exotic leafminers have been the centre of our attention recently – and with good reason. American serpentine leafminer – detected across northern Australia in July 2021 – has the potential to become a significant issue for nation-wide potato production. AUSVEG Biosecurity Officer Zali Mahony reports.

American serpentine leafminer (ASLM; *Liriomyza trifolii*) is a small fly that belongs to the family Agromyzidae, and, has a wide host range. ASLM seriously affects a range of vegetable, ornamental and legume crops including solanaceous crops like potatoes, capsicums and tomatoes.

Yield losses vary but leaf damage can reduce photosynthetic activity, causing premature leaf drop, plant sickness and even death. Feeding damage can also lead to a much greater risk of harmful fungal infections in the crop.

Distribution

ASLM was detected first in July 2021 in the Torres Strait Islands and in northern Australia. Soon after, there were further detections across northern Australia, including Kununurra and Broome in Western Australia, Darwin and Katherine in the Northern Territory, and the Northern Peninsula Area of Cape York, Queensland.

Domestic trade and containment in place

While ASLM is a National Priority Plant Pest, the Consultative Committee on Emergency Plant Pests (CCEPP) – Australia's key technical body for coordinating national responses to emergency plant pest incursions – is responsible for determining whether a pest is technically feasible to eradicate.

Following the detection of ASLM in 2021, the CCEPP determined that the pest



ASLM stippling damage caused by adult feeding and egg laying. Image courtesy of Bahram Fayaz from H.M. Clause.

is not technically feasible to eradicate largely due to the pest's biology, current distribution, and wide host range.

A containment strategy is in place for ASLM due to its current distribution limited to northern Australia. In Queensland, movement restrictions from the far northern biosecurity zones are in place and restrict the movement of the pest and any potential carriers (i.e. plant, soil, equipment, etc.) out of the zones. This has previously been successful in preventing further spread of a different non-native leafminer pest that is only present in the Cape York Peninsula (Vegetable leafminer; *Liriomyza sativae*).

Keep an eye out for the symptoms!

ASLM is small and extremely difficult to see; however, the symptoms of an ASLM infection are easier to spot when monitoring a susceptible crop.

The lifecycle for ASLM begins as females lay eggs just below the leaf surface of host plants. This causes 'stippling' damage that can be visible in some instances. Stippling involves opening a 'wound' on a plant leaf that increases the risks of fungal and bacterial infection for a plant.

Eggs hatch between 2-5 days after being laid. Eggs are too small to be seen by the naked eye, so a seemingly healthy plant may be harbouring the pest without us knowing. Inside the leaf tissue, larvae begin to feed within the leaf creating tunnels or mines that become larger as the larvae matures.

These leaf mines cause significant damage to plants as they reduce the plant's photosynthetic area and activity, causing premature leaf drop, plant sickness and even death.

Larvae then exit the leaf to transition to adults (pupate) externally to the leaf, usually in soil below the plant from which adults emerge 7-14 days later.

The duration of the ASLM lifecycle varies with temperature. Favourable environmental conditions can reduce the time it takes for an entire lifecycle, meaning several generations can occur in one season. In unfavourable environmental conditions, the cycle takes longer.

Identification

Adult ASLM are difficult to identify in the field, and molecular diagnostic tests are necessary to confirm species, but if you see these mining symptoms on potato leaves then you should think about getting it identified by professionals.

The stippling and leaf mines are the key indicator to look for when monitoring crops and surrounding vegetation.

Major risk pathways for spread

Major risk pathways of ASLM into and across Australia is by the importation of infested ornamental host plants and cut flowers. Leafy vegetables and seedlings can move ASLM. Natural pathways (such as wind) can also contribute to the spread of this pest.



Adult ASLM are between less than 2 mm long, Black and yellow and larvae are initially transparent transitioning to yellow-orange as they mature. Image courtesy of Central Science Laboratory, Harpenden, British Crown, Bugwood.org.



Leaf damage of ASLM identified by twisting white leaf mines caused by larval feeding habits. Image courtesy of the Western Australian Department of Primary Industries and Regional Development.

Climate models and existing pest knowledge have been used to determine the pest's risk of establishment in regions across Australia. A predictive model based on temperature, moisture constraints and predicted dominant stressors (cold, heat, desiccation) was developed by Cesar Australia as part of project, MT16004 – *RD&E program for control, eradication and preparedness for vegetable leafminer* – which developed a contingency plan for each pest.

ASLM is predicted to have suitable habitats along the northern, eastern, southern and southwestern coastline of Australia and Tasmania (see map). ASLM is a heat tolerant species and will thrive in tropical conditions.

However, they are not only tropical pests and are also suited to temperate regions. ASLM is still predicted to be able to maintain populations year-round across Australia. ASLM has been reported to have delays in development (diapause) at low temperatures, which will allow them to survive cold conditions, until warmer weather arrives.

What's the key to management?

ASLM – and other *Liriomyza* leafminers – are known to rapidly develop chemical resistance to various groups which can make control difficult.

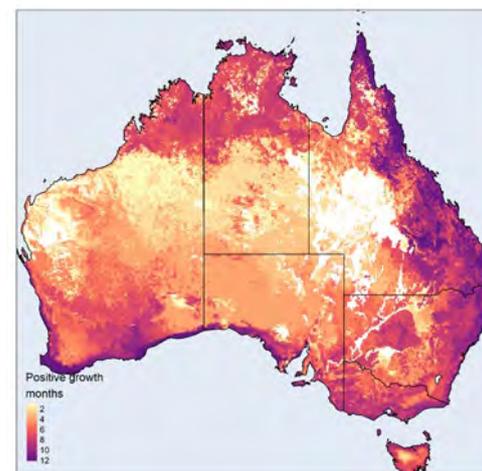
Application of broad-spectrum insecticides often results in larger leafminer populations as these insecticides reduce the reservoir of natural enemies

(parasitoid wasps, as well as other generalist predators like spiders), which keep leafminer populations in check. Translaminar and systemic chemical options better support the management of leafminers as they are able to reach leafminer pupae within the leaf. However, their use is note inherently low risk to beneficials.

Several insecticides are used overseas for the control of exotic leafminers, including – but not limited to – abamectin, azadirachtin, chlorantraniliprole, cyromazine, indoxacarb, spinetoram and spinosad. There are several minor use permits currently available for *Liriomyza* leafminers for the vegetable and potato industry. For more information, please visit horticulture.com.au/growers/serpentine-leafminer-update.

Further reading

- Management of leafmining flies in vegetable and nursery crops in Australia: bit.ly/2X1vkps
- Monitoring for serpentine leafminer in Australia: bit.ly/3D21UqC
- Plant Health Australia – ASLM fact sheet, diagnostic protocol and contingency plans: bit.ly/38P6gEE



The aggregated yearly establishment potential of ASLM as the number of months across the year with increasing population sizes based on temperature and moisture constraints. Image courtesy of Cesar Australia.

Find out more

For further information, please contact Zali Mahony on 03 9882 0277 or email zali.mahony@ausveg.com.au. The Farm Biosecurity Program is funded by the Plant Health Levy.

AUTUMN 2022

POTATO LINK

FEATURE ARTICLE

SUSTAINABLE AGRICULTURE AND CARBON FARMING

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EXTENSION PROJECT

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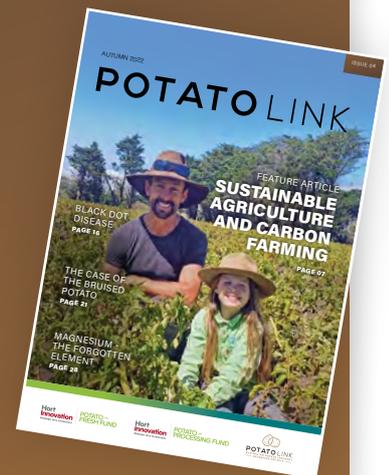
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Cover: PotatoLink's Stuart Grigg and daughter Kiara in their crop of Atlantics a week before harvest

- Kate Grigg



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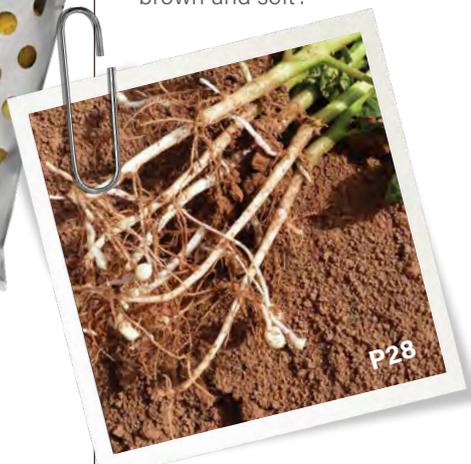
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NEW POTATOLINK TEAM MEMBERS

The PotatoLink team has expanded over the last few weeks, with new regional representatives appointed in Queensland, Victoria and Western Australia.

We also have a new staff member in our Sydney office, who will be actively involved in organizing and promoting field days, workshops and other face to face activities.

QUEENSLAND

Dr Naomi Diplock is a plant pathologist with 15 years research and university teaching experience. She enjoys working in diverse environments, from the cattle stations of the north Queensland outback, to farms in Bhutan and the vegetable production areas of the Lockyer Valley. These reflect Dr Diplock's varied research career, with projects on biological control of woody weeds, spider behaviour, mushroom production and vegetable pathology.



Now based near Nambour, Naomi will co-ordinate PotatoLink activities in both southern and northern growing areas of Queensland.

VICTORIA

Stuart Grigg, from Stuart Grigg Ag-Hort Consulting, is vegetable farming born and bred. Now a vegetable agronomist, he has nearly 20 years experience working and consulting throughout Australia (with a Victorian focus) as well as New Zealand. Originally specialised in lettuce, brassicas and babyleaf, he has



more recently extended into apiaceae (celery and parsley) and potato crops.

Stuart is passionate about precision agriculture as well as sustainability and soil health. As someone who has been involved in research projects as well as responsibility for the day-to-day running of major vegetable production businesses, he has unique skills, understanding both the theory and commercial reality.

Stuart and his young family have now invested in their own 148 acre property at Bolwarrah, west of Ballarat. Here, Stuart has teamed up with potato grower Neville Quinlan, producing spuds on virgin ground alongside his broccoli crop. Stuart will run trials using their local crop of Atlantics, as well as coordinate some Victorian PotatoLink activities.

WESTERN AUSTRALIA

Regional coordination in WA will be shared between Rachel Lancaster and Mark Warmington.



Rachel has worked in research and extension with Western Australian horticultural businesses for more than 28 years.

After many years with the WA Department of Agriculture, in 2016 Rachel left to become principal of EATS (Environmental and Agricultural Testing Services) as well as consulting privately on a wide range of research projects. She has since investigated plant nutrition, disease, insect and weed management and efficient crop irrigation. With skills in implementing and analysing trials as well as working with growers, Rachel is ideally qualified to work with the PotatoLink

team managing activities in WA.

Mark Warmington has worked around Australia as an agronomist in a wide variety of crops for over 30 years. After 11 years with the WA Department of Agriculture, based in Kununurra filling the role of farm manager for the research station, he recently moved south to join EATS as their Sampling/ Research Manager. Mark enjoys working with growers and will be involved with the PotatoLink activities in WA.



NEW SOUTH WALES

New recruit Stephanie Tabone graduated from the University of Sydney in 2016, with a B. Science in Agriculture with honours, majoring in horticulture and agronomy. Stephanie has since gained hands-on vegetable production and postharvest experience with a major, vertically integrated vegetable producer in South-East Queensland. She has also managed stewardship and a sales territory for a crop protection and seed supply company based in Sydney.



Stephanie was nominated for the Young Grower of the Year award and the Women in Horticulture award in 2019 and is participating in the Cultivate - Growing Young Leaders program with Action For Agriculture. She is passionate towards helping the agriculture industry to find and implement solutions to the challenges faced through crop production and the supply chain.

Stephanie will be actively involved in organising, promoting and running face to face events for PotatoLink.

REGENERATIVE AGRICULTURE OR SUSTAINABLE FOOD SYSTEM - WHAT'S THE DIFFERENCE?

Really, not much! The terms regenerative and sustainable can virtually be used interchangeably. They are both frequently defined as integrated production systems that:

- Produce food
- Enhance environmental quality
- Minimise use of non-renewable resources
- Integrate natural cycles and biological controls
- Promote the health and wellbeing of both farmers and communities

Views differ as to exactly what is meant by regenerative or sustainable agriculture. It may be argued that "sustainable" implies little or no change in the farming environment, whereas "regenerative" is focussed on improvement, but in reality the terms mean much the same.

Whether regenerative or sustainable, there are many different approaches. These may be characterised as "ecocentric" or "technocentric".

The ecocentric approach

This system involves little or no external inputs – including artificial fertilisers and pesticides. It is often championed by believers in organic / biodynamic production systems.

Adoption of this approach would inevitably create radical changes. To give an extreme example, in April



2021 the government of Sri Lanka banned importation and use of all synthetic fertilisers and pesticides. The stated aim was to improve both human and environmental health. The country's two million farmers, who had previously relied heavily on chemical inputs, were ordered to go organic.

Within six months rice production fell 20%. The cost of vegetables rose 5-fold and food scarcity developed. Combined with the collapse of tourism, this has resulted in fuel shortages, millions plunged into poverty and billions wiped from the economy. Although the ban has been reversed, the value of the rupee has halved, and farmers are struggling to purchase the inputs they need.

The technocentric approach

Technocentric approaches rely on modifying existing farming systems, with sustainability a goal to be reached through biotechnology and

innovation. Sustainable systems can potentially use robotics, precision agriculture, soft chemistry, genetic modification, and many other new technologies.

Sustainability is hard to measure. Soil conservation and health are clearly key, with carbon capture sometimes used as a metric of success. However, the characteristics of sustainable soil management, and how much agriculture should contribute to biodiversity, remain unclear.

Key practices associated with regenerative/sustainable agriculture (Figure 1, p8) include:

- Reduce tillage and control traffic
- Keep the soil covered with mulch or cover crops
- Maintain living roots in soil
- Build soil carbon
- Reduce reliance on chemical fertilisers and pesticides
- Increase diversity through crop rotations, multi-species cover crops and long-term plantings
- Integrate livestock
- Improve water infiltration through maintaining good soil structure

Whether called regenerative agriculture, a sustainable food system or carbon farming, the outcome can be a win for both the grower and environment.

MOVING TOWARDS CARBON NEUTRAL FARMING

Growers need to prepare for the opportunities and challenges ahead that arise from carbon emission management, particularly whether they can generate carbon credits from their operations. But it all starts with basics, writes **Linda Drake**.

The unfolding carbon situation presents new opportunities to potato growers, particularly those on mixed farms.

Growers can choose between becoming more carbon neutral by reducing emissions and capturing carbon, or implementing changes on-farm to earn carbon credits.

Adrian James from Natural

Resource Management (NRM) North, an independent not-for-profit organisation for NRM in northern Tasmania, has been tracking the evolution of carbon farming options through funding from the Australian Government's National Landcare Program.

He suggests that the key to making a start is understanding what you want.

"You need to know if your goal is to help the industry become carbon neutral and benefit from market access or premiums from carbon-neutral products. Or is your goal to earn money from generating and trading in carbon credits? It's more challenging, but not impossible to do both," says Adrian.

For potato growers who want to start



Figure 1. Principles of regenerative / sustainable agriculture

managing carbon but are unsure how to begin, there are some key issues to think about. These include reducing farm greenhouse gas emissions, managing wastes, capturing and storing more carbon (Figure 1), and considering whether purchasing carbon offsets make sense.

“When your farm emissions match your farm carbon capture, plus offsets, your farm is carbon neutral. This is not as improbable as it might seem, with some farms already succeeding. But earning carbon credits, without becoming carbon neutral, is also perfectly viable,” Adrian says.

There are funding programs that ensure that growers get the right advice from the get-go.

The Tasmanian Government, for example, has launched a Carbon Farming Advice Rebate pilot program offering up to \$10,000 per farm through Landcare Action Grants. Similar rebates are also offered in some other states.

“Making carbon projects more attractive to farmers has involved a range of pilots and improvements, especially in the mixed environmental planting methodology. If a farmer wants to plant mixed native vegetation as a carbon offset, the current rules allow for streamlined application and reporting processes, and an exemption from expensive audit requirements,” says Adrian.

In addition to revegetation, other actions can also be considered for managing carbon on-farm.

Carbon offset methodologies are in the pipeline that can be used for assessing whole farm management and wetland carbon. These will happen under the Climate Solutions Fund (formerly the Emissions Reduction Fund), so monitor for announcements.

A new soil carbon methodology was released in December last year, allowing for a mix of soil testing and modelling of soil carbon



Figure 2. Cattle are a major source of methane, which is more than 25 times more efficient at trapping heat in the atmosphere than CO₂.



Figure 3. Measuring nitrous oxide emissions in a broccoli crop; nitrous oxide is an extremely potent greenhouse gas



Figure 4. Deep rooted perennial pastures improve and retain soil carbon.

- A. James

changes. It has decreased costs but, unfortunately, also increased complexity. Farmers participating in the soil carbon methodology can be paid for carbon baseline testing in advance through the Clean Energy Regulator.

“It’s a highly individual response that any grower will ultimately make, depending on location, scale, and business circumstances. For example, in Tasmania, where electricity is from renewable resources, the impact from carbon dioxide emitted from fossil fuels in tractors, utes and quad bikes is relatively high. Emissions also come from using lime, because it contains carbonate, while urea releases carbon

dioxide as it turns into ammonia,” Adrian says.

Potato growers who run ruminant stock need to consider managing methane emissions (Figure 2). Reducing methane from stock hinges on quality feed, high performance genetics, rapid growth for early processing, culling poor performers, early joining and supplementing feed with tannins and red seaweed.

Nitrous oxide is 280 times more potent a greenhouse gas than carbon dioxide (Figure 3), so managing nitrogen is a key factor in reducing farm emissions. While it might still be a relatively small proportion of total emissions, it may be a bigger problem to manage,



Figure 5. Planting trees boosts carbon above as well as below ground, and can earn carbon credits.

especially when soils are waterlogged and warm.

Potato production can sometimes result in high nitrous oxide emissions because they are a high-input, irrigated, warm-season crop. Adrian's tips are to accurately manage nitrogen, or use controlled release variations of fertilisers. Timing of application is critical, as is avoiding excess soil moisture through irrigation scheduling and improved drainage.

"Good soil moisture management not only reduces disease and nutrient loss, but also limits nitrous oxide emissions. Special enhanced-efficiency fertilisers can also help" Adrian says.

Capturing carbon and storing it are key steps in more sustainable agriculture, which often hinges on enhancing soil health. Improving soil carbon in areas used for growing potatoes relies largely on cover crops or pasture leys (Figure 4). Just like pastures, mixed species of deep-rooted plants often give better carbon results, because carbon lasts longer when it's stored deeper.

Addressing soil constraints, such as waterlogging, acidity, poor fertility and compaction is also critical. This includes minimising the time soil stays bare to reduce erosion. Year-round plant growth should be encouraged. If tillage is used, then organic matter can also be added. For pasture, good

quality dung beetles can be useful, and grazing management aimed at maximising ground cover and pasture production is key.

Growing woody vegetation is also valuable because it stores carbon above and below the ground and can be particularly useful for offsetting high emissions on mixed farms (Figure 5). If a grower's aim is to be carbon neutral, any tree planting can work, though fast-growing plantations capture the most carbon in the near term. If trees are used to earn carbon offsets, it must use a registered project and an approved methodology.

"Under the carbon model that is used in offset projects, mature forest systems don't capture carbon as quickly as rapidly growing younger trees, and carbon captured last year doesn't balance out emissions this year," Adrian says.

In working out how many trees to plant, the short answer is, the more the better. A rolling program of newly planted zones continues to provide rapid growth as other areas mature. Working out the area of vegetation needed to balance out emissions requires carbon accounting, usually starting with a farm carbon calculator.

There is also the option to purchase carbon offsets to counter farm emissions, but that can be the most expensive option. Adrian says it's

worth getting advice on eligibility before deciding on any schemes, and taking into account your individual circumstances.

Engaging a third party provider can help optimise the financial opportunities from capturing and storing large amounts of carbon. Ambitious growers with an appetite for risk (and paperwork!) may be able to take advantage of special deals in voluntary markets. However, Australian Carbon Credit Units (ACCU) are certified, so there are many rules. The largest market in Australia is currently the Australian Government, which can simplify the transaction. While revegetation projects are easier now, Adrian says that it is often better to pay a specialist to do most of the paperwork, reducing complexity and risk.

Earning carbon credits from soil or vegetation requires a 25-year minimum time frame. While increasing soil carbon is harder to achieve on cropped ground, it's not impossible to see useful carbon improvements. It's also essential that you don't start until you've registered the project. Any carbon sampling done beforehand can't be used, so register first, and use an independent contractor to establish baseline soil carbon to at least 30cm.

Carbon service providers are a growing sector, but farmers should do their homework first to ensure the deal is a fair one for both sides.

A webinar presented by Adrian in October 2021 on De-mystifying the Carbon Story contains worked examples of the costs and returns of planting shelterbelts to earn carbon credits, though note the carbon price and some methodologies may have changed: potatolink.com.au/webinars

Other resources from NRM North, including interim results from its soil carbon and diverse pasture trials can be found at nrmnorth.org.au/land/soil-carbon-project/

CARBON CALCULATORS: USEFUL BUT NOT PERFECT

Carbon calculators allow a grower to establish a baseline on their emissions. While more are being developed and refined, so far they are somewhat a blunt instrument. They give an indication of emissions but are inherently inaccurate at a farm level.

A calculator is available for farms producing beef, dairy and grains. It may have some application for potato growers with diversified interests, but is complex and takes time to enter material. A key deficiency is that the livestock calculators don't include soil carbon:

www.picc.org.au/resources/Tools

Based in the UK, the Cool Farm Alliance has developed a Cool Farm tool, for field level assessment of greenhouse gases, biodiversity and water:

<https://coolfarmtool.org/coolfarmtool/>

Another simple calculator, covering basic inputs:

<https://www.vegetableclimate.com/tools/carbon-footprinting-tools/vegetable-carbon-calculator/>

Developed some years ago by HortInnovation, this tool doesn't cover the full range of inputs that need to be considered for an accurate indication of emissions on farm but is geared to the horticultural sector.

Consultants can do the work for you, but are likely to be expensive due to the data required.

RESOURCES TO BUILD KNOWLEDGE

Understanding how the **Clean Energy Regulator** and the Emissions Reduction Fund work are essential for those looking to earn carbon credits. The Clean Energy Regulator website has key, comprehensive information on how to participate in the Emissions Reduction Fund, registering projects, steps needed to be compliant with its rigorous criteria and other resources:

<http://www.cleanenergyregulator.gov.au/ERF>

Meat and Livestock Australia's Carbon Neutral 2030 Program has comprehensive resources for producers on managing emissions:

<https://www.mla.com.au/cn30>

CSIRO's online tool to start looking at market opportunities:

<https://looc-c.farm/>

Elders has a soil carbon and herd management service:

<https://eldersrural.com.au/tech-services/carbon-farming/>

Grain Growers has produced a document that gives an invaluable overview of carbon in agriculture. *Carbon and Cropping* includes definitions and explanations of terms, soil carbon and farming practices, carbon markets, reducing carbon footprints and an extensive list of additional resources. While intended for grain growers, potato growers will find this highly useful as most material is non-specific. Either an excellent starting point on your carbon journey, or to broaden and deepen understanding of the myriad elements of sustainability, this is 40 pages of clear concise information for non-experts, with good graphic elements to aid understanding:

<https://www.graingrowers.com.au/wp-content/uploads/Carbon-and-Cropping-September-2021.pdf>

Rabobank Research Food & Agribusiness: It's Australia and New Zealand *podcast* features research analysts discussing what's setting the pace for global sustainability transitions, including drivers such as consumer preferences and government policy responses in the EU, US and other overseas markets. Although focused on grains, dairy and other food commodities, the perspectives in each episode are valuable to all players involved in food production, particularly on the increasing importance of carbon management for continued access to markets and finance. While rarely potato specific, sustainability issues as drivers of market changes have application to food growers, as do episodes addressing recent fertiliser and land price surges. Download from your preferred podcast supplier.

PotatoLink has hosted a series of *webinars* on sustainability related topics:

<https://potatolink.com.au/>

Soil Wealth is another project, with many applications for potato growers:

<https://www.soilwealth.com.au/>

CARBON NEUTRAL POTATOES

Potatoes and sustainability go hand in hand, not only because carbon neutral potatoes are now for sale in the UK, but because they punch above their weight compared with other food staples when it comes to environmental impact.

The first carbon neutral potatoes hit supermarket shelves in October 2021.

However, potatoes are also being recognised more widely for their lower environmental impact compared to grain crop staples.

Potatoes have proven themselves an efficient and sustainable source of calories. A World Potato Market report says potatoes will play a major role in feeding the world, using fewer resources and requiring less land than other foods.

High yields per hectare contribute to potatoes scoring well on environmental impact. Potatoes produce less carbon dioxide, leach fewer nitrates and require less water to grow than legumes, wheat or rice.

With yields commonly 50t/ha, they need about a quarter of the area required for similar volumes of rice and far less than needed for legumes.

The volume of protein produced has been estimated as between 354 kg and 417 kg/ha, based on 2.05 g of protein per 100 g and average global yields of 17.3 t/ha (EAT Forum), or 20.33 t/ha (UN FAOSTAT). However, Australian yields are up to three times this, making potatoes an efficient source of protein compared to other staple crops.

Research on environmental impact by the Barilla Center for Food & Nutrition



HUW Thomas, MD of Puffin produce UK



calculates that the carbon dioxide emission of potatoes is 1,205 g per kilogram produced, compared to 1,660 g for legumes and 3,755 g for rice. Another analysis found that eating potatoes three to five times a week results in greenhouse gas emissions of 9 kg a year, compared to 69 kg for rice, 25 kg for pasta and 12 kg for bread¹.

The analysis points to a good future for potatoes as an efficient source of nutrition, while growers are well placed to benefit from the sustainability of their crop.

Meanwhile, in Wales, the carbon neutral potatoes grown by Puffin Produce and sold under its Root Zero brand, are now available in 400 Co-op and Waitrose stores across the UK, with plans to expand further.

The potatoes are certified carbon neutral, and grown using sustainable farming practices which remove carbon dioxide from the air, create healthy soil and increase local biodiversity.

Managing director of Puffin Produce, Huw Thomas, says: "We have to act now, so we're on a mission to become carbon neutral and farm in a way that protects and regenerates our land, plants and wildlife."

Sustainability measures include consideration of power used on the farm, transport to the supermarket, eco packaging components, and even how customers cook their potatoes.

Based on its footprint assessment, Puffin Produce has set a target to reduce the carbon intensity of Root Zero potatoes by 51 per cent by 2030, including emissions from the entire supply chain as well as carbon offset investments.

¹ <https://www.bbc.com/news/science-environment-46459714>

THE DEVELOPING CONNECTION BETWEEN BANK LOANS AND CARBON

Agribusiness lenders are taking a keen interest in sustainability, while also looking at practical ways to support growers embarking on carbon management journeys. These factors are likely to become more important when it comes to accessing capital on optimal terms, writes **Linda Drake**.

Unless you're dealing with a loan shark, lenders will always want to know about your business before providing a loan. This information is increasingly going to include sustainability criteria.

At this stage, it's less about any action you've taken, and more about early planning on how you could either reduce emissions, or earn carbon credits.

It's yet another reason why growing sustainably will make a difference to your bottom line.

For lenders, this is seen as good business. The country's biggest agribusiness lender, National Australia Bank, holds about 30% of the Australian market, followed by Netherlands based Rabobank at 20%. They are among many banks globally now actively linking sustainability outcomes on farms to lending risk, with teams working on developing tools and resources to support clients.

RABOBANK

Rabobank's head of sustainable business development, Crawford Taylor, says: "We need to think about what we don't know about a client."

"The first step for a farmer is to understand their own emissions, and take time understanding this before formulating anything else. Establish a baseline, work out what the drivers are and what this means for opportunities."

Good record keeping, tracking inputs and keeping data that measures the farm's emissions are the absolute starting point. There is also interest in supporting emission reductions and carbon offsetting activities on farms.

"We really need to understand where the clients sit, look at solutions and take a collaborative approach," Crawford says.

Lenders are also being influenced by customers who want to know

more about the carbon footprint of their food, already a strong driver in other countries that have greater commitments to being carbon neutral by 2050. Wholesale funders to banks also want information about the sustainability of their exposures. For example, there are moves to include climate risks within business financial statements.

"While it's important for investors, eventually it will track down to inside the farm gate," Crawford says.

Agriculture is expected to be a heavy lifter in Australia to reach its carbon goals, with a strong reliance on soil

Crawford Taylor, Rabobank's head of sustainable business development





Julie Rynski, regional and agribusiness executive at NAB. - ATN

In other agricultural commodities, there's already a stronger link to carbon management and access to markets, as has been seen with canola exported to Europe. It is expected that accessing capital for farming business investment will increasingly be based on sustainability criteria across many sectors.

NATIONAL AUSTRALIA BANK

NAB has partnered with the Food Agility Co-operative Research Centre, with an aim to provide practical guidance to farmers on how they can use climate and sustainability research to make science-based, commercially considered decisions about where to invest their time, effort and money.

NAB executive for regional and agribusiness, Julie Rynski, says there's a vast amount of scientific research

on sustainability and adaptation, but it's difficult to translate into practical guidance.

"Many of our agribusiness customers are telling us they experience 'analysis paralysis'. When it comes to adapting their business practices, they feel overwhelmed with the research and don't know where to start," Ms Rynski says.

"We play an important role in supporting customers on ways they can improve the long-term sustainability and viability of their business".

"Many of our agri customers recognise the importance of transitioning to a low carbon economy. We want them to have practical guidance on how to use less water and chemicals, or how to reduce emissions as an example. Ultimately, it's about building resilience for the long-term."

carbon to meet these outcomes. Cost considerations, and concerns about climate variability, could make this challenging.

"There is so much work in where and how to implement effective and efficient farm practices," he says.

Developments such as cheaper soil testing, or appropriate carbon calculators would make this easier, he says.

WHY ACT NOW?

On the market driven side, food companies are among those announcing ambitious carbon targets. They will be looking increasingly at suppliers' efforts to meet their own sustainability goals.

McCain Foods says regenerative agriculture will be the foundation of its approach and by 2030 all potatoes that it turns into fries will be sourced from farms using regenerative ag practices. McCain's global sustainability report, *Together, Towards Planet-Friendly Food* says it will implement regen ag practices across 100% of its potato acreage - representing 150,000 hectares worldwide by the end of the decade.

PepsiCo says it aims to impact 2.8 million hectares of farmland and reduce an estimated 2.7 million tonnes of greenhouse gas emissions, also by the end of the decade. PepsiCo also aims to improve the livelihoods of more than 250,000 people in its agricultural supply chain and sustainably source 100% of the company's key ingredients by 2030. "Taking action in the next decade is crucial for the development of a more sustainable, resilient and inclusive food system," it says. A recent innovation in the UK includes using potato peel left over from making Walkers crisps into low carbon fertiliser for potato growers to use in their fields. PepsiCo is buying oats in Western Australia on the basis of rigorous sustainability credentials, an early example of looking towards its supply chain to meet sustainability goals.

Coles has taken the approach that customers and stakeholders want products that are sourced in an ethical, transparent and responsible way. It's strongly signalled its intent to meet robust sustainability targets on carbon emissions within its operations. Seafood and tomato production have been at the forefront of its efforts in sustainable sourcing of products so far, as well as a move towards locally grown produce.

Woolworths says that by 2022, in collaboration with its farmers, suppliers and other partners, it will carry out and publish a review of the potential for adopting sustainable and regenerative agriculture practices across its fresh food supply chain. The aim will be to improve areas such as soil health and water efficiency in high-risk areas, and it will provide an annual update on implementation actions.

Institutional investors include superannuation and overseas pension funds. They are looking for ways to meet their sustainability commitments in line with member expectations and investment mandates. With long-term investment horizons, funds are increasingly recognising the importance of sustainable agricultural production, agritech and initiatives encouraging soil carbon and soil sequestration. North American and European pension funds already view agriculture-based and natural capital assets in Australia as an important asset class with high potential for growth in future, as well as an important risk mitigation strategy by diversifying exposure to investments outside the northern hemisphere.

POTATO 'MILK' GOES ON SALE



Caption: DUG finds a niche among plant-based milk products

- Juliet Garland

Coffee with DUG? A potato 'milk' called DUG has joined the range of plant-based milks now available in Australia.

Stocked by Panetta's Mercato in Sydney, and increasingly available through supermarkets in the UK, Sweden, and via Amazon, it sells locally for \$6 for a one litre carton.

The milk is targeting consumers wanting good froth for their coffee while also having strong eco credentials.

The milk is made by combining pressed potatoes with canola oil, under a patented process developed in Sweden by Professor Eva Tornberg at Lund University.

A key quality of the product is that it can be used like any other milk and doesn't separate when added to hot drinks, including tea and coffee, which is a problem with some other plant-based milks when used for cooking or baking.

The details on how the milk is manufactured remain a trade secret, but the product is making solid inroads into the strongly growing UK plant-based milk segment where its sales have been a standout performer for premium brand focused supermarket Waitrose.

Growth has been driven by strong awareness among consumers of the carbon and energy footprints of other plant-based milks, as well as concerns about the environmental and animal welfare issues related to commercial dairying.

Founder of parent company, Veg of Lund, Thomas Olander, says: "Our choice to use potatoes as a base means we have a super sustainable drink."

DUG claims growing potatoes is twice as efficient for agricultural land use as growing oats in the same space. Oat milk is now one of the most popular plant-based milk drinks. It also claims

that potato milk has a 75% lower climate footprint than dairy milk. Moreover potatoes use 56 times less water than growing almonds, which are also popular when processed into milk form. Almond milk takes about 130 litres of water to produce one glass.

The potato milk product was launched in Sweden in last year, and was initially sold online to the UK, before increasingly being stocked by retailers in other countries.

So, what does it taste like? Rachel Redman, marketing manager of Veg of Lund, says it has a balanced taste.

"DUG has a really neutral taste profile. This is one of its major strengths compared to other milk alternatives, which all have quite a distinctive taste that can affect whatever they are mixed with," she says.

The texture is similar to other creamy milk alternatives, with enough foaming potential for coffee.

"The milk is nutritious, low in sugar and saturated fat, and free from 14 of the most common allergens, like lactose, soy, gluten and nuts," Ms Redman says.

DUG is available in three versions: original, barista and unsweetened.

<https://dugdrinks.com/>

BLACK DOT

(*Colletotrichum coccodes*), the elusive disease

Dr Julie Pasche (North Dakota State University) calls black dot the **Silent, Early Yield Robber**. Silent because it is often confused with other diseases, and Early because infection that occurs early in the season has lasting effects on both yield and quality.

Black dot is a widespread disease caused by the fungus *Colletotrichum coccodes*. While known since the 1920's, it was seen as a weak soil pathogen of little economic importance. However, it is now recognised as a significant pathogen in Europe, the Americas, the Middle East, Africa and Australia.

Yield losses can be considerable, especially as early infections of black dot can make plants more susceptible to damage from other diseases. There is also a strong association between *C. coccodes* infection and early dying.

Symptoms of black dot infection may not appear until relatively late in the season, or remain hidden right up to harvest. Despite this, significant yield loss can still occur.

Infection stunts plants and can cause wilting and premature senescence. In Australia this has been shown to reduce yields by at least 12%¹, with similar results reported from the USA and Israel². Not only is total yield reduced, but the percentage of small tubers tends to be increased.

While symptoms may not be visible at harvest, they can develop during storage. Fortunately, the disease does not spread between stored tubers. However latent infections can develop and expand, especially under humid conditions.

While symptoms on tubers are often superficial, infected tubers lack the smooth, attractive skin finish consumers want. This is a big problem for packed ware potatoes, which are likely to be downgraded if not rejected outright. Moreover, disease that develops during storage can penetrate deeper into the flesh, resulting in problems for processors.

SPOT THE DOT

One factor that has limited recognition of the scale of black dot related problems is that it is so easily mistaken for other diseases. Symptoms on the tubers are often mistaken for silver scurf (*Helminthosporium solani*), while rots on leaves can resemble Early blight (*Alternaria solani*) and diseased stems misidentified as Fusarium wilt.

The key to identification is the presence of tiny, dot like sclerotia (resting structures) on the tubers, stems and leaves (Figure 1). These can be seen with a hand lens and are quite different to the "Christmas tree" conidiophores of silver scurf. Other key identification factors include:

- Internal tissues in the roots turn a reddish-purple, amethyst colour (Figure 2)
- Outside of the main stem detaches from the inner core, so can be easily rubbed away
- Watersoaked lesions on leaves that turn dark brown to black

- Leaf lesions that tend to be darker than those of early blight, and lack concentric rings (Figure 3)
- Reduced growth and rotting of underground stems and roots
- Discoloured areas are frequently over the heel end of the tuber, including roundish spots >5mm diameter
- Discoloured areas / spots have diffuse edges, compared to the more sharply defined margins characteristic of silver scurf (Figure 4)
- Discoloured areas have a dull appearance, whereas silver scurf spots tend to be shiny
- Dead stems collapse, rather than remaining erect, as is typical of verticillium wilt
- Infected stems eventually turn black to grey due to the large numbers of sclerotia emerging from them

Associate Professor Julie Pasche from North Dakota State University has considerable experience in managing black dot. She recently presented an excellent webinar on the disease for the Ontario Potato conference. This included a number of the specific identifiers for black dot which allow it to be differentiated from other diseases.

"Black dot often infects tubers from



Figure 1. Black dot results in formation of tiny dot like black sclerotia (spores) on stems and tubers
 - Photo left: Ontario Crop IPM

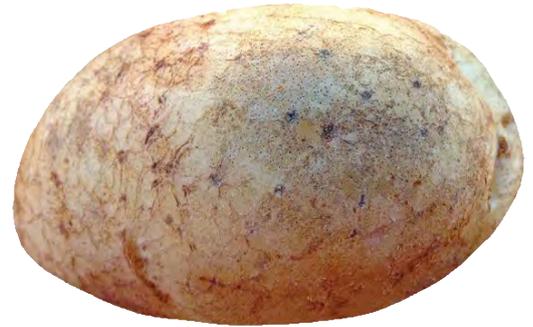
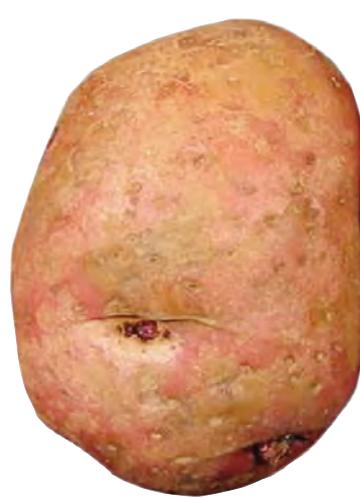


Figure 2. Roots are stunted, and both stems and roots can turn a purplish colour

- Photo: Ontario Crop IPM



Figure 3. Leaf lesions lack the concentric rings typical of early blight - Photo: J. Pasche



Black dot



Silver scurf

Figure 4. Black dot lesions (left) tend to be duller and more diffuse than those of silver scurf (right) - Photo: J. Pasche



Figure 5. Infected stolons tend to hang onto tubers after harvest

- J. Pasche

the stem end. The stolon then tends to hang on after harvest, like a 'piggy tail' (Figure 5). You can often see the black sclerotia on that tail, and if you cut the tuber open you can see the discolouration spreading through the tuber vascular system. Infection can exacerbate sugar end development,

with dark colour at the stolon end after frying" explained Julie.

THE LIFE OF FUNGUS

The most common source of infection is sclerotia in soil. Sclerotia build up over successive potato crops and

can remain viable in the soil for at least eight years. High concentrations of sclerotia in soil are associated with high rates of infection in plants. Infection can occur within days of planting, especially under moist conditions. Frequently, however, the disease is initially detectable on above ground stems, but soon spreads to all parts of the plant (Figure 6).

C. coccodes does not restrict itself purely to potatoes, or even just to Solanaceae. The fungus has more than 50 hosts from 17 plant families. While most commonly found in plants such as tomato and capsicum, it can also infect strawberries, cucumbers, mint, canola and legumes (such as soybean) among many others. Barley, maize, wheat and rye are some of the alternate crops that could be used in rotations and which have been shown to be non-hosts³.

Even without a host, black dot sclerotia can survive for many years in the soil and are resistant to soil fumigation. The amount of sclerotia

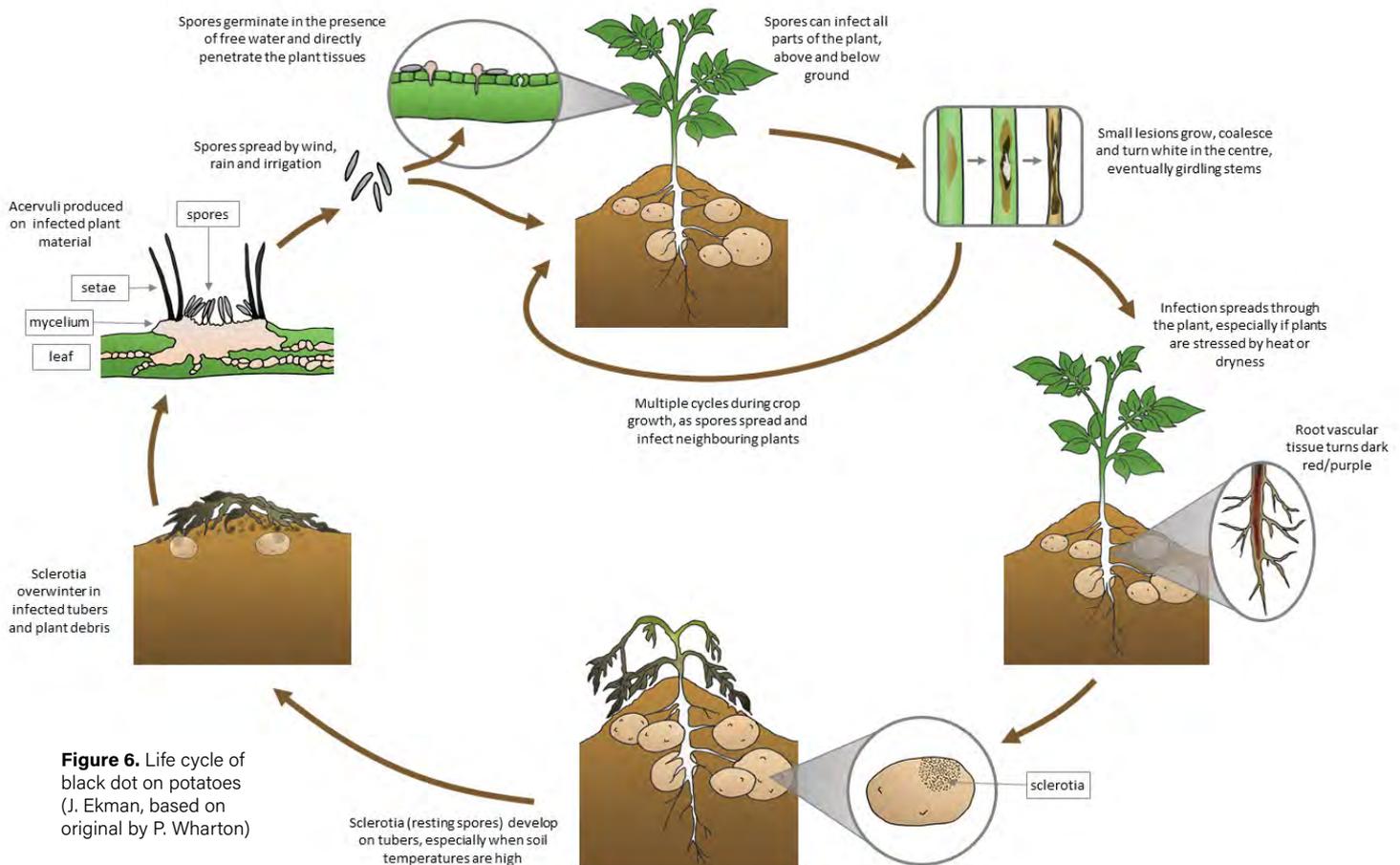


Figure 6. Life cycle of black dot on potatoes (J. Ekman, based on original by P. Wharton)

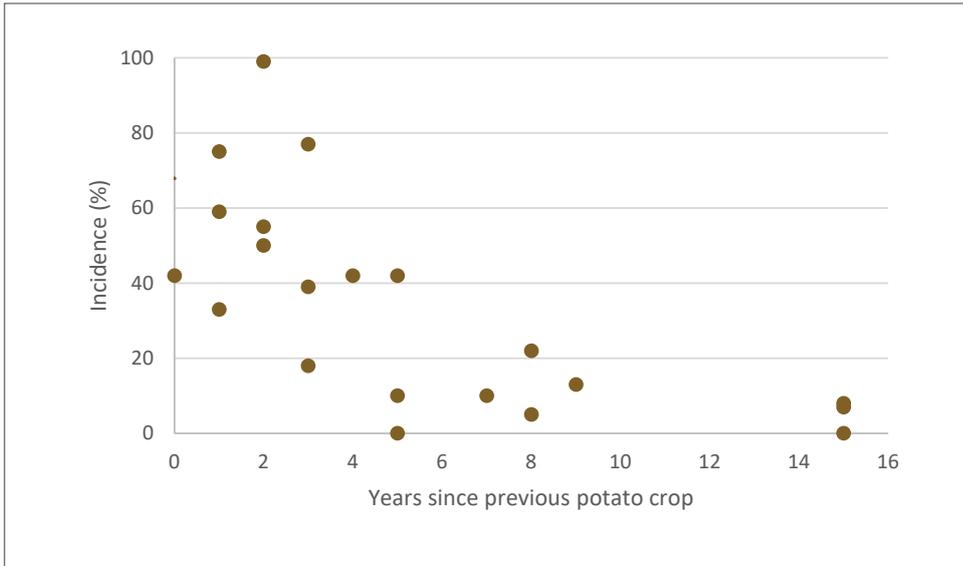


Figure 7. Incidence of detectable black dot on skins of stored Norkotah potatoes relative to the number of years between potato rotations. Data from Johnson and Cummings, 2015.

in the soil increases with continuous potato cropping, as does the incidence of infected tubers (Figure 7). While rates of infection decline if no potato crops are sown, it can take 5 years or more to reduce incidence below 40% if the soil was initially highly infected⁴.

Despite this, black dot is generally a weak pathogen that may be resisted by healthy and undamaged plants. However, the presence of wounds – such as those created by windblown soil or sand – aid infection. This is most likely to occur before row closure, when stems are still exposed. The tiny sclerotia carried with the soil can then infect the plants.

REDUCING RISK

Plant stress, especially due to nutrient deficiency, makes plants more vulnerable to infection by the black dot fungus. Low levels of nitrogen and potassium are particularly associated with increased disease⁵. Stress can also be caused by excessive or uneven irrigation, both of which also increase black dot severity, as can co-infection with pathogens such as *Verticillium dahlia* (verticillium wilt) or *Spongospora subterranea* (powdery scab).

As the amount of inoculum in soil is an important determinant of infection,

avoiding heavily infected areas is an important risk reduction strategy. The Predicta PT service can provide an indication of the disease risk in soil, based on DNA testing. Predicta PT is also available for seed, although in this case results indicate population density only, rather than risk.

Young plants need to be protected from coarse, blowing sand, especially if the pathogen is known to be present, as this is very likely to increase foliar infections.

In high risk situations (such as high inoculum levels in soil), early harvest can reduce both initial severity and

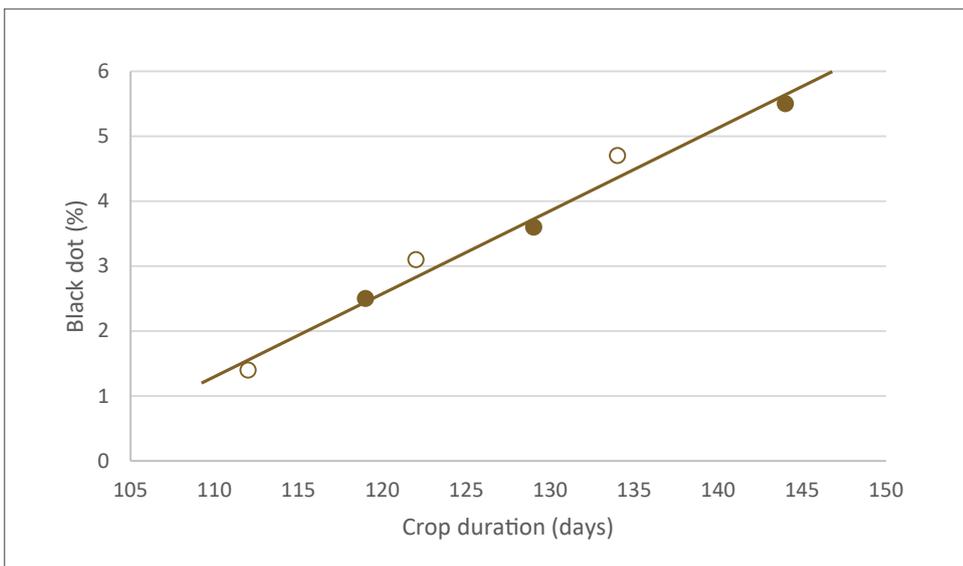


Figure 8. Mean black dot severity (% surface area) on Maris Piper potatoes harvested after different crop durations plus 20 weeks storage. Crops were harvested 21 days (o) or 28 days (•) after vine termination. From Peters et. al., 2016.

that developing after extended (20 weeks) storage⁶ (Figure 8). For example, delaying harvest by 2 weeks increased the percentage of tubers with black dot by 10% to 40% in UK trials⁷.

Unlike many other potato pathogens, *C. coccodes* grows well at warm temperatures. The optimum temperature range for germination and infection is 22 to 28°C. This means it is favoured by warm to hot conditions. Even in temperate regions, periods of unusually high temperatures have been associated with high incidences of black dot³.

Dr. Julie Pasche usually recommends an application of a Qol (Strobilurin)

fungicide at the mid-rate early in the season. "The key to effective control is to apply fungicides before row closure, as this will protect against infections caused by pathogen-infested soil blowing against plants. In-furrow applications of an SDHI (Group 7) fungicide may provide additional benefit under high disease pressure situations. In organic systems, the biological Serenade may be beneficial as an in-furrow application.

UK trials have also shown that application of Azoxystrobin in furrow at planting is effective at reducing incidence of black dot⁷. However, Azoxystrobin is not registered for this purpose in Australia.

"Crop rotations are a useful control strategy, so we recommend at least three years between potato crops. Reducing plant stress with an effective fertiliser program is also a good strategy. While black dot can be seed borne or soil borne, soil seems to be the most important route of infection. We don't believe that seed treatment fungicides effectively reduce black dot" she said.

In conclusion, managing black dot should not rely on fungicides alone. Rather, an integrated approach that includes risk assessment, accurate management of irrigation, fungicides and early harvest can all contribute to reducing the impact of this elusive disease.

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THE CASE OF THE BRUISED POTATO



Everybody loses if the potato bruises.

Harvest is where everything that has been put into the crop comes together. It is the culmination of months of investment in soil preparation, feeding, watering, protecting and nurturing. Harvest for many growers is the last, critical piece of the puzzle, where value is finally realised.

Damaging the potatoes during harvest is surely snatching defeat from the jaws of victory!

Physical damage not only reduces eating quality of the tubers, it increases water loss and makes tubers more susceptible to rots and disease. In some cases, damage can make potatoes completely unsuitable for the target market.

External injuries are obvious. These include cuts as well as shatter bruises, which appear as cracks on the tuber skin. The cracks can extend into the core of the tuber, making an easy entry point for fungi and bacteria.

Skinning can also occur, where potatoes are harvested before the skins have fully matured and hardened.

Rubbing by machinery, soil clods or simply other tubers removes the outer layer of skin. As with cuts, this makes it easier for pathogens to gain entry, as well as allowing dehydration.

However, internal bruising – blackspot – is harder to detect. Not only is blackspot not visible from the outside, but the damage does not appear immediately, rather developing over time.

WHAT IS A BRUISE?

Potato bruises develop due to impacts that either break the cells apart (shatter bruise) or rupture the cell membranes (blackspot).

While shatter bruises are straightforward to understand,

blackspot is a little more complex.

Phenolic compounds inside potato cells are normally kept separated from reactive enzymes by internal cell membranes. If the membranes are ruptured, the two mix together and oxidise (Figure 1). Oxidation of the compounds that develop (ortho-quinones) ends in formation of the pigment melanin – essentially the same pigment that tans our skin and colours our hair and eyes. This is why bruises develop the black-brown colour we are so familiar with.

The potato skin is made up of relatively small, corky cells that resist damage. However, the swollen, starch laden cells that make up the pulp are more fragile. As the force of the impact

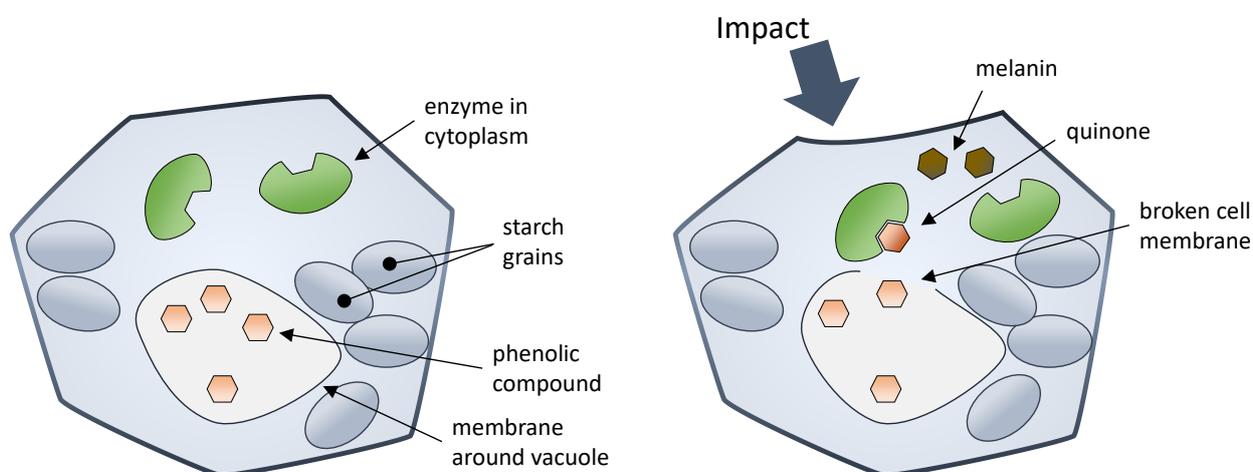


Figure 1. Intact potato flesh cells (left) contain phenolic compounds and oxidising enzymes, kept separate by internal cell membranes. An impact (right) can rupture this internal membrane, allowing mixing. Through oxidation, this eventually gives rise to the dark compound melanin, typical of blackspot.

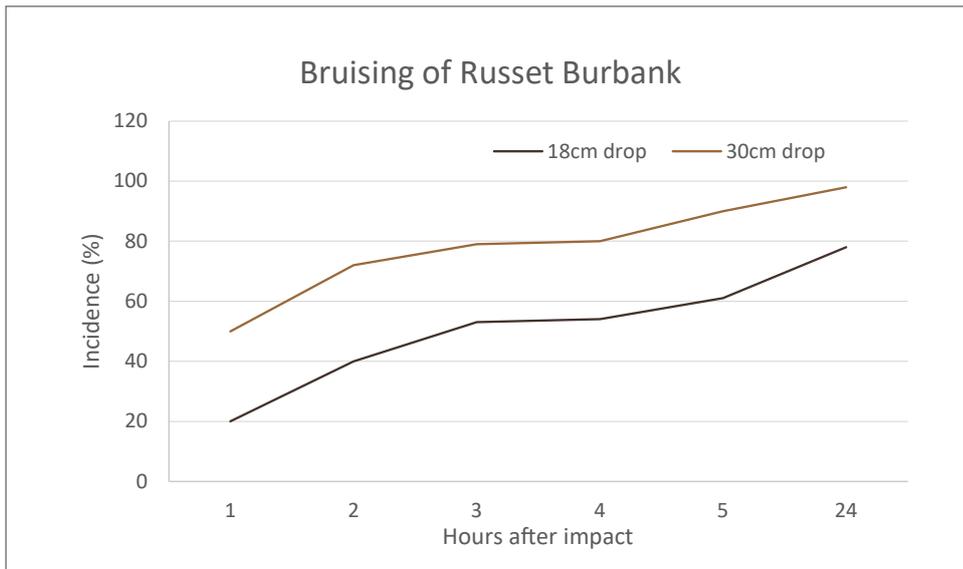


Figure 3. Blackspot development in Russet Burbank potatoes. Data extracted from Olsen and Thornton.



Figure 2. Blackspot development after 1, 2, 3 and 4 hours.

transfers from the outside to the inside of the tuber, it is the membranes of these cells that fracture most easily.

The reaction that produces melanin is not instantaneous, so bruises continue to darken over hours or even days (Figure 2). Initially, the damaged area develops a pinkish colour – possibly due to formation of ortho-quinones from the oxidised phenolics. This gradually oxidises into melanin, with the intensity of colour directly relating to the amount of phenolics and enzymes initially present in the cells.

Just as phenolic content varies between cultivars, so does the speed at which the bruise expands and darkens. Temperature and impact force also play a role. For example, Olsen and Thornton (University of Idaho)¹ found that bruises developed more slowly on Russet Burbank than

Ranger Russet, and more slowly at cold temperatures than warmer ones. Despite this, most internal bruising became obvious within 3-5 hours of impact (Figure 3).

WHAT IS THE IMPACT THRESHOLD OF POTATOES?

Resistance to both shatter bruises and blackspot varies considerably between cultivars. The issue is compounded by factors such as soil moisture, temperature and specific gravity. So, for example, high specific gravity reduced bruising susceptibility in Snowden, but increased susceptibility in Russet Burbank and Atlantic².

Depending on their structural qualities, a variety may be relatively resistant to blackspot but susceptible to shatter, or vice-versa. For example, Russet

Burbank is generally less easily damaged than Ranger Russet, while Shepody and other chipping varieties may be resistant to blackspot but susceptible to shatter bruising³.

Temperature is also important. In general, temperatures between 12 and 18°C are often considered best for harvesting potatoes. Potatoes are less susceptible to bruising at such moderate temperatures than if they are either hot (>25°C) or cold (<12°C). This is reflected in the drops that can be tolerated.

Temperatures of dry soils are more likely to approach air temperatures; under warm conditions, soil (and the tubers it contains) can be cooled through more frequent irrigation.

Irrigating a few days before harvest also ensures tubers are well

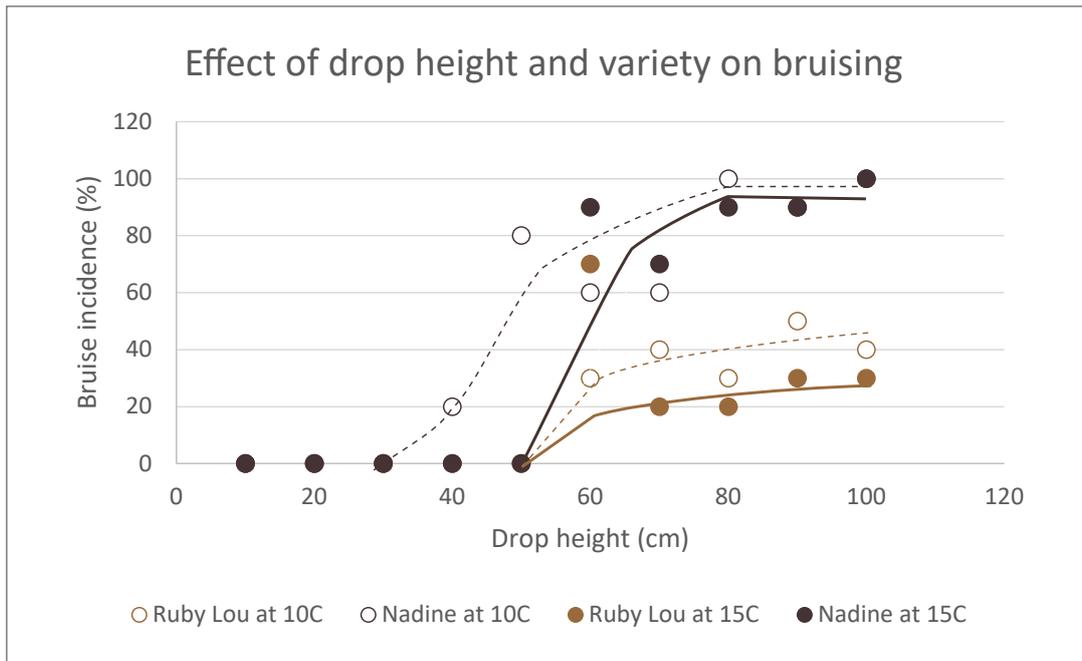


Figure 4. Incidence of bruising of Nadine and Ruby Lou potatoes dropped 10–100cm at either 10°C or 15°C. Lines indicate approximate best fit to data, except for the outlying value at 60cm for Ruby Lou. Data from Dawson and Johnstone, 2016.

hydrated, another factor that reduces susceptibility to bruising. However, there is a downside, as very high levels of soil moisture can make potatoes more susceptible to shatter bruising. The general recommendation is that soils should contain 60–80% available soil water at harvest.

Mathew and Hyde⁴ estimated that the drop heights (onto steel) that were likely to cause a blackspot bruise in 10% of Russet Burbank tubers were 25, 30 and 50mm at tuber temperatures of 10, 15.5 and 21°C respectively. While this suggests that 21°C is optimal for harvest, the risk of increased disease at this temperature (and higher) likely outweighs any possible benefits from reduced blackspot.

Western Australian researchers⁵ conducted similar tests on Ruby Lou and Nadine potatoes. One of the aims was to link bruise damage at 10 and 15°C to impact forces recorded using a “SmartSpud” (Sensor Wireless Inc.) datalogger. The SmartSpud contains an accelerometer and is used to record impacts during harvest and handling.

More on the SmartSpud, and other

similar devices, on p25.

In the WA work, Nadine proved to be more easily bruised than Ruby Lou, with a trend to increased damage at 10°C compared to 15°C (Figure 4). One thing that is clear from these results is the increased bruising of both types, regardless of temperature, once heights exceeded 50cm. This corresponded with a value of 218G recorded with the SmartSpud. In contrast, Royal Blue tubers were more susceptible to bruising than either of these other varieties, with 10% of tubers damaged by a mere 30cm drop.

WHAT CAN I DO TO REDUCE RISK?

LOTS! There are two broad strategies for preventing blackspot:

1. Improve resistance to damage and
2. Avoid mechanical injury.

Elements of these strategies begin even before planting⁶.

Improve resistance to damage

- Choose varieties with low susceptibility to bruising
- Don't over fertilise with nitrogen,

especially late in the season:

High vine nitrate readings are associated with increased susceptibility to blackspot

- Manage the crop to keep it as uniform as possible (e.g. through effective management of irrigation and fertiliser)
 - Uneven growth will result in under mature/overmature tubers, which are more prone to damage
 - Uniform stands also mean uniform flow through the harvester, reducing impacts on hard surfaces
- Control diseases that can cause premature vine death, as affected crops will have varying levels of maturity
- Kill tops before more than 50% of vines have died and wait at least 14 days before harvesting
- Avoid harvesting during hot conditions; consider harvesting in the early morning, when the air and soil are coolest
- Ensure soil is moist at harvest,



Figure 5. Devices for measuring impacts during potato harvest and packing: From left the Series 500 IRD (Techmark, USA), TuberLog (Esys, Germany) and Mikras (Esys, Germany)

especially if the weather is hot

- Well hydrated potatoes are less easily bruised
- Irrigation will drop the soil temperature below that of the air, cooling the tubers and reducing blackspot susceptibility
- Irrigation helps soften clods
- Damp soil will move more easily through the harvester
- If harvest must be carried out at high temperatures, consider how the tubers can be cooled to remove field heat
 - If potatoes stay warm during transport to a processing facility or storage, moisture loss can be high and diseases such as bacterial rots increase dramatically
 - Tubers that remain warm are physiologically older, reducing the quality of seed crops
- Angle the digger blade at the front of the primary conveyor so that tubers are lifted onto the chain/web, not jammed into it
- Adjust the harvester speed so that the conveyors are kept around 85% full
 - If speeds are too slow, tubers will pile up and be forced against the sides
 - Too fast and tubers can roll around, hitting more hard surfaces
 - Suitable conveyor speed to ground speed ratios are estimated at 1.0 to 1.2 in sandy soil, but 1.2 to 1.5 in heavier soil⁴
 - Adjust other conveyors according to yield, increasing speed if picking up a windrow, while minimising rollback of tubers
- Cover conveyor support bars with padding to reduce impacts
- Use deflectors to divert tubers away from the sides of the diviner, chain link ends and sorting table
- Minimise use of agitators and conveyor shakers to dislodge soil
- Minimise drops between different conveyors, particularly from the end of the boom conveyor into the truck, trailer or bins

Avoid mechanical injury

- Use cover crops or rotations that improve soil organic matter and deep rip to break up hard pans, as this will reduce crust formation and creation of damaging clods
- Further reduce clod formation by avoiding ploughing, discing or cultivating soil while wet
- Remove rocks and stones from the field

The easiest way to find out where

damage could be occurring is using an impact recorder, such as the SmartSpud already noted. Once identified, the drop may be reduced and/or cushioning added. Running the recorder through the line again can show whether the modification has been successful.

OK, I SEE THE VALUE - BUT WHAT IMPACT RECORDER SHOULD I GET?

The SmartSpud is not the only such device on the market, nor is this new technology, having been around since the 1990's.

The original impact recording device or "IRD" (Techmark USA) was a sphere designed to simulate an apple or onion. (Figure 5) This device is now sold in a range of shapes and sizes, and can be custom made to resemble anything from a blueberry to an egg to large processing potato (<https://www.techmark-inc.com/impact-recording-device---ird.html>).

Another option is the TuberLog (Martin Lishman) (Figure 5). Similar to the SmartSpud, Tuberlog consists of an accelerometer embedded in a synthetic case that mimics the size, shape, density and movement of a ware potato. One difference between the TuberLog and other devices is that data is transmitted instantly via bluetooth, making it easy to see exactly where the damaging impact has occurred.

A final potential candidate is the Mikras logger (Figure 5). In this case the logger is supplied in a simple case. The user hollows out a cavity in whatever product is being handled, whether an apple, carrot, cucumber or potato. The advantage of this is that the user is measuring real impact on an actual potato. The disadvantages are that A. Not being brightly coloured, the device may be difficult to find and B. The “casing” needs to be replaced very often.

A group of German researchers compared these devices⁷. Interestingly, the IRD, TuberLog and Mikras (inserted in a synthetic case) all overestimated impacts onto a metal plate compared to the Mikras sensor implanted in an actual potato. However, the artificial potatoes were fairly accurate when dropped onto PVC or rubber cushion.

The SmartSpud recorded both fewer impacts and smaller impact values

than the other devices, suggesting this device may actually underestimate potential impacts.

All of the impact recorders could provide information about where impacts were occurring during harvest and packing.

However, the authors noted that each one needs to be compared against real potatoes to understand what measured impacts could be actually causing damage.

SMARTSPUD PROVIDES QUALITY IMPROVEMENT INSIGHTS IN WA

By Georgia Thomas, Senior Project Manager, WA Potatoes

Following a successful application for funding to the Agriculture Produce Commission, Potato Producers Committee in 2020, the Potato Growers Association of WA (PGAWA) purchased a SmartSpud device for industry-wide use.

The SmartSpud is an electronic potato shaped device (pictured in a recent test) used to measure the damage caused by impacts potatoes receive during processing and transport to pinpoint and fix root causes. It does this by measuring the G-Force produced on the unit during harvest, sorting, washing or transport.

WA growers and packers are using the device to help discover where bruising, shatter damage and black spots might be occurring to assist increase potato quality and pack out.

The device was ordered from Masitek in Canada and arrived in late 2020. Upon receiving the device PGAWA staff undertook training in its use and how to interpret reports. The team then started practical training, testing

the device on a wash packing line and then during harvest on-farm.

The initial trials highlighted the need for further fine tuning to troubleshoot a few issues. As such, staff have been liaising with Masitek to work through updates which are ongoing.

The trials also highlighted the wide-ranging use for the device and the opportunities for industry to make the most of the investment.

According to the manufacturers, the SmartSpud can reduce bruising and damage by up to 50%. Other benefits include:

- Improve line efficiencies, targeting downtime and maintenance.
 - Test new equipment in quick time.
 - Measure levels of damage through all stages of processing.
 - Make data-driven decisions
- Following initial testing and training a User Agreement was developed for WA potato industry members to access the device. The agreement



Figure 6. The SmartSpud consists of an accelerometer mounted inside a potato-shaped urethane capsule.

requiring members to undertake training so they can use the device effectively.

The device has already been used to investigate impact points in a wash packer process, and in August this year commenced on-farm testing of the harvest process.

David Anderson, Supply Manager for Beta Spud has been running the device in a range of settings and locations.

“We have had the opportunity to use the device from the outset and have so far been running trials across several farms and in our wash packing facility. The information we have



Figure 7. Initial testing of the SmartSpud on farm and at Beta Spud's packing facility, with progress monitored by Morena Perdec from PGAWA. All photos by Georgia Thomas, PGAWA.

gathered indicates that most areas on the harvester are within range. The SmartSpud has shown two minor areas that we can work on to improve quality within the packing shed," said David (Figure 7, Figure 8).

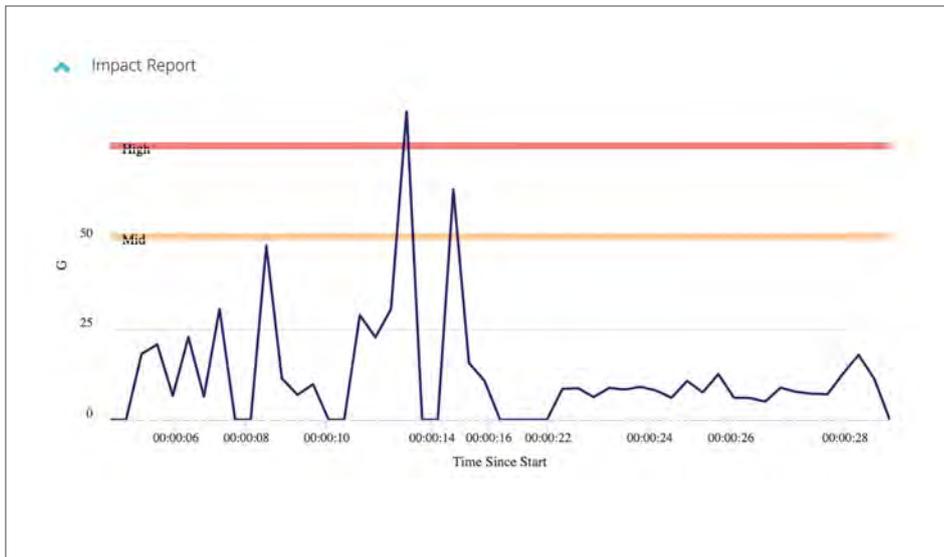
Moving forward, the PGAWA continues to support industry with

training and use of the device with the goal of achieving incremental quality gains.

"As more growers take advantage of the device, more knowledge can be gathered about the specific areas of focus for industry. It is as much about ruling out issues and it is discovering

where more effort should be focused to find improvements," said Potato Grower Association WA CEO Simon Moltoni.

Feedback from activities have continued to be communicated back to the manufacturer to enable improvements to be made to the device in future updates.



Read more about SmartSpud at aaggrii.com/products/smartspud

Figure 8. Example of output from a SmartSpud. The two peaks indicate points in the packline where damage may be occurring.

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Dear Spud GP

I cut open a couple of tubers the other day and found that the inside was brown and soft. What is it and why has it happened?

Patty Brown



ASK THE SPUD GP

Discolouration of the internal tuber tissue is most often a disorder caused by environmental conditions. They have descriptive names such as Blackheart, Internal heat necrosis, Hollow heart, Blackspot and Net necrosis.

Some of these conditions do look similar to symptoms caused by diseases. Moreover, opportunistic microbial infections causing secondary rots in affected tubers can mask the primary cause. This means it is important to review all the field environmental conditions and clinical signs of diseases for an accurate diagnosis.

Here are some common conditions that illustrate similarities between some tuber physiological disorders and diseases.

Contact the spud GP by emailing info@potatolink.com.au

	<p>Hollow heart – rapid tuber enlargement, moisture stress; excess nitrogen application; slight deficiency of potassium. <i>Photo L. Tesoriero</i></p>
	<p>Blackheart is caused by a lack of oxygen, which can occur from waterlogging. It is also associated with temperature extremes and potassium deficiency. It may be followed by soft rot bacterial infection or Pythium Leak if symptoms develop near the stolon end or there are surface wounds. <i>Photo L. Tesoriero</i></p>
	<p>Net necrosis can be caused by chilling/frost injury to the phloem tissue of the vascular ring in tubers. It can look very similar to damage caused by Potato leaf roll virus or Verticillium wilt.</p>
	<p>Bacterial wilt also causes necrosis of vascular tissue in tubers, but is accompanied by white ooze from affected tissue if gently squeezed. Oozing bacteria also appear on the tuber surface from eyes (called milky eye). <i>Photo L. Tesoriero</i></p>
	<p>Pink rot, caused by <i>Phytophthora erythroptica</i>, forms a dark line at the margin of affected tissue and has a characteristic pink colour. <i>Photo UNECE</i></p>
	<p>Fusarium dry rot is often a result of damage to the tuber surface. It can occur as a secondary rot in tubers affected by Blackheart, Blackspot or Hollow heart. <i>Photo PotatoPro.com</i></p>

MAGNESIUM - THE FORGOTTEN ELEMENT?

Magnesium (Mg) is essential to plants. It is strongly involved in photosynthesis and transporting carbohydrates from leaves to roots, which is particularly important for tuber development. Yet, it may be overlooked within fertiliser programs focused on N, P and K.

Even if plants appear in good condition above ground, root systems are likely to be stunted if Mg levels are low. High levels of available potassium and heavy applications of calcium (e.g. gypsum, lime) can reduce uptake of Mg by the plant.

As Mg can be slowly leached, highly weathered soils are the most likely to be low in Mg. Magnesium helps to protect plants from aluminium toxicity which is more likely in acidic soils. This means that if weathered soils are low in pH, the issue is further compounded.

Getting Mg right is important to maximise yield, firmness and starch content of potatoes. Increases in starch accumulation improve specific gravity, which has direct financial benefits to processing growers. Ware growers may benefit from reductions in bruising and discolouration during transport¹.

THE POTATOLINK MG MINI-TRIAL

PotatoLinks' Marc Hinderager recently conducted a small trial on magnesium at the Canowindra demo site. The

test paddock has fairly light soil (CEC approx. 8) and is under pivot irrigation.

"We applied 130 units of potassium (SOP) pre-plant and got the seed into the ground on 19 October," said Marc. "A week later I put on the first application of magnesium sulphate (Epsom salt) at a rate of 200kg/ha. This effectively added 20 units of magnesium plus 25 units of sulphur to our two 20m experimental plots".

The treatment was repeated a month later (23 November) when the potatoes were at tuber initiation



Figure 1. There were no obvious differences in growth between Mg treated and control plots (left) at tuber initiation (right)

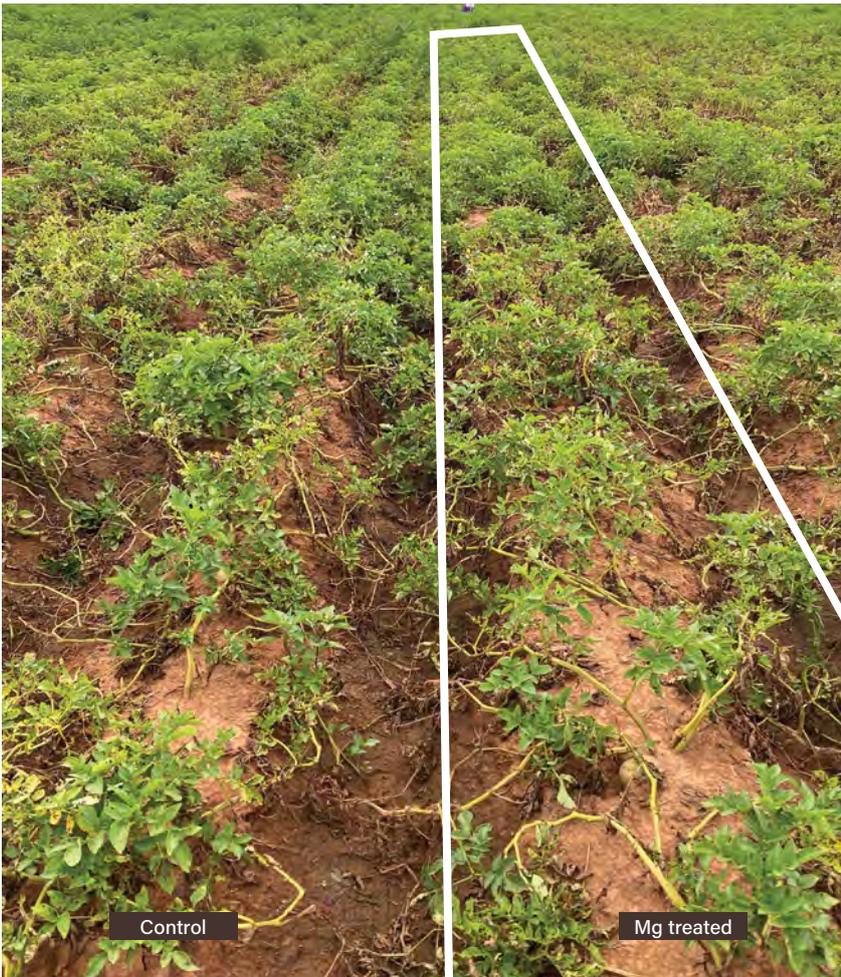
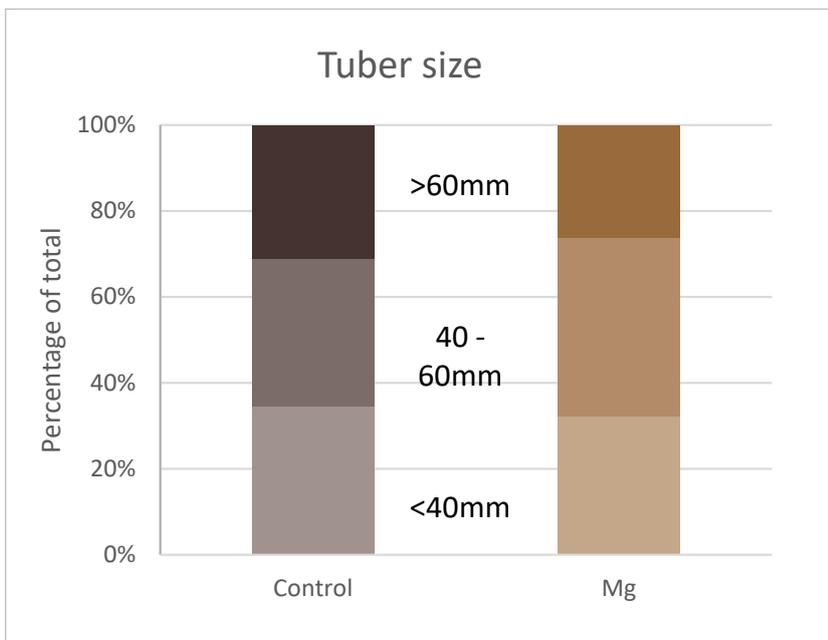


Figure 2. There were still no obvious differences between Mg treated and control plots one week before harvest



stage. This was a mid-morning foliar application with 1,500 L/ha water. While the application did not cause any foliar burn, it should be noted the weather was unseasonably cool (max 25°C).

“We harvested from our two test plots plus untreated adjacent rows on 24 January, 97 days after planting. Even though the tops had looked the same throughout (Figure 1, Figure 2), we found some really interesting differences in the tubers” commented Marc.

The total number of tubers, and the percentage of tubers within each size range, was about the same for the treated and untreated rows (Figure 3). However, reduced water rot of tubers (possibly *Pythium* or *Phytophthora*, with secondary bacterial infections) in the rows treated with Mg meant that yield was effectively increased (Figure 4).

Increased levels of Mg have previously been associated with reductions in both fungal and bacterial diseases of potatoes. Mg fertilisation has been demonstrated to improve plant tissue resistance to the pectolytic enzymes produced by bacteria, while improved transport of nutrients around the plant may enhance resistance to fungal pathogens².

“As you know, it’s been a really challenging season with well above average rainfall” says Marc, “so the reduction in disease was great to see. Obviously, we need to repeat this on a larger scale, but still a very positive outcome.”

Another interesting result was a small but potentially significant increase in specific gravity in the Mg treated

Figure 3. Effect of two applications of mag-sulphate on tuber size, incidence of soft rot, and specific gravity

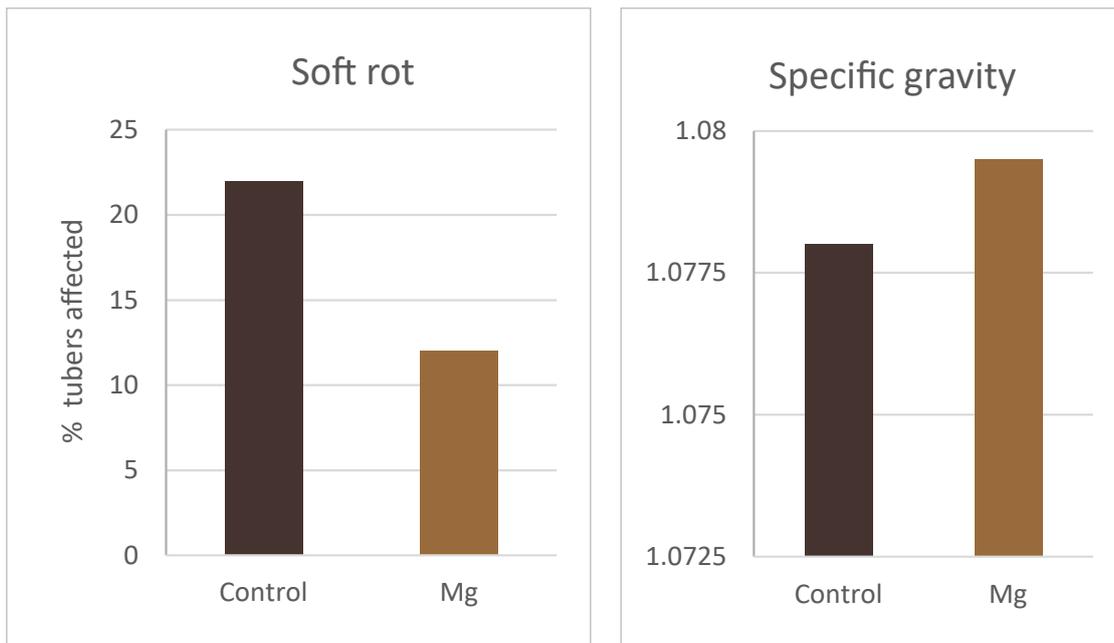


Figure 4. Effect of two applications of mag-sulphate on tuber size, incidence of soft rot, and specific gravity

rows (Figure 4). While there was a fair degree of variability between the different plots, this is consistent with published data and seems worthy of further examination.

“Mag sulphate, applied at the 400kg/ha rate we used in our demo, costs over \$400/hectare, so we need to consider costs and benefits before rushing in,” suggests Marc. “Depending on soil properties, other magnesium products such as calcium magnesium (dolomite), Sul-Po-Mag/

K-Mag, and magnesium nitrate could be considered. However, mag sulphate is definitely the best option for foliar application.”

Application of Mg is also complicated by the fact that the solubility of Mg fertilisers varies widely as does release in different soil types and bio-availability to plant roots. For example, Kieserite (magnesium sulphate monohydrate) is more bioavailable to potatoes than calcined magnesite (magnesium oxide).

In UK trials, Kieserite consistently increased both yield and % dry matter, even at sites where leaf analysis indicated Mg was within the recommended range (>0.25%). In contrast, cal-mag often had little effect, even though both products were applied at 60 kg/ha³.

One thing that is clear is that magnesium should not be forgotten.

Rather, magnesium is essential to both yield and quality of potato crops.

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EYES ON THE WORLD

Seed piece spacing for early maturing table-stock potato grown under sub-tropical conditions

Andrade MHML, daSilva ALBR, Pesantes LG, Christensen CT, Zotarelli L. 2021. Am J. Pot. Res. 98:246-254.

WHAT'S IT ABOUT?

There have been many studies comparing the effects of seed size and in-row spacing on yield and quality of potatoes. In general, planting densely increases yield, as does using a large seed size (Figure 1).

However, total yield isn't everything, and these factors interact. As seed potato spacing (SPS) increases, so do the number of large tubers. For example, research in Idaho showed total yield was relatively constant when seed size was adjusted with SPS so that tonnes seed/ha remained the same. However, the size profile shifts,

with a greater proportion of small tubers at the closer planting distance.

In the Idaho study, returns on processing potatoes were maximised by planting 64g seed with 30cm SPS. In contrast, a closer SPS of 20-25cm provides the best returns for processing varieties in Florida.

However, low prices have seen many Florida growers shift to the fresh market, particularly as the spring harvest provides an advantage over other US production areas. This study examined interactions between variety and SPS on total yield and size of 6 varieties of ware potatoes (Actrice,

Envol, Natascha, Purple Majesty, Red LaSoda and Satina) when grown in a subtropical climate, analogous to northern parts of Australia.

WHAT WAS CONCLUDED?

Only Red LaSoda and Satina had significant yields of A3 (8.3 – 10.2cm diameter) tubers. These varieties also yielded more A2 (6.4 – 8.3cm diameter) tubers.

Both total yield and the number of A1 tubers (4.8 – 6.4cm diameter) was greater at 15 and 20cm SPS than at 25 or 30cm SPS. However, the cultivars differed in the magnitude of their response to changes in SPS. For example, Purple Majesty and Natascha had mainly small tubers regardless of SPS, whereas narrow SPS's increased the number of small Satina tubers.

In general, a potato SPS of 15 or 20cm provided the highest yields of medium to small tubers, whereas the SPS of 25 or 30cm increased yields of large tubers, regardless of cultivar (Figure 2).

The authors note that potato seed represents 22% of total production costs in Florida. In this study, seed costs ranged from US\$1529 (30cm SPS) to US\$3,058 (15cm SPS) per hectare. The higher costs incurred by narrow SPS clearly need to be offset by increased yield and profitability.

Growers therefore need to set SPS according to market demand for smaller or larger tubers, while also considering varietal characteristics.

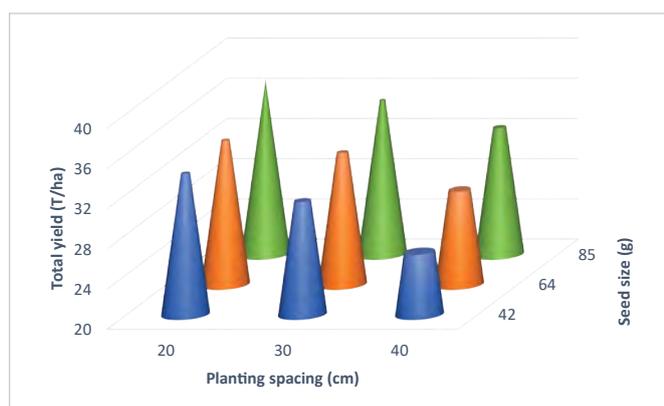


Figure 1. The effects of seed size and planting distance on total yield. Derived from Bohl et al., 2011.

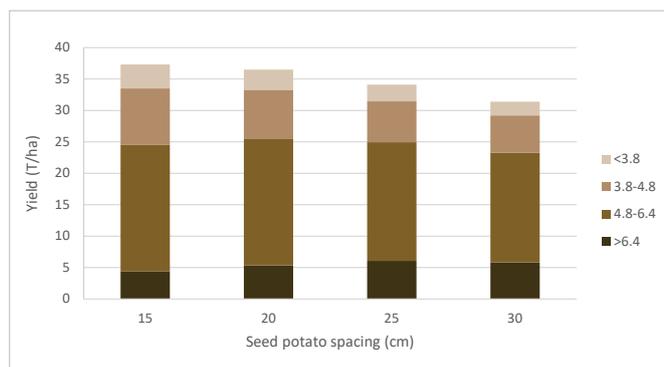


Figure 2. Effect of SPS on yield of different size grades for 6 ware potato varieties grown in Florida, USA. Derived from Andrade et al., 2021.

