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## **Editorial Contacts**

Bill Bulmer AUSVEG CHAIR

Michael Coote AUSVEG CEO

Shaun Lindhe COMMUNICATIONS MANAGER AND EDITOR

#### CONTRIBUTORS

Sophia Auld Chloe Betts Sophie Burge Fair Farms Mick Keogh Lilith Palmer Ossie Lang

#### EDITORIAL

AUSVEG Phone: 03 9882 0277 communications@ausveg.com.au

PRINT Metro Printing

GRAPHIC DESIGN Sam Behr

PHOTOGRAPHY Cover Growcom

PHOTOGRAPHY Hort Connections 22 Andrew Beveridge

#### ADVERTISING

Tim Withers AUSVEG Account Executive – *Advertising* Phone: 03 9070 0704 tim.withers@ausveg.com.au



## 

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**Cover** Tim and Brenda Baldwin and their son Eric from Baldwin Produce. *See Page 14.* 

## AUSVEG

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## Editorial

One of the major topics on everyone's minds is the weather, with the Bureau of Meteorology confirming that a third consecutive La Niña weather system will persist until early 2023. This will result in increased rainfall, which will lead to more significant rain and flooding events that will impact production regions.

It has already been a wet autumn, winter and start to spring, with likely wet weather to continue towards the end of the year and into 2023.

Conditions are difficult and we know that growers were already operating in a challenging and unpredictable environment; this is another blow for hard-working farmers trying to get fresh food to Australian families.

Unfortunately, it is when growers and their workers are under considerable time, weather and financial pressures that farm businesses can be most at risk of scams. The ACCC has provided *Potatoes Australia* an overview of the most common scams that are affecting farm businesses, including:

- Phishing scams attempts by scammers to trick you into giving out personal information such as bank account numbers, passwords, credit card details or personal information; and
- Remote access scams when a scammer gets access to your computer after convincing you to download software to fix an internet or computer problem.

While there is more information on these scams on page 6 of this publication, it is important to emphasise the top tips that the ACCC recommends growers and farm businesses follow.

#### Tips to avoid being scammed:

- 1. If it seems too good to be true, it probably is
- 2. Don't purchase machinery if you haven't seen it in person
- 3. Beware if they offer a 'free trial or an 'escrow' service
- 4. Don't rush into a purchase

- 5. Do your own research
- 6. Be careful what personal details and information you provide
- 7. Speak to someone you trust

On a lighter note, this edition features numerous profiles of growers who have demonstrated excellence in their fields, or working to promote the horticulture industry as an attractive industry to work in.

These include

- Marlon Motlop, Sam Kisvarda and Tim Bond, the winners of the Butler Market Gardens Environmental and Sustainability Award, E. E. Muir & Sons Community Stewardship Award and the UPL Tech Innovation Award respectively;
- Potato business Baldwin Produce, and
- Seed potato agronomist Emily Nellis.

If you know a potato grower or industry member who is doing outstanding work and deserves to be recognised by their industry, please get in touch with us at communications@ausveg.com.au or on 03 9882 0277.

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AUSVEG is the only national industry body that has the scale and legislative remit to represent the interests of potato growers to government and the broader supply chain. To support potato growers through such a challenging and turbulent time, we have been working hard behind the scenes to highlight the concerns of growers to political and government stakeholders and the broader supply chain, and deliver projects and services that directly help growers to produce healthy, highquality fresh potatoes and vegetables.

AUSVEG has stepped up our own advocacy efforts to ensure that growers' concerns are raised to all levels of government, including parliamentarians, ministerial and departmental staff. However, we also recognise that collective advocacy that incorporates the voices and concerns of growers ensures potato growers' issues are considered by government and the broader supply chain.

Some of the recent collective advocacy activities that AUSVEG has been involved with include:

**Federal Government Engagement** AUSVEG was the first industry body

## Message from the CEO

It's no secret that 2022 has been one of the most challenging years for many potato and vegetable growers around Australia, who have dealt with significant floods, increases to costs of production, the ongoing labour shortage issues and rising costs of living and inflation.

to secure a meeting with the newlyappointed Agriculture Minister Senator Murray Watt at Hort Connections in June. This was a unique opportunity to provide the Minister with insight into the challenges facing growers and the broader supply chain, as well as raise growers' concerns directly with the Minister responsible for our sector. AUSVEG maintains strong relationships with many MPs, such as Victorian Senator Raff Ciccone, who is heavily involved in horticulture-related issues, particularly around labour.

#### Food Supply Chain Alliance

AUSVEG has increased its collective advocacy efforts in 2022 to ensure that potato growers' issues and concerns are considered in broader agricultural advocacy efforts by the supply chain. AUSVEG is a member of the Food Supply Chain Alliance, which represents over 160,000 businesses with a revenue of over \$224 billion.

The Food Supply Chain Alliance has been active in the media, particularly ahead of the Jobs and Skills Summit in September where it highlighted the 172,000 worker shortage throughout the supply chain. The Alliance has also commenced talks with several Government and Opposition Ministers to develop a National Food Supply Chain Strategy to ensure the industry is ready and able to deal with the future challenges that will impact the sector.

#### Fruit & Vegetable Consortium

AUSVEG has been heavily involved in collective advocacy with the health, nutrition and agriculture industry to fund and develop a national behaviour change strategy that will lift potato and vegetable consumption. AUSVEG is a founding member of the Fruit & Vegetable Consortium, and was involved in the development of a KPMG report that highlights the issues regarding potato and vegetable consumption in Australia, which have deteriorated further as a result of the COVID-19 pandemic. I took part in an expert panel discussion at the launch, saying that initiatives to boost consumption cannot happen in isolation, and require coordinated cross-sectoral support at a national level to drive meaningful change.

AUSVEG will continue to 'fight the fight' for growers and further expand our advocacy activities to ensure that growers' concerns are raised to all levels of government, the media and the broader supply chain.

Michael Coote CEO, AUSVEG

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Mick Keogh, ACCC Deputy Chair

# Improving market transparency through the Horticulture Code

There's been some debate in recent months about whether the historically high prices that consumers have paid for vegetables like lettuce, broccoli and beans reflect what is paid to the growers who supply the produce.

You'll hear contrasting perspectives from different parts of the supply chain, with many arguing that higher prices were mostly due to shortages caused by floods in the growing regions.

Beyond that, arguments about retailers' profits and growers' margins raise long-standing questions about market transparency. Cynicism is understandable if the market structure that's evolved over time prevents the growers of the goods seeing what the retailers or other buyers pay for them.

This lack of transparency, or information asymmetry as economists call it, was one of the reasons the Horticulture Code of Conduct was legislated in 2017. Industry codes aren't a panacea for all bargaining power imbalances and are not intended to set prices, but they can be effective in addressing problems in specific markets.

> First and foremost, the Horticulture Code requires that trading between growers and wholesalers happens through written contracts, called Horticulture Produce Agreements. But it also obligates some traders to report the price they paid growers for the produce and the price at which they on-sold it. This allows growers to see what price is paid for their produce as it moves through an intermediary.

The ACCC audited a cross-section of fruit and vegetable traders at the start of this year and found that some weren't meeting their legal obligations under the code. After reviewing the range of potential breaches and engaging with horticulture produce traders it was clear that some in the industry needed additional guidance on their legal responsibilities under the code. For this reason, in the shortterm, we decided that increasing our engagement with industry was more appropriate than enforcement action.

To support any traders with different interpretations of the code's requirements, we have just published updated Horticulture Code guidance for traders and growers.

The update provides extra detail on some of the key elements of the code, including the requirements for traders to publish their terms of trade, and for merchants who operate under a pricing method or formula to report to the grower the gross sales price received when selling the grower's produce to a third party.

We are now stepping up our engagement and giving the industry enough time to consider the guidance material, but our focus will turn to enforcement in the very near future. Fruit and vegetable traders should be on notice that future noncompliance risks penalties.

The ACCC has previously identified and recommended fixes for some of the regulatory gaps that are allowing harmful practices in agricultural industries to continue. But we've also pointed out that the existing regulatory framework already deals with some of these issues.

We strongly urge fruit and vegetable traders and growers to read our updated guidance material and review their contracts and statements in light of it.

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CAUTION





### Ag machinery scams

Australian farmers and agri-businesses are the targets of tractor scams.

Between January 2021 and August 2022, the ACCC's Scamwatch has received 533 reports about tractor and heavy machinery scams, including total losses of \$2.6 million.

These scams were for new tractors, with scammers creating fake websites, and for second-hand sales on marketplace websites such as Facebook and Gumtree.

#### How tractor scams work

#### Fake tractor website scams

Scammers create fake websites that look like genuine online shops selling agricultural machinery. They may use sophisticated designs and layouts, photos and brand logos taken from other websites, a '.com.au' domain name and even an Australian Business Number (ABN) taken from a legitimate business. The websites often have a physical business address listed on the website which are vacant blocks or belong to another business.

#### Second-hand tractor scams

Scammers will pose as genuine sellers and post fake ads on classifieds websites, in print classifieds, and on online platforms such as Gumtree and Facebook Marketplace. However, once a deposit is paid, the scammer usually 'disappears' and delivery is never made.

#### 7 Tips to avoid being scammed

- 1. If it seems too good to be true, it probably is Scammers advertise machinery at much lower prices than what the market rate is.
- Don't purchase machinery if you haven't seen it in person
   Scammers will always come up with an excuse as to why you can't inspect the machinery in person, or they will ask for a deposit first.

#### 3. Beware if they offer a 'free trial' or an 'escrow' service

Scammers may offer a 'free trial' in an attempt to earn your trust. However, they would ask for a deposit to be paid first. Scammers may also reassure customers that the deposit is paid into a third party or 'escrow' account, but the 'escrow' service is also fake

#### 4. Don't rush into a purchase

and part of the scam.

Be cautious if the seller tries to make the sale feel urgent. For example, scammers often say that they need to sell quickly because they are in the army and about to be deployed overseas, or that their father has passed away and they need to get rid of machinery from their parent's farm.

#### 5. Do your own research

Look for online reviews to see other people's experience with the business. Do your research beyond the website itself, as those reviews may be fake. Scammers may also steal other businesses' names and ABN details for their website. If a physical address is listed, look it up online and see if it is the correct business on Google Maps. You could also call a neighbouring business to verify the seller.

#### 6. Be careful what personal details and information you provide

Be careful if you are asked to provide a driver's licence, passport or home address, which may be used for identity theft. Where people reported losses as a result of a scam, more than half of them lost personal details.

#### 7. Speak to someone you trust

If you think the sale might be a scam, get a second opinion from a family member or a friend to see what they think.

#### **Report a scam**

We encourage you to report scams to the ACCC via the report a scam page. This helps the ACCC to warn people about current scams, monitor trends and disrupt scams where possible. Please include details of the scam contact you received, for example, email or screenshot.

Scamwatch also provides guidance on protecting yourself from scams and where to get help.

#### **Fake invoices**

#### Agri-businesses may be unknowingly paying fake invoices

Did you know that scammers sometimes send invoices that appear to be from real business suppliers, and you could pay them, not realising they are fake invoices until sometime later?

These are known as 'fake invoice scams' and between January and August 2022, the ACCC's Scamwatch received 19 reports from farmers and agricultural businesses, with \$320,572 in reported losses. Overall, over the same period, Australians lost \$15,006,570 to fake invoice scams.

The scammers may hack into the email account of a business or supplier, and send you an email saying that their bank details have changed. These scammers can make invoices look almost identical to the real ones, with the only difference being the bank account details.

In one instance, a farmer paid a scammer's fake invoice of over \$60,000, as they believed they were paying an invoice for the purchase of machinery.

#### Protect yourself

#### What can you do to avoid being scammed?

Be careful if a business tells you they have updated their bank details

- If you receive an email containing an invoice that says the supplier's bank details have been updated, you should call them to confirm this. Do not call the phone number on the invoice, as this may have been changed by the scammers. Instead, find the supplier's phone number from another source.
- You should also confirm via a phone call that you have the right bank details, if it is the first time you are paying money to that supplier's account, or for large purchases.

We encourage you to report scams to the ACCC via the report a scam page. This helps the ACCC to warn people about current scams, monitor trends and disrupt scams where possible. Please include details of the scam contact you received, for example, email or screenshot.

Scamwatch also provides guidance on protecting yourself from scams and where to get help.



#### Two common types of scams

#### **Phishing scams**

Phishing scams are attempts by scammers to trick you into giving out personal information such as bank account numbers, passwords, credit card details or personal information.

A scammer may contact you by email, phone call or text message and pretend to be from a legitimate business such as a bank or internet service provider. For example, they may pose as a bank seeking to 'verify' customer records.

To protect yourself from phishing scams, do not click any links or attachments in an email unless you are certain it is from a trusted organisation. If the email asks you to update or verify your details, this should be a warning sign.

Do an internet search using the names or exact wording of the email or message to check for any references to a scam. Many common scams can be identified in this way.

#### **Remote access scams**

A remote access scam happens when a scammer gets access to your computer after convincing you to download software to fix an internet or computer problem.

The scammer will usually phone you, pretending to be a from a large telecommunications or computer company such as Telstra, the NBN or Microsoft. They may also claim to be a technical support service provider.

Once they have remote access, scammers can access personal information stored on your computer, install malicious software or use your information for other crimes, such as identity theft.

To protect yourself from remote access scams, never give an unsolicited caller remote access to your computer. You should also never give your personal, credit card or online account details over the phone unless you made the call and the phone number came from a trusted source.

#### **FIND OUT MORE**

You can read more about these scams and other common scams on the ACCC's Scamwatch website. Scamwatch also provides guidance on protecting yourself from scams and where to get help.



## 'Massive flights of green peach aphids' meet their match in new Versys®

Dowling AgriTech is a well-established seed potato producer based near Mount Gambier in SA. While pest control is important for all vegetable growers, it is probably even more crucial in seed potato crops because any loss of control could have a multiplier effect if infected seed potatoes were sent out as the source of commercial crops.

It goes without saying that a successful company like Dowling AgriTech has very strict quality control to make sure the seed potatoes it supplies are totally free of infestation or infection, and that all starts with great pest control in the growing season.

Peter Ellison, the company's General Manager and Senior Agronomist explained that in years where there are massive flights of green peach aphids, it can be a challenge to keep on top of them as existing control methods are faced with unusual population pressure.

"Aphid control is absolutely critical for seed potato production, because all aphids – and especially green peach aphids – are very effective vectors of diseases, with the main threat being potato virus Y. Any level of infection will be magnified from the seed crop into the commercial, daughter crop."

While the Dowling AgriTech team was pretty happy with the insecticides they were already using, the chance to use a new 'aphid specialist' was too good to miss.

"Versys was launched in a year with very high aphid pressure. When we'd first heard about it, we pricked up our ears and the trial data was very convincing. Despite having a robust, very full IPM program, we were under a bit of pressure. So Versys ended up being the first foliar product we turned to, because of its fast knockdown and good residual control."

The results were so dramatic that Peter worries people will think he's exaggerating.

"It sounds a bit cheesy, but I just didn't believe how effective it was. I walked through the crop and couldn't find a single aphid. But at the same time it was overrun by ladybirds and red and blue beetles – the beneficial insects.

"We rely on choosing soft, selective chemistry that will protect those beneficials that are controlling other pests as well. So Versys ticks a lot of boxes."

While Peter was very impressed by such high levels of control and selectivity under such exceptional pest pressure, he says the best thing about Versys is that it combines two benefits usually only found in separate products.

"Often a product will be good at knockdown or at residual control, but they're not normally good at both. Versys almost replaces a couple of products in the rotation because it is doing everything in the same drum."

Not that the Dowling AgriTech team will be discarding other products. They are

only too aware that using a mix of chemistry from different groups along with other management techniques is essential.

"We're not just going to hammer a single product, no matter how good it is. That's the way to break them. Green peach aphids are particularly quick to develop resistance, so it's great to have Versys as another tool in the toolbox. Especially when it turns out to be an extremely effective tool that I'm very happy to pick up."

Dowling AgriTech also contracts out seed-potato production. "I've been recommending Versys to all our contract growers," Peter says, "and they've been reporting success too. One of them used it in their commercial potato crop as well and said they'd walked through and it was just littered with dead aphids."

Peter is certain Versys will be an integral part of his company's program from now on, but he'll be hoping not to see it put to such an extreme test again. "I'm just glad we had such a good product to turn to in what was a tough season", he says. "It's not every day a new product impresses you so much that you call the rep to tell him how good it is!"

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# **Costs of production and produce prices** – not a short-term problem for growers

While costs of production and produce pricing have recently been in the limelight, especially the past 6 months, the difference between cost of production and produce pricing has been an ongoing problem for many years. AUSVEG Policy Officer Chloe Betts provides a report on its advocacy activities for growers.

The costs of production covers all inputs from fertilisers and fuel to wages and packaging. The prices of these inputs have steadily increased over the last decade, and more rapidly over the last few years. However, the retail prices that the public pays for vegetables and potatoes have not.

#### Historic Data 2013 to 2021

# When we look at the historic price of vegetables, it is clear that the farm-gate value of produce is relatively flat.

Take potatoes as an example.

Potatoes are an Aussie favourite – they are versatile, easy to prepare, and great for your health and well-being.

However, according to Hort Stats (Hort Innovation | Australian Horticulture Statistics Handbook 2020/21), over a nine-year period from 2013 to 2021, the dollar per kilo value of fresh supply (i.e. produce that goes to retail and food service) of potatoes (total volume of fresh supply over the value), potatoes have only increased by 5.4 per cent, nowhere near keeping up with the costs of inflation or the increases in production costs.

While there are many factors that influence this, including the improved production practices of potato growers, this is concerning for the long-term viability of many businesses. Consumers are understandably concerned that their prices are increasing, but they should also be aware and concerned that the prices growers are receiving has hardly increased in the last decade.

The outlook for other commodities for fresh supply is also similar:

<b>Vegetables \$/kg</b> Fresh supply	2013	2021	% Change
Potatoes	\$1.11/kg	\$1.17/kg	5.4%
Onions	\$0.75/kg	\$1.02/kg	36%
Carrots	\$0.88/kg	\$0.98/kg	11.4%
Head Lettuce	\$1.29/kg	\$1.45/kg	12.4%
Celery	\$0.94/kg	\$1.06/kg	12.8%
Broccoli / Baby Broccoli	\$3.07/kg	\$3.96/kg	29%
Tomatoes	\$3.00/kg	\$2.63/kg	-12.3%
All Vegetables	\$1.99/kg	\$2.31/kg	16.08%

Part of the persistent issue is that consumers not knowing the cost of growing food, resulting in fresh produce being undervalued.

Another problem facing growers is buyers (i.e. retailers, processors, wholesalers) not paying growers a fair price for their produce.

#### Food and Grocery Code of Conduct

To assist in negotiating a better price, growers who have contracts with the major retailers (Woolworth, Coles, Aldi, and Metcash) can use the Food and Grocery Code of Conduct (FGCC). The code is underutilised but contains important protections and procedures for growers to receive a fair price.

#### How to negotiate a better price and elevate issues with the FGCC

#### STEP 1 A

#### Ensure your grocery supply agreement with the retailer includes a mechanism to negotiate price on a regular basis.

In this mechanism should be a 5-day timeframe for the retailer to conclude price increase negotiations from the day you inform the retailer of the price increase.

#### STEP 1 B

# Submit a price increase request to the retailer.

If the retailer rejects the price increase or you are unhappy with the outcome, you can elevate your issue to the Code Arbiter or straight to the independent reviewer.

Your complaint will be treated confidentially, and you can control when you want your identity (or the identity of your organisation) to be disclosed to the retailer. You can also be represented by a third party when undertaking this process. The Code Arbiters are individuals appointed by the retailers to investigate and resolve complaints.

#### STEP 2

# Lodge your complaint with a Code Arbiter.

When lodging your complaint, you must include the following details:

- Supplier identification details.
- Contact details for the supplier.
- Details of the conduct giving rise to the complaint.
- The provision of the code you think is relevant to the complaint.

There is no cost to you as the supplier for using the Code Arbiter process.

The Code arbiter will conduct an investigation and provide a proposed remedy.

If you do not accept the proposed remedy, you can refer your complaint to the Independent Reviewer.

The independent Reviewer oversees conduct including the dispute resolution process of all retailers and suppliers. You can also speak confidentially with the code arbiter to make an informal complaint. This does not require a written submission and can be used by the code arbiter in an aggregated and de-identified format to provide to the retailers of early signs of bad behaviour. You can remain anonymous.

#### For more information

Please refer to the ACCC website, the Food and Grocery Code Legislation, the FGCC independent reviewer website or contact Policy Officer Chloe Betts at chloe.betts@ausveg.com.au

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#### STEP 3

# Refer your complaint to the Independent Reviewer.

The independent reviewer will conduct an investigation and make recommendations to the Code Arbiter to reconsider your case if insufficient procedures were taken.

If the Independent Reviewer finds any breaches of the FGCC that have not been addressed by the Code Arbiter or retailer, he can refer the matter to the Australian Competition and Consumer Commission (ACCC) for potential enforcement action. There is no cost to you as the

supplier for this Independent Reviewer process.

#### **STEP 4**

#### Mediation and Arbitration.

Suppliers can also choose to take an alternative dispute resolution system. Provisions in the Code make it compulsory for the supermarkets/ wholesaler to take part in mediation or arbitration in good faith.

Supplier can take their own legal action or lodge a complaint directly with the ACCC regarding breaches of the Code or other breaches in the *Competition and Consumer Act 2010.* 

## POTATO TRADE UPDATE Slight increase in frozen potato imports after fall in 2021

AUSVEG has reviewed Global Trade Atlas import data to understand:

- The changes in the levels of frozen potato imports pre and post-COVID, as well as
- The changes in import levels over the last 12-months as growers have faced significant increases in costs of production.

While frozen potato imports have increased 12 per cent in value and 15 per cent in volume over the last 12-months, the level of frozen imports has decreased year-on-year since 2017/18.



Year ending June	<b>Volume</b> (Tonne)	% Change
2018	138,116	
2019	119,647	-13.37%
2020	110,599	-7.56%
2021	102,789	-7.06%
2022	118,407	+15.19%

Year ending June	Value (\$m)	% Change
2018	166.8	
2019	153.7	-7.87%
2020	151.6	-1.38%
2021	144.3	-4.80%
2022	161.7	+12.06%

The following tables demonstrate, there has been an overall decline in the value and volume of frozen potato imports from 2017/18 to 2021/22.

33,457

36,246

BELGIUM	2017/18	2018/19	2019/20	2020/21	2021/22
Value (\$m)	22,108,552	27,494,279	32,950,500	34,653,155	45,927,471
Volume (Tonne)	15,878	18,954	20,995	21,885	28,049
NETHERLANDS	2017/18	2018/19	2019/20	2020/21	2021/22
Value (\$m)	46,846,721	30,860,304	23,971,910	41,933,109	43,609,253

18,764

28,307

42,599

Volume (Tonne)

#### Potato Imports 2021/2022



NEW ZEALAND	2017/18	2018/19	2019/20	2020/21	2021/22
Value (\$m)	62,122,840	54,297,120	51,625,472	34,311,453	34,003,694
Volume (Tonne)	54,357	46,636	47,020	28,618	30,871
UNITED STATES	2017/18	2018/19	2019/20	2020/21	2021/22
Value (\$m)	28,169,476	29,063,733	29,434,933	15,100,307	20,892,265
Volume (Tonne)	20,924	19,660	17,565	9,643	11,995
REST OF THE WORLD	2017/18	2018/19	2019/20	2020/21	2021/22
Value (\$m)	22,108,552	27,494,279	32,950,500	34,653,155	45,927,471
Volume (Tonne)	15,878	18,954	20,995	21,885	28,049

#### **FIND OUT MORE**

Any growers wanting to find out more information are encouraged to contact AUSVEG on 03 9882 0277.



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## For one Bundaberg producer, it's all about growing the right crisping potato

Samboy, Thins, Kettle Chips and Natural Chip Company; the snacks that go crunch in your mouth and keep you coming back for more. Chances are, come spring, when you break open a pack of chips, the potatoes could well be sourced from Baldwin Produce, Bundaberg. Growcom's Fair Farms team speaks with Baldwin Produce.

Baldwin Produce, a member of Growcom and Hort360 Great Barrier Reef (GBR) certified, is proactive in doing what's best for soil and water, to get the most out of its crops and to boost environmental outcomes for the GBR and its catchments, so that future generations can enjoy this natural wonder.

Baldwin Produce, consisting of Tim and Brenda Baldwin and their son Eric, are proactive in implementing Hort360 certified practices at their own pace, so that there isn't too much added strain on their business.

"It's really a matter of trying to be progressive and get ahead of the game. You can't refuse it if it's going to be there all the time." Tim said.

Hort360 GBR certified practices are just one part of this diversified venture.

#### Diverse crops offer rewards... and bags of chips

When Growcom's Fruit and Vegetable News visited Baldwin Produce, the potatoes were starting to flower, and the dam was at capacity with crystal-clear water.

The Baldwins plan to harvest this crop from August through to mid-November.

"We've got fairly sandy soils that suit for crisping potatoes and good irrigation supplies so there are a lot of things that add up for us," Tim said.

"A good crisping potato is probably a potato that grows in a range up to 90mm, doesn't have deep eyes, is round and has a good flesh colour.

"The Australian market [chips] is for white flesh."

In addition to potatoes, it's a diversified operation, with 12,000 macadamia trees planted on 40ha and some sugar cane.

"I don't think it's wise to have all your eggs in one basket," Tim said.

"The macadamia trees are holding up within reason at the moment – they were a hefty capital investment at \$20 a tree plus land prep and irrigation infrastructure.

"We headed towards some diversification with potatoes."

When asked what the biggest challenges were in starting to grow potatoes, Tim is honest and humble in his response.

"What was the biggest learning curve? When starting to grow potatoes, the biggest challenges was learning nutrient and water requirements," Tim explained.



"They all just look like a spud sitting here in the shed, different varieties have different characteristics requiring a few tweaks to their growing requirements.

"We are on a learning curve – I'm 55 and still learning plenty I can tell you.

"I don't think it's different to moving into any other industry.

"I don't think there is a farmer out there that has waltzed into growing any crop and nailed it bang first time."

Potatoes are nutrient hungry, sucking a lot out of the sandy soils. To spell the fields ready for next winter, the Baldwins' practice a 1 in 2 rotation with a summer sorghum crop and a winter cereal crop on the potato fallows.

"I have found that the biggest deterrent to a good potato crop other than government bureaucracy is too much rain," Tim said.

"When we have dry winters, we grow our best crops."

Diseases like blight and slimy stem can affect the potato crop, but lack of soil oxygen when too much rain falls is the biggest threat. Fundamentally the potatoes drown.



For the most part Baldwin Produce is drought-resistant and the business anticipates that with current capacity they will have enough water for up to four years.

Fruit and Vegetable News magazine asked Tim what kinds of responses he gets from the general public when they find out he's a potato grower.

"It's surprising how many people don't know that a spud grows under the ground," Tim responds.

#### **Growing potatoes for chips**

"The goal for us is to fill the void when potatoes are not harvested in the south of Australia," Tim said, when asked why potatoes are grown in such a warm location like Bundaberg.

"They are a temperate crop.

"In Europe, their warm, growing season is equivalent to our cool season in this area in Queensland." Tim added that crisping factories in Europe only cook fresh chips for a limited amount of time, with most potatoes stored at controlled temperature and atmosphere.

#### For good chips – fresh is best.

In Australia, there is a diverse geographic spread of growers.

"Chipping companies like to have a spread – if it rains up north, they have some diversity when it comes to drawing potatoes for chipping," Tim said.

At Baldwin Produce, about 100ha are planted every Autumn through to mid-winter. That's 3.25t/ha with a 37t/ha yield or a rate of between 10 and 12 spuds per plant.

Seed potatoes are freighted from South Australia to Baldwin Produce at a cost of \$1000/t plus and are delivered to the farm - by far the highest expense for the Baldwins' potato crops.

Fertiliser is running a very close second to freight at the moment, Tim said.

"Expenses are rising quickly and Snackbrands Australia is coming with us – they are lifting the contract prices to help cover the costs of production," Tim said.

Additionally, Tim said, farmers' ability to absorb costs is becoming harder with most competent farmers today using state-of-the-art technology and methods.

Despite these challenges, Tim is committed to farming and paving the way for the future of Baldwin Produce.

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- Agronomist, Tom Brown

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## New nematicide provides relief from root-knot nematodes

Root-knot nematodes [RKN] (*Meloidogyne* spp.) are one of those pests that growers can sometimes forget to monitor for and manage. It's often a case of out of sight, out of mind. But the good news is that if you know RKN are present at levels that could cause economic damage, they can be managed effectively with a combination of cultural and chemical strategies.

# Often, by the time symptoms are visible, irreparable harm has been done to the crop.

"When we're talking about nematodes, we're talking about microscopic plant parasitic organisms. They're impossible to see with the naked eye" said Syngenta Technical Manager, Rob Vitelli. "Under the microscope they're quite easy to see, but in the field, you're looking for a certain type of damage."

Plants rarely die from a RKN infestation but galling on roots caused by RKN feeding limits the ability of a plant to use water and nutrients. Often, by the time symptoms are visible, irreparable harm has been done to the crop.

"The galling caused by RKN feeding impacts negatively on plant growth and you can't reverse that damage," said Mr Vitelli.

"It compromises the root system and that means the crop is compromised – it can't grow properly."

RKN have an egg, juvenile and adult stage and complete their whole life cycle in the soil.

"When there's moisture in the soil profile, the RKN eggs will hatch and the second stage juvenile (J2) is the mobile stage of the nematode." "They use the thin films of water around soil particles to move through the soil. If they sense that there's a root exudate, they attack. They can travel up to a metre actively looking for plant roots to invade."

When it finds a suitable root, the RKN releases enzymes to soften the plant cell walls and then uses a retractable spear (stylet) to create a wound so it can enter the root. After a few days the infested root starts to swell resulting in a gall.

"Once the root-knot nematode is inside the root it can complete its life cycle and become an adult. The female can produce up to 1000 eggs."

RKN are commonly associated with porous sandy and sandy loam soils. The texture of these soil types allows RKN to move freely between soil particles.

"TERVIGO® nematicide is now registered for root-knot nematode in potatoes. It is specifically formulated for soil application to help move the active ingredient through the soil profile to protect the developing root system," said Mr Vitelli.

Because of their small size, specialist identification and quantification is needed for nematodes, to determine

if they are at levels that could cause economic damage.

"It's important to go out and take soil tests, using the Z-shaped sampling pattern and send the samples to a lab to obtain nematode counts before planting," said Mr Vitelli.

"Most agronomists should have access to a soil corer to take soil samples and can advise where to send the soil for analysis. Alternatively, you could use a DNA based PREDICTA® Pt soil testing service."

The suspension concentrate (SC) formulation of TERVIGO® nematicide contains abamectin, an active ingredient that irreversibly paralyses RKN, so they are no longer able to move and infest roots. For potatoes, TERVIG® nematicide is applied as an in-furrow spray at planting with the nozzle directed into the furrow just before the potato seed is covered, followed by a second application as a banded spray over the row between 14 and 30 days after planting.

"At the end of the day you want to achieve early protection of root systems. We're not eradicating nematodes; we're just reducing the level of pressure, which reduces galling and potential damage to tubers" said Mr Vitelli.

A withholding period is not required when TERVIGO<sup>®</sup> nematicide is used as directed and there are no plant back restrictions. For resistance management it is classified as a Group 6 insecticide. TERVIGO<sup>®</sup> nematicide provides a powerful and simple solution that protects potato crops from RKN, helping growers deliver more consistent marketable yields.

#### **FIND OUT MORE**

For more information on TERVIGO® nematicide contact your local Syngenta representative or visit syngenta.com.au/tervigo.

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Less galls means a better root system, maximising nutrient and water uptake and allowing the crop to thrive and reach its yield potential. In the case of potatoes though it's not only root systems being attacked, tubers can also be damaged impacting both on quality and yield." FROM THE BUREAU OF METEOROLOGY Climate outlook overview

#### Rainfall

#### Wetter than average October to December likely for eastern Australia

There is a moderate to high chance (greater than 70%) of above median October to December rainfall for much of the eastern half of Australia; below median rainfall is moderately likely (60% to 70% chance) for parts of Western Australia and central west coast to south-west Tasmania.

The pattern is generally consistent throughout each of the three months in the outlook period; chances of abovemedian rainfall in eastern Australia are strongest in October and November.

Large parts of the Top End and around the Gulf of Carpentaria, much of the eastern mainland states, and eastern Tasmania have more than twice the average chance of unusually high October to December rainfall (in the wettest 20% of all such periods over 1981–2018).

#### **Temperature**

#### Warmer days likely for the north-west, north and west coast, and Tasmania during October to December, but cooler for parts of the east

October to December maximum temperatures are moderately likely to be above median (greater than 65% chance) across the north of Western Australia, and most of the northern and western coasts of the mainland, and highly likely to be warmer than median for most of Tasmania (greater than 80% chance); cooler than median days are likely across much of New South Wales and the southern half of Queensland.

Minimum temperatures generally likely to be warmer than median for October to

December over much of Australia (greater than 70% chance).

There is at least three times the average chance of unusually high minimum temperatures (in the warmest 20% of all October to December periods over 1981–2018) for the northern tropics and much of south-eastern Australia, and two times the average chance for the west of Western Australia.

The Bureau of Meteorology has declared a La Niña event is underway in the Pacific Ocean and communities in eastern Australia should be prepared for more rain than average over spring and early summer.

#### What does this mean?

While La Niña criteria have been met, most models forecast this event to be weak to moderate in strength, likely to peak during spring and ease during summer.

- More than 80 per cent chance of above average rainfall for most of the eastern half of Australia.
- Increased chance of a wetter spring for inland areas of New South Wales and Queensland.
- Drier than usual in parts of Western Australia and in western Tasmania.
- The first rains of the northern Australia wet season are likely to be earlier than average for much of Queensland and the Northern Territory.
- An increased risk of tropical cyclones forming in the Australian region.
- Warmer days across our tropical north and far south.
- Cooler days for large parts of mainland Australia.

**SUMMARY** 

- October to December rainfall is likely to be above median for the eastern half of Australia, but below median for parts of Western Australia and part of western Tasmania.
- October to December maximum temperatures are likely to be above median across Tasmania, the north of Western Australia, and most of the northern and western coasts of the mainland; cooler than median days are likely across much of New South Wales and the southern half of Queensland.
- Minimum temperatures generally likely to be warmer than median for October to December over much of Australia.

La Niña declared, along with increased chance of above average rain for eastern Australia

#### **More information**

Bureau's website bom.gov.au/climate/outlooks/ Climate Outlooks bom.gov.au/climate/ahead La Niña criteria bom.gov.au/climate/enso/outlook **Climate Driver Update** bom.gov.au/climate/enso **Flood warnings** 

bom.gov.au/australia/flood

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Jane Bunn in her session.

With regards to rain, meteorologist and popular weather presenter Jane Bunn said two factors must work together – tropical moisture and instability. "On weather maps, we see instability as low pressure," Jane said, addressing the crowd at Hort Connections 2022.

Tropical moisture comes off tropical oceans, while in comparison, air coming from the south holds minimal moisture.

# Illustrating sea surface temperature

Jane used charts through her presentation (much like her weather forecasts), drawing the audience's attention to the latest sea surface temperature anomaly. "If it's blue, it's cooler than average. Orange and red are warmer than average," Jane explained.

Blue water in the Pacific Ocean box means moisture is being sent towards Australia. "That is known as La Niña." Blue colours in the Indian Ocean box mean moisture is being sent towards Australia from the Indian Ocean.

Next, she showed a chart of the Indian Ocean Dipole (IOD) – a measure of the difference in sea surface temperature between two areas (or poles) in the Indian Ocean, which affects Australia's climate. Jane noted every model was predicting a move towards a negative dipole in spring 2022, indicating tropical moisture will be pushed towards Australia from the Indian Ocean until the end of the year.

# Taking advantage of the weather to maximise farming opportunities

Understanding more about the weather can assist with making good farming decisions. In her session at Hort Connections, meteorologist and Melbourne Channel 7 weather presenter Jane Bunn explained how growers can use weather forecasting to maximise farming opportunities. **SOPHIA AULD REPORTS** 

Similar patterns occurred in 2020 and 2021. In the five to ten years prior, the IOD was mainly positive, Jane said. Therefore, "no matter how many lowpressure systems you got, they just didn't contain much moisture, so we didn't get the great rains."

Turning to the Pacific Ocean, Jane said indicators were "hovering just on the side of La Niña", making it the third in a row if it occurs. "This would mean the Pacific Ocean would continue to push tropical moisture towards Australia and whenever low pressure comes in, that is going to turn to rain."

#### Low pressure

The other factor necessary for rain is low pressure. However, when looking at the weather map, Jane suggested first looking at where high pressure is. She explained that when high pressure sits over New Zealand, "the winds travelling in this direction pick up warm moist air from the Pacific Ocean and push it straight into the eastern parts of Australia."

Next, look where low-pressure cells are. When moist air driven by a high over New Zealand encounters a cold front coming up from the Southern Ocean and low pressure off or near the coast, it leads to heavy rain. This pattern was responsible for the widespread flooding experienced in Queensland, New South Wales and parts of Victoria earlier this year, Jane said. A measure called the southern annular mode (SAM) indicates what is happening with lows and highs.

"When it's positive, it encourages highs to sit over the southeast and troughs and lows to form in Queensland and New South Wales," Jane said.

"When it's negative, that encourages cold fronts to come up from the Southern Ocean. Through summer and autumn, it was positive most of the time.

"We had trough after low parked over Queensland and New South Wales bringing tropical moisture and lots of wet weather."

#### Jane's predictions

Next, Jane made predictions for the following months. For June and July, indicators suggested a higher-thanaverage chance of above average rainfall for southwestern parts of the country and chilly temperatures. For August to October, a range of global models suggested it looks like being "quite a wet year" with temperatures set to stay "on the chilly side".

#### FOR MORE INFORMATION

Growers can visit **janesweather.com** for a range of weather information, with an alerts service to help you capitalise on opportunities and minimise risk. The team can also curate personalised weather details to help with decisions such as when it's best to spray.

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# **Challenges and opportunities** for the horticulture industry

Staying current with industry trends helps horticulture businesses prepare for risks and capitalise on opportunities. In the State of the Industry session at Hort Connections – sponsored by Hort Innovation and led by the International Fresh Produce Association of Australia and New Zealand CEO Darren Keating – a panel discussed some of the findings from EY's latest industry report. **SOPHIA AULD REPORTS** 



International Fresh Produce Association of Australia and New Zealand CEO Darren Keating.

#### Affordability and value

A key theme from EY's latest industry report is consumer focus on price, noted Alastair Mcarthur, a Director at EY.

However, according to Coles Fresh Produce General Manager Craig Taylor, the real issue is value.

"Cost is what you pay. Value is what you take home," Craig said.

"Where fresh produce is concerned, there's a rich tapestry of stories we can be telling our customers, whether that's around quality, freshness or how and where it's grown.

"It's not just about what they're buying – it's around their experience when they take that product home."

Organic produce, for example, "attracts premium prices, but to that customer it represents value."

Marie Piccone, Managing Director at Manbullo, added convenience is key to delivering value.

"My son loves jackfruit, but he won't eat it unless I put a container of ready-to-eat portions in front of him," Marie said. "We have to grab this opportunity to make fruit fresh fruit and vegetables a great experience for people. We're seeing a rapid movement in the way consumers are thinking and behaving. If we're not cognisant of that, we'll be dinosaurs."

#### **ESG issues**

Marie sees climate change and sustainability being major challenges over the next 10 years, she said. She noted a balance must be struck between consumer affordability and grower profitability, necessitating greater efficiency.

"We need to do things quicker, smarter and better, like using energy more efficiently," she said.

ESG is on the radar of investors and regulators, said Alastair.

"It's becoming increasingly important in planning and decision making. We're seeing banks make financing decisions based on people's actions and activities," he said.

For horticulture, Alastair says the top risk lies in modern slavery, while the top opportunity lies in biodiversity.

Sustainability is also driving consumer sentiment, with the report showing 30% of consumers say they consider sustainability all the time when purchasing fruit and vegetables, Darren said.

Craig added that in three years' time, one in four people will cite sustainability as the number one criterion when purchasing. Furthermore, Coles gets significant customer feedback about food waste and packaging, with reductions in plastic and unnecessary packaging viewed favourably.

#### Shift to online shopping

In another trend, online shopping has increased by 40 per cent, said Chanel Day – Executive Manager Fresh and Packaged Food at Quantium.

"We've seen new shopper groups, such as retirees, purchasing online. Some of those will return to their pre-COVID behaviours and start shopping in stores again, but a cohort are continuing to shop online," Chanel told the Hort Connections crowd.

She added online shoppers were more likely to purchase the same brands and products and less likely to try new ones, "so in-store is definitely the place to attract shoppers when you're launching a new product."

#### Ag tech opportunities

Darren noted ag tech is predicted to become a \$100 billion industry, with drones and robotics increasingly used.

Chanel added that businesses can benefit from technologies that collect and track data throughout the supply chain.

"We could get real-time forecasting across an entire crop and understand how much product is flowing down the supply chain at any time. We could match that with demand-side factors, so at retail you can move levers with things like promotional activities," she said.

Marie agreed tech will continue to positively influence the industry.

"It's going to add more efficiency and bring more talent into horticulture. It's opening up great opportunities for growers and exporters," she said.



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RDO





At Native Co, Marlon Motlop and team grow a collection of native foods such as River Mint, Sea Parsley, Salt Bush and many more, available for consumers and on the wholesale market.

# Making First Nations foods accessible for all Australians

In 2018, Marlon Motlop noticed a gap in the market – for readily accessible native ingredients and First Nations foods, especially in his home state of South Australia. Fast forward two and a half years, and the original vision has scaled up – to creating a governance framework for distribution of these culturally significant foods, that ensures input from Aboriginal and Torres Strait Islander groups every step of the way.

Marlon Motlop met Damian Manno, Director at Quality Harvest and recently named Corteva Agriscience Young Grower of the Year in the National Awards for Excellence, through Marlon's cousin Daniel – who himself works in native produce supply.

With the help of Joe Capobianco, it wasn't long before they conceptualised and developed the Native Co. They produce a collection of native foods such as River Mint, Sea Parsley, Salt Bush and many more, available for consumers and on the wholesale market.

"Food is such a great way of bringing people together. It's how we share our cultures and our stories," says Marlon, Director and Farm Manager at Native Co.

But there were setbacks along the way.

#### Setbacks

Getting a new business off the ground is hard, but facing off with a global pandemic in your first few years of operating is another matter altogether. Marlon says there were moments when he wasn't sure they were going to make it.

"I looked to Damian and Daniel a lot, for advice and guidance. There's a meaningful and respectful relationship between the three of us," he says.

A passion for preserving and sharing the cultural significance of these foods helped the team persist.

"A lot of these products have cultural properties, traditional meanings or have been used medicinally by First Nations cultures," says Marlon.

"We wanted to explore, acknowledge and respect those roles first, before taking them into a commercial context."

#### Raising awareness of First Nations food

The goal of Native Co is to make these products available at every level of the food spectrum, increasing awareness and knowledge of the unique tastes and precious qualities available in plants right here in Australia.

The Native Co website includes recipes for the herbs and greens it sells, easy swaps to make for your own favourite recipes and tasting notes. Scoring press and TV slots has also helped to elevate knowledge of these foods amongst Australians.

By creating greenhouse environments, Native Co has been able to revitalise endangered species of First Nations foods and preserve them for future generations – all with a minimal carbon footprint.

Wholesalers, retailers and consumers can all place orders directly through Native Co, and the products are also available to consumers at the Adelaide Central Markets.

Marlon says winning the Butler Market Gardens Environmental and Sustainability Award has helped shine a light on the real story of Australia, the history and lineage of Aboriginal and Torres Strait Islanders, and the other cultures we were trading with for hundreds if not thousands of years before colonisation. It was also an acknowledgement of "a lot of effort and persistence".

#### Creating opportunities for First Nations peoples

Preserving these culturally significant foods, for Marlon, goes hand in hand with creating economic opportunities for First Nations peoples. Supply Nation has found that Indigenous-owned businesses are 100 times more likely to employ Indigenous Australians than non-Indigenous-owned businesses.

Setting up Native Co has given Marlon the opportunity to involve other First Nations people in a commercial context, and this is just the beginning for how these foods can contribute to income and commercial opportunities for Aboriginal and Torres Strait Islanders.

Marlon and the team behind Native Co are already diversifying and responding to shifts in the market as they appear. They are starting to consolidate the growing and production of Native Co products into Quality Harvest supply lines, freeing up some of Marlon's time to explore other opportunities, such as First Nation Fresh Produce.

The concept started as a way to deliver fresh produce and essential items to Aboriginal communities during the pandemic. It's now evolved into product evaluation.

Marlon has also been awarded a Nuffield Scholarship, which he is using to research how First Nations foods are being preserved, utilised and commercialised around the world. He is also exploring how to build a deeper understanding of Australia's First Nations foods, their application and use around the country.

With so many diverse languages groups and Indigenous nations, there's a lot of knowledge to tap into and learn from.

He says something he would love to do through the Nuffield Scholarship is not only bring insights from around the world back to Australia, but also to identify ways to protect and celebrate culture.

"[I'm keen to] create a framework or model for preserving these foods that has First Nations input every step of the way: from capturing traditional uses and cultural practices, harvesting and growing, right through to selling to consumers in a way that honours and shares the lineage of these plants and their significance."

Not only an entrepreneur, Marlon is also a musician, collaborating with former AFL team mate Rulla Kelly-Mansell, amongst others. While he's a busy man, his passion for sharing these foods and utilising their significance to uplift the Aboriginal and Torres Strait Islander community keeps his feet firmly planted in the horticulture sector.

#### Sponsoring the Butler Market Gardens Environmental and Sustainability Award

Butler Market Gardens is very proud to be the on-going sponsor of the Environmental and Sustainability Award.

Sustainability is one of our business' four core pillars of focus. We certainly understand and support its importance to the industry.

To us, sustainability is about strengthening and improving a business and the environment it works within.

We believe sponsoring this award prompts and promotes businesses and individuals to continually challenge, improve and refine practices and procedures within their business. It promotes innovative thinking and leadership within the industry and leads to collaboration and sharing of new techniques which strengthen the industry as a whole.

It's very important we recognise and celebrate those who excel in this area to continue the growth.

The goal being to achieve ongoing supply of great quality produce for generations to come.



# Sponsoring the E. E. Muir & Sons Community Stewardship Award

E.E. Muir & Sons are passionate about improving the environmental sustainability of agriculture. We recognise that the long-term financial success of our business and our customers is inextricably linked to the protection and enhancement of the natural resources we rely on to produce the best quality fresh produce in the world. We are proud sponsors of the Community Stewardship Award and congratulate this year's deserving winner.

**Above.** Sam Kisvarda, Chief Marketing officer at Flavorite, has played a crucial role in the organisation's partnership with Maddie Riewoldt's Vision.

## Aussie-grown tomatoes support research for bone marrow failure syndromes

Flavorite, the largest glasshouse grower in the southern hemisphere, has partnered with the charity Maddie Riewoldt's Vision for seven years. The winner of this year's E.E. Muir and Sons Community Stewardship Award isn't satisfied with just raising funds – they're committed to telling Maddie's story and raising awareness of bone marrow failure syndromes (BMFS).

Beginning in the early 1990s as a tomato grower, Flavorite has since diversified its product range to become a leading Australian supplier of not just tomatoes but also capsicums, cucumbers and blueberries.

In 2019, one of its founders, Mark Millis, lost his battle with a rare blood cancer called Multiple Myeloma. Before he passed, Mark was adamant about finding a way for Flavorite to give back to the community. This led to a partnership with the charity Maddie Riewodlt's Vision, which has now been going strong for seven years.

Sam Kisvarda, Chief Marketing Officer, has been with Flavorite for 17 years. He worked with Mark Millis and says the personal connection the team feels to the cause is what spurs them to grow the campaign every year.

#### A truly worthy cause

Maddie Riewoldt was just 26 years old when she died of complications of a Bone Marrow Failure Syndrome called Aplastic Anaemia. She was diagnosed at 21 years and for five tough years, she put up a brave fight. Maddie spent those years enduring several bone marrow transplants, hundreds of blood transfusions and ongoing treatments. Maddie wanted to ensure nobody else went through what she did. Maddie Riewoldt's Vision is her legacy.

#### PROFILE | HORT CONNECTIONS WINNER





Each November, Flavorite runs their Maddie's Month campaign in Coles stores across Australia. Flavorite tomatoes and capsicums are wrapped in purple packaging – the branding colour used by Maddie Riewoldt's Vision.

#### **Raising awareness**

Every year, Flavorite looks for different ways to grow its contribution. Four years ago, it brought Coles on board. Now, with each campaign, Coles supports the program with advertising and in-store marketing materials. They've even been able to foster relationships with Australian sport stars to advocate for the cause.

Winning the national E.E. Muir and Sons Community Stewardship Award this year was the first time Flavorite has been recognised within its own sector for this contribution. It has been another opportunity to raise awareness and "get the cause in front of our industry peers" says Sam.

He says working to give back on a specific issue helps the team at Flavorite to tap into, and stay connected to, their community.

"The more you talk to people, the more you realise the long ranging impact these syndromes and cancers have. I've spoken to customers that have a connection to this cause, I've heard from our partners, friends, colleagues and more."

Sam is always looking for ways to scale up the partnership, Flavorite's contribution and awareness.

"I would love to see year-round recognition. So not just Maddie's Month in November with Flavorite, but something happening every month to keep this cause top of mind."

#### **Giving back to the community**

For horticulture as a sector, or indeed any organisation looking to get active in their community, Sam has some words of advice.

"We're all working hard; it can be easy to think we'll get around to these things later. But the key for us at Flavorite was to make it a part of business as usual. Find ways to make it something that's a part of your every day, that you naturally just do."

For the Flavorite team, these BMFS are close to their heart after having it affect one of their own. Finding a cause that resonates with the team, something they are passionate about, keeps them engaged in the campaign year after year.

"That's what I keep coming back to, those conversations with Mark when we were first getting the partnership going. I know he would be proud of where the program is now."

So, what's next for Flavorite and Maddie Riewoldt's Vision?

"The more partnerships we form, the more networks we become a part of – that's how we can share this important message."

**Above.** The Flavorite team has a personal reason to support Maddie Riewodlt's Vision. In 2019, one of its founders, Mark Millis, lost his battle with a rare blood cancer. Before he passed, wanted to find a way for Flavorite to give back to the community. This led to a partnership with the charity.

Each November, Flavorite runs their Maddie's Month campaign in Coles stores across Australia. Flavorite tomatoes and capsicums are wrapped in purple packaging – the branding colour used by Maddie Riewoldt's Vision. Ten cents from every specially marked pack sold is donated directly to Maddie Riewoldt's Vision to assist in the search for a cure to the often-fatal syndromes affecting bone marrow failure patients.

Flavorite has raised \$100,000 in donations each year for the last six years. In fact, it was one of the first major businesses to partner with the charity. Now in its seventh year, the partnership has made a significant contribution to the research capacity of Maddie Riewoldt's Vision. But Sam says: "It's not just about the money – there's much more to it."

"A lot of our work has been about tapping into our network to bring more partners on board and raise awareness of these syndromes and the huge amount of work that needs to happen if we're going to improve how BMFS can be managed and ultimately cured."

## Using EEFs and soil testing for spring spud productivity

With potato planting season underway, growers should consider enhanced efficiency fertilisers (EEFs) to manage nitrogen (N) efficiently, reduce loss and optimise fertiliser use. That's the view of Incitec Pivot Fertilisers (IPF) Horticultural Technical Agronomist, Conrad Leeks who says growers who include an EEF in their nutrient management plans should see a boost in N availability and potentially increased productivity.

"EEFs are widely used by growers to protect against N losses and provide greater flexibility in the timing of N applications. By reducing N losses growers may find that they can save on 1 or 2 N fertiliser applications.

"EEFs manage three of the four main N loss pathways – run-off, leaching, and denitrification," Mr Leeks said.

"On their own, EEFs do not protect N from the fourth loss pathway volatilisation, so effective incorporation into the soil is essential."

eNpower<sup>®</sup> is an EEF containing the nitrification inhibiter DMPG. It works by slowing down the conversion of ammonium-N to nitrate-N, which is more prone to loss. Ammonium contains a positive charge, and therefore binds to the negatively charged soil ion. This allows it to remain in the topsoil longer, hence reducing leaching losses, that typically occur with the negatively charged nitrate ion.

#### **Balancing nutrition**

Understanding the available nutrients in the soil is also an important step for potato growers, according to Mr Leeks. This should start with soil testing to understand initial soil fertility levels; followed by a fertiliser program that matches crop demand; and finally tissue testing to address any in-crop nutrient deficiencies.

"Soil testing helps understand what nutrients are present in the soil and the level of their availability to plants," Mr Leeks said.

"Ideally, soil sampling should be conducted at the same time each year, so the results can be used to monitor and improve soil health over time. Ideally, growers should sample several weeks prior to planting. At least 25 to 30 cores should be collected for each topsoil sample, to a depth of 0 - 15 cm. If there are areas in a paddock with different soils or different management strategies, they should be sampled and tested separately."

The IPF Nutrient Advantage® E72 soil test is the best comprehensive package for potato growers in southern Australia. It will provide results on all the macronutrients, as well as the micronutrients (copper, iron, manganese, and zinc) pH, texture, organic carbon, chloride levels and electrical conductivity. Having this information will help develop fertiliser recommendations tailored to individual crops.

The Nutrient Advantage<sup>®</sup> laboratory is a major provider of soil, plant tissue and water analysis and is externally accredited by third-party parties such as the National Association of Testing Authorities (NATA) and Fertcare<sup>®</sup>. It also participates in the Australasian Soil and Plant Analysis Council's (ASPAC) proficiency program.

An example of the E72 test results is shown (Table 1). The paddock in the northern Mallee was about to be planted with potatoes. "Based on these results we can see that the soil pH is highly alkaline and, therefore, phosphorus (P) and zinc (Zn) availability will be limited. The PBI is low so the soil's ability to hold onto P is poor. The CEC and the calcium (Ca) percentage are very high which indicates that the soil is calcareous, which would also likely limit P availability."

#### Consider a custom blend

With spring underway, Mr Leeks advises using custom fertiliser blends to develop a fertiliser program to match nutrient supply with crop demand.

"Blended fertilisers are a convenient and inexpensive type of fertiliser as they meet all the crops nutritional requirements. Furthermore, trace elements can be applied in the one application, at the required rates."

Potatoes typically require 5.2 kg of N, 1.96 kg of P and 7.85 kg of K per ton of harvested crop. An example Custom Blend for this situation would be a blend of Cal-gran, Gran-AM, Granulock Z with Potassium Sulphate (SOP).

"You can add eNpower to this blend and apply pre-planting or at banking to help keep more N in the root zone for a longer period of time," Mr Leeks said.

"Incitec Pivot offers more than 900 standard blends, with a further 3,600 custom blends generated after requests from Nutrient Advantage® Advice accredited advisers or from Incitec Pivot distributors.

#### TABLE 1.

Results from a 0-15 cm soil test from a sandy soil in the northern Mallee.

Analyte	Unit	Result
pH (CaCl)		8.4
Nitrate (NO <sub>3</sub> <sup>-</sup> )	mg/kg	11
Chloride (Cl <sup>-</sup> )	mg/kg	13
Phosphorus (Colwell)	mg/kg	35
Phosphorus Buffering Capacity Index (PBI)		17
Available Potassium	mg/kg	190
Electrical Conductivity. Sat.ext	dS/m	1.5
Cation Exchange Capacity (CEC)	cmol(+)/kg	17.5
Calcium (Ca) % of Cations	%	86
Magnesium (Mg) % of Cations	%	10
Sodium (Na) % of Cations	%	0.43
Potassium (K) % of Cations	%	2.8

"Access to custom blending and to a comprehensive range of fertiliser blends allows the nutrients in your fertiliser investment to better match crop requirements."

"To help, the Nutrient Advantage Pro® decision support system has a comprehensive set of horticulture rules to convert soil test results into a fertiliser recommendation." Mr Leeks said.

#### FIND OUT MORE

Growers interested in upgrading to an EEF as part of their nutrient management solutions, visit **smartfertilisers.com.au** to find more about **eNpower**<sup>®</sup> and the wider range of IPF smart fertilisers.

To find out more about soil testing and custom blends, visit **ipfhorticulture.com.au** or **nutrientadvantage.com.au**.

Alternatively, contact Conrad Leeks, IPF Horticultural Technical Agronomist, via conrad.leeks@incitecpivot.com.au



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# Next-gen agronomist showcasing perks of working in horticulture

## At a glance

Name: Emily Nellis Age: 27 Job: Agronomist Location: Tasmania

As an agronomist, Emily studies plants and soils and applies the knowledge to strengthen the crop production techniques and soil management procedures.

Her general job tasks include monitoring the crop from planting to harvest and making sure there are no issues with pests or diseases.

She also provides crop and soil management advice and recommends products to growers when required, such as fertilisers, insecticides, and herbicides, to ensure the best possible yield, all while conserving the soil.

Although some of her time is spent in an office, Emily primarily works outside and is constantly driving around Tasmania visiting different farms.

## Emily, can you please describe your role at Agronico and what it involves?

My role at Agronico is as a vegetable agronomist and our main business at Agronico is in seed potatoes.

When doing the agronomy for Agronico, I work primarily in carrots, onions and Based in Tasmania, Agronomist Emily Nellis is working as a vegetable agronomist for Agronico, mainly focussing on seed potatoes, as well as broccoli, Brussels sprouts and cauliflower crops.

potatoes, however, we also do broccoli, cauliflower and Brussels sprouts. The end market for the produce is all over the world – some of it is on the national market, however, a lot of it is also exported.

My responsibility as an agronomist is to be monitoring the crop from planting all the way through to the harvest; keeping an eye on the crop; making sure there are no issues; recommending products where they need to be recommended, such as fertiliser, insecticide, herbicides; and keeping the grower up-to-date.

As an agronomist, you've got to have a variety of skills. A driver's licence is key, and you've got to be relatively fit to be able to do this as we're walking several kilometres a day.

You've also got to have an AgSafe in order to recommend these herbicides and insecticides, which is a safety mechanism put in place.

#### Why do you like working in horticulture?

The bulk of what drew me to agriculture and specifically horticulture is that I could get out and about on-farms. It's a lot better than sitting in an office... I even call my office a cave so it's great to get out and about.

The coolest thing about my job is that every day is different. I get to see a range of crops, I'm outside and I meet with lots of really exciting, really cool people, and it keeps me on my toes.

## How does your job fit into your lifestyle?

Work/life balance is manageable. I play sport outside. I've got family and friends. So essentially, I don't find myself struggling to fit other things in with my work roster.

#### How did you become an agronomist?

To become an agronomist, it is vital to have a Bachelor of Agricultural Science – it is vital to my agronomy and I use my degree every day.

It gives me a lot of background knowledge in everything that I need, whether that be plant physiology, chemistry of products. It's also fantastic to have hands on experience in agriculture before moving into the agronomy role.
We're feeding the world and the country, and you get to see that. <u>It's really exciting.</u>

> Grow Your Career video series





Before I was an agronomist, I got some experience on a vineyard and I also worked as a field manager in a raspberry farm.

What advice do you have for someone considering a career in horticulture/agronomy? For someone looking into getting into agriculture, I'd just say, just go ahead and do it. It's fun. It's exciting. It gets you out of the office. It keeps you on your toes. We see a seed get planted, and then we see a carrot or an onion or pea or anything at the other end, and you get that sense of accomplishment.

#### **FIND OUT MORE**

AUSVEG has launched the **Grow Your Career in Horticulture video series**, which highlights the diverse range of careers in the Australian horticulture industry.

To find out more about the Grow Your Career in Horticulture series, visit

ausveg.com.au/grow-your-career.

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

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## You're in safe hands with Soleto®

Soleto<sup>®</sup> is a pre-emergence herbicide for the control of annual broad-leaved weeds and annual grasses in potatoes.

Very high crop safety, no variety restrictions. Safer on Metribuzin sensitive varieties.



FEATURES	BENEFITS
New Active Constituent	500g/L METOBROMURON GROUP 5 Suspension Concentrate (SC) Herbicide applied as a Pre-Emergent Herbicide.
Tried and trusted	Trials and demonstrations in Australian conditions over the last 4 years.
Very high crop safety	No variety restrictions. Safer on Metribuzin sensitive varieties. Assessed for efficacy and crop safety in multiple trials in Victoria, Tasmania and South Australia prior to registration.
Broad spectrum weed	Large range of broadleaf and grass weeds including Nightshades and Fathen.
Persistent residual weed control	Half life of 27-33 days in soil and only moderately soluble, ensuring effective weed control until after row closure.
Suitable for all soil types and moistures	Effective under all conditions with consistent results, including dry conditions.
Tank mix flexibility	Can be tank mixed with a range of pre-emergent, and knockdown herbicide. Ask your local agronomist for recommendations.
Applicator Safety	Non scheduled poison.



With increased fertiliser prices and no sign of a decrease on the horizon, growers are seeking ways to reduce input costs while retaining a profitable yield. Soil First Tasmania has completed some grower trials to examine if soil amendments when paired with reduced fertiliser can retain profitable yields. The trial results were shared at a recent field day with the Tasmanian Institute of Agriculture, Soil Wealth and Integrated Crop Protection (SWICP) and VegNET Tasmania.

With increasing fertiliser costs, it is more important than ever for growers to be getting the best nutrient use efficiency they can from their applied fertilisers.

The grower group Soil First Tasmania conducted on-farm trials over the 2021-22 growing season to examine if soil amendments paired with reduced fertiliser input can produce a marketable yield comparable to (or better than) a more conventional fertiliser program. The results from this trial were shared at a recent field day at the Tasmanian Institute of Agriculture (TIA) Forthside Vegetable Research Facility.

## **The Trials**

Each of the growers involved was able to select from a range of amendments to include in their trial. The amendments included humates, chicken manure pellets, Neutrog and kelp-based products, along with microbial and micro-nutrient products.

The general aim was to combine organic material alongside the synthetic fertiliser to promote nutrient availability for the crop. Potatoes, which are the largest annual crop (by tonnage and dollarvalue) in Tasmania, were selected for these trials but the principles apply across all crops.

## **The Results**

At harvest, strips were dug by hand from the trial rows and the potatoes weighed and recorded. Yields were then analysed to determine the marketable yield from each strip and extrapolated to determine marketable yield per hectare. This allowed us to determine a yield that growers can sell at harvest.

Yield results were a mixed bag with some areas yielding up to 11 tonne/ha above the control through to nearly 8 tonne/ha below the control. While variable most results were above or close to the control plots despite having reduced fertiliser applied (see Figure 1).

Treatment costs were calculated and compared with the marketable yield returns for each treatment against the control. These were combined to calculate a net benefit in \$ per ha for each treatment. Again, the results were varied with benefits ranging from nearly \$4,000 per ha to costs of around \$2,000 per ha.

Figure 2 shows the results for one of the growers with the Humates, chicken pellets and soil wetter treatments all showing a net benefit with the blended fertiliser and zinc, microbes and fertiliser treatments with a net cost compared to the control treatments.

"What we learnt is that there are options to reduce the amount of fertiliser we plant with but what we really learnt is that there is a lot more work to be done." ROBIN TAIT, SOIL FIRST



L-R. Growers and Agronomists inspecting the cover crop trial plots. Growers and Agronomists taking in the results from the trial.

## Sap testing

Alongside yield results each of the treatments had sap testing completed to determine if there were observable differences in how the crops responded to the different treatments. While there were no significant differences across the treatments there were some observed general trends. Overall nitrogen levels were quite high and micro-nutrient levels were low for all treatments.

## What Next

The participating growers have indicated they will be using some of these amendments in the upcoming season. Further trial work will be undertaken in future years to refine the use of these amendments in conjunction with the fertiliser applied.

## **Cover Cropping Research**

The field day also involved exploring species diversity in cover cropping. Theresa Chapman, a PhD candidate with TIA, led the group through her research plots where she is assessing the impact of species diversity with plots of 1, 2, 4 and 16 species in each cover crop mix.

Theresa is examining a range of factor's while aiming to emulate a normal Tasmanian cash crop rotation between the cover crop plots. With the cover crops about to be terminated ahead of a potato crop this season Theresa has been collecting data and will be sharing the data once analysed.

One early (and visual) result was an increased weed pressure in the single species plots compared with the more diverse plots. While cover cropping is becoming a more regular practice within the industry there is still plenty to learn as growers and agronomists work through how they can achieve their desired outcomes. Theresa's research will help to fill some of these gaps.

#### Acknowledgements

The trial was funded by Landcare Tasmania and the Tasmanian Landcare Fund. SWICP and VegNET are vegetable research and development levy funded projects. The full report will be available through Soil First, SWICP and VegNET shortly.

#### FIGURE 1.

Yield comparison for each treatment against each grower's control plots.



#### FIGURE 2.

Example of some of the net benefit results for one of the trial growers.



#### Find out more

Please contact Ossie Lang on 0430 380 414 or email ossiel@rmcg.com.au

*VegNET 3.0* is a strategic levy investment under the Hort Innovation Vegetable Fund. This project has been funded by Hort Innovation using the vegetable research and development levy and contributions from the Australian Government.

Project Number: VG21000

Hort VEGETABLE Innovation Strategic levy investment



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Add humic acid to your blends. Talk to your dealer or agronomist today about Trigger.







Tim Bond, Sales Manager for Automation at J-Tech, knew they were onto something special with the Aporo.

## Innovative technology eases labour strain for growers

J-Tech is in the business of making life easier for growers. Their latest offering, the Aporo, allows orchardists to grow their business despite labour shortages hitting the industry. This innovation resulted in J-Tech winning the UPL Tech Innovation Award at Hort Connections 2022.

J-Tech supplies labelling, packaging and automation solutions to fruit and vegetable growers across Australia. When its parent company, the Jenkins Group, took on global distribution for the Aporo, Tim Bond, Sales Manager for Automation at J-Tech, knew they were onto something special. He was confident it would change how growers, big and small, package their fruit for market.

The Aporo is an automatic packer that places apples into packing trays, with other fruit varieties currently being trialled. This year, J-Tech took home the *UPL Tech Innovation Award* for its work in bringing the Aporo to the Australian market.

"J-Tech has always been an innovative company and we put a lot of effort into getting out across the world to look for new products and tech, to bring back and make available to the Australian fresh produce industry," says Tim.

Two companies with which J-Tech had long-standing relationships through labelling systems, Blue Moon Packing (in Western Australia) and Montague's (in Victoria), came on board as early Aporo adopters. They invested in the technology before they had even seen it in action.

"That's a real testament to the trust they have in us, and the excitement around this innovation," says Tim.

## Flexibility key to success

It also gave all three companies the opportunity to make changes to the Aporo setup, learning as they went and trying out different iterations. The flexibility in Aporo's system is crucial to its success. Shed to shed, all growers and packers have differences in how they package and label products. A technical product that can adapt to different environments means a custom experience for the different growers.

For example, of the three organisations currently using the Aporo in Australia, each has its own approach. Blue Moon Packing had a shed and grader designed specifically for the Aporo to be integrated, while GV Independent Packers use the Aporo as its main packing apparatus. The third, Montague's, initially only used it for specialty product lines. But have since integrated it into major packing lines for shorter runs and higher volume specialty packs.

The Aporo has three different modes. At its simplest, it moves apples from crate to packing tray. In presentation mode, it looks for blush and places that side up when it moves the apple into the packing tray. Finally, it can be set to rotate apples until it finds the blush for each one.

Orientation can always be set, and the machine is responsive to different inputs. Even if the packing pockets aren't consistent, it will spot this – using built-in cameras – and pack accordingly.

It can even be integrated into existing setups, including for mixed sizes and grades of fruit. This helps to improve overall consistency of the end product.

## **Easing labour burden**

The labour market in Australia is currently under pressure. Lots of sectors, including fruit growers and packers, are facing shortages. The Aporo has started easing this burden to its current users, and there is potential for it to dramatically change how the sector operates.

"We estimate for each Aporo, three to four people can be removed from the packing process," says Tim.

"The original narrative was around saving money by not having to pay wages. "But actually, what we're seeing now is that the Aporo is about something much more significant for growers. It means they can grow their business without having to increase infrastructure."

Automation can also help with reducing the logistics that come with managing labour in a market under pressure, which is a huge win, especially for smaller operations. For owners, the Aporo frees up mental bandwidth – for working on their business, instead of in it. For managers and staff, the Aporo gives them back time to focus on higher value activities.

"We've seen different customers come to us with a core group of reliable staff, that have been with them and know the business. The Aporo doesn't replace these staff, it gives them the freedom to come off the packing line and work on activities that require more problem solving or creative thinking," says Tim.

And for businesses, it means they can jump on extra orders when the opportunity arises.

## What's next?

This is just the start for the Aporo. J-Tech is working on ancillary automation to go around it, removing the need for manual placing of crates and packed trays.

Plus, apples were just the first focus for this innovative technology. J-Tech has investigated how the machines can be modified to work with stone fruit. Field testing was completed in the United States last season, and this application is now available to Australian growers.

The team at J-Tech would love to see this innovation explored for avocados, pears, mangos – anything that's being packed in a dimpled tray.

"We're currently in discussions with some growers to work on this next cycle of development – so stay tuned," Tim says.

The Aporo in action, packing apples for Australian growers.



# Challenging and changing mindsets toward on-farm workplace safety

While Australian potato growers have received Nuffield scholarships and undertaken important research, there are many other topics researched by members of the broader global agriculture industry that can offer a broader perspective on topics that all growers can learn from.





#### TITLE

Superheroes, not super humans: Challenging assumptions and building capability to support 'good work, thriving people and great farming'

## AUTHOR

Lynsey Stratford Primary People, New Zealand. Lynsey is a 2021 Nuffield Scholar.

## Farm Safety in New Zealand

## Agriculture is the most dangerous occupation in New Zealand, the UK and Australia.

The rates of fatality and harm in NZ agriculture remain stubbornly high. This has negative impacts on the sector's productivity, profitability and sustainability. The consequences for farming families and communities are tragic.

The report Superheroes, not super humans: Challenging assumptions and building capability to support 'good work, thriving people and great farming' explores the paradox: Farmers care about people and each other, and Their workplaces kill, hurt or harm too many people.

Lynsey's report draws on semi structured interviews with nearly 50 stakeholders

complemented by conversations with countless farmers, their team and family members. A review of research exploring the current state of health and safety on farm and how farmers think identifies possible root causes of the current state (what's happening now).

## **Assumptions and beliefs**

Although largely invisible, assumptions and beliefs powerfully influence farmer behaviour, including:

- Lack of perceived susceptibility (they don't think they personally will get hurt).
- Risk is normalised by family and peers (everyone's doing it).
- Risk is assumed to be a part of farm work that can't be managed or controlled (when accidents happen, they are explained as 'freak' events or unpreventable).
- Risks are perceived to be commonsense and people are expected to take care of their own health and safety, with some being perceived to be 'just accident prone'.

Farmers expect themselves and their people to be superhuman!

Lynsey's report uses the Conscious Leadership's Fact vs Story model to explore common farmer beliefs and compare these with facts and data to identify the 'stories' that prevent positive change.

Given unhelpful stories are a strong influence on behaviour, it is critical that interventions address these beliefs and farmers' 'mindset'. However, interventions have traditionally focused on 'education only'. Health and safety has been pigeonholed as a compliance issue of little value to individuals or their businesses. Establishing the 'why' or 'what's in it for me?' and the compelling benefits of good work design, is critical. The mindset/practices model shared by Fiona Ewing at the New Zealand Forestry Industry Safety Council identifies the importance of establishing both the mindset and capability to support the design of good work.

## Benefits to good work design

There are examples of farmers in quadrant 4 (*get it, do it,* see next page) which demonstrate what is possible for the sector if the correct mindset and practices (capability) are established.

There are many measurable benefits of good work design which will help establish the *'why'* for individual farmers including:

- Higher engagement
- Lower absenteeism
- Enhanced social licence
- Better attraction and retention
- Positive return on investment
- Lower costs
- Increased productivity

Articulating these benefits may provide farmers with something they really want (better work and work environments which address some of their existing challenges).

Good work results in win:win:win outcomes: better work quality, more productive and enjoyable work environments and healthy and safe people.

## Challenging unhelpful assumptions and beliefs

Challenging pervasive stories and unhelpful beliefs requires relationships built on trust.

It is important that the sector values those who bring diverse thinking and nontechnical skills. Non-technical skills are identified as critical to better health and safety outcomes. Supporting farmers to develop nontechnical skills will improve health and safety outcomes but also have a range of other benefits at business and sector level.

Credible, trusted 'connectors' need to be available to support farmers to make change – the messenger makes a difference. To be effective these connectors need trusting relationships with those they seek to influence. Building these takes time and requires proper resourcing.

It is important to take a holistic approach to the farm system that acknowledges good work design is fundamental to success and influences all aspects of the enterprise; health and safety can't be put in a box.

Once the benefits of good work are articulated and farmers 'get it' or connect emotionally with the 'why', the what and how become easier.

With the right mindset, the focus becomes lifting capability by setting up farmers up for '*can do*'. They need:

- **The knowledge** (an understanding of why, how and what to do).
- **The skill** (the research shows this must encompass both the technical and non-technical skills required for success). Developing skill requires practice and it is important that support is provided during this stage.
- **The method** The correct method for 'good' work design, specific to the farm context and focused on practical and effective outcomes. This requires an understanding of the hierarchy of controls and an emphasis on higher level (more effective) controls like



elimination or minimisation, rather than the current sector wide focus on lower level and less effective controls (administrative controls or Personal Protective Equipment). It also requires collaboration and leadership to agree 'what good looks like' for the sector.

- **The tools** Support from up-stream duty holders (those who share responsibility for controlling workplace risks) is required to ensure farmers have access to the tools required to manage risk in their workplaces and set up f or 'good work' in a practical and effective way.
- **The resources** the money, materials and people to be successful. The closed border and current immigration settings are currently a limiting factor due to the severe people shortages in the sector.

Only if all five components of *'can do'* are present can farmers be expected to successfully manage work design and ensure healthy and safe outcomes for their people.

## **Changing social norms**

Changing social norms requires a compelling vision for the sector. This is more likely to be successful if it addresses

health and safety by stealth, given many farmers have totally disengaged with the tainted health and safety brand. Motivating farmers with a vision which connects with them on an emotional level is more likely to be successful.

Supporting change by communicating:

- Through multiple channels and mediums.
- Using visuals and graphics (rather than text).
- Through storytelling to share stories of positive change and develop selfefficacy (a belief that farmers have the ability required to design good work and prevent harm).
- Examples of the journey taken by farmers at all stages (beginning, developing and excellence) focused on small, low/no cost changes and safe change at a pace and scale suited to individual capacity and resources.
- Realistic examples of positive change aligned with something farmers really want (more enjoyable, productive workplaces with fewer people headaches) is the recommended approach.

#### FIND OUT MORE

To read Lynsey's full report, Superheroes, not super humans: Challenging assumptions and building capability to support 'good work, thriving people and great farming', visit nuffieldscholar.org

For more information, or to read more reports like Lynsey's, please visit **nuffieldscholar.org/reports** 

## Are you in a business dispute?

The Australian Small Business and Family Enterprise Ombudsman is here to help resolve your business dispute and encourages potato growers to contact our expert advisors in the Assistance Team.

The Assistance Team can provide growers and traders with information about alternate dispute resolution options, including access to mediation services, avoiding lengthy and costly legal avenues.

Under the Horticulture Code of Conduct, Assessors can be appointed to address issues such as whether a trader was entitled to reject produce or whether a grower has received the correct payment from a trader.

The Ombudsman's approach is to focus on fair outcomes for growers and traders while maintaining good working relationships.

For more information about the Code and to resolve your dispute, go to <u>asbfeo.gov.au/assistance</u> or call our InfoLine on 1300 650 460.





## Call us today **1300 650 460**



## **Potato Levy Update**

It is Hort Innovation's job to work with industry to invest the potato levies and Australian Government contributions into initiatives to help growers be as productive and profitable as possible, through the Hort Innovation Fresh Potato and Potato Processing Funds.

## What is the potato levy?

Levy is payable on potatoes that are produced in Australia and either sold by the producer or used by the producer in the production of other goods. The R&D levy rate on unprocessed potatoes is 48 cents per tonne.

This levy is collected by the Australian Government and then entrusted to Hort Innovation. It is then Hort Innovation's responsibility to work with industry to invest the levies – together with Australian Government funds in the case of R&D – into strategic R&D initiatives.

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

## How are levy investment decisions made?

Investments specific to the Hort Innovation Fresh Potato Fund are guided by the industry's Strategic Investment Plan (SIP) and Annual Investment Plan (AIP). SIPs provide an overarching roadmap for industry to follow, and AIPs detail how levy dollars will be spent each year to achieve industry goals.

## What is the potato Strategic Investment Plan?

The potato SIP 2022-2026 is the roadmap that helps guide Hort Innovation's oversight and management of both the fresh potato and potato processing levies and Australian Government contributions, ensuring investment decisions are aligned with industry priorities.

The SIP lays the foundation for decisionmaking in levy investments and represents the balanced interest of the potato industry. The most important function of the SIP is to make sure that levy investment decisions align with industry priorities.

Previously, the Potato – Fresh Fund had a separate SIP, called the potato grower SIP, and in 2021, it was refreshed and combined with the processing potato SIP to reflect the current needs of industry. The refresh involved close consultation with growers, industry participants and the wider research community.

The current potato SIP details the industry's strategic goals centred around four outcome areas: extension and capability; industry supply, productivity and sustainability; demand creation; and business insights. Under each of those outcomes, there are industryspecific strategies and key performance indicators that provide guidance on how the potato - fresh industry will work towards achieving the outcomes.

For the previous potato grower SIP, a performance report has been developed to demonstrate how investments delivered in the Potato – Fresh Fund from 2016/17 to 2020/21 generated impact for potato growers. The report provides an overview of key achievements delivered through each levy investment, and how they relate to the industry's SIP outcomes and strategies.

While this performance report provides a five-year review of the potato grower

SIP 2017-2021, going forward an annual performance report will be provided for the potato SIP 2022-2026.

## What is the potato Annual Investment Plan?

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

AIPs are developed each year by Hort Innovation, informed by the SIP and industry consultation, and then discussed with the industry SIAP for feedback and prioritisation. Investment decisions will be guided by the industry SIP and prioritised based on potential industry impact, as well as availability of levy funds.

The AIP provides detailed information on:

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

## Where do investment ideas come from?

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



#### How are investments prioritised?

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

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

The recommendations are then taken to the relevant advisory panel for feedback and prioritisation based on potential impact and available funding. Details of projects that will be progressing are then featured in the AIP.

The potato SIAP consists of supply-chain stakeholders from both the fresh and processing potato industries, most of whom are levy-paying growers. Panels also include industry representative body representation and, where applicable, a lead agency representative from within the National Horticulture Research Network.

The SIAP is in place to discuss investment ideas, in order to provide advice to Hort Innovation on potential levy investments. The advice they give is guided by the industry's SIP. The SIAP provides a vital link between meeting the priorities of industry and helping Hort Innovation to make decisions on how, where and when investments need to be made.

## How are investments progressed?

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

## How to keep track of investments

Investments in the Hort Innovation Fresh Potato and Potato Processing Funds are detailed in the Your investments page of this Fresh Potato and Potato Processing Fund sections of Hort Innovation's website. Resources that are produced by the projects – such as fact sheets and guides – are also available through the Research reports and more page.

Hort Innovation also sends alerts about project updates to its members.

Paying a levy doesn't automatically make you a **Hort Innovation member**, but signing up is free.

The levy-funded communications program, run through the investment Australian potato industry communication and extension project (PT20000; PotatoLink), also provides regular information on levy-funded activity.

#### Find out more

Please visit horticulture.com.au/growers/ potato-fresh-fund/ to read more about the Hort Innovation Fresh Potato Fund, and horticulture.com.au/growers/potatoprocessing-fund/ to read more about the Hort Innovation Potato Processing Fund.

For further details or if you have any questions, please contact Hort Innovation Industry Strategic Partner Mark Spees on 0439 574 173 or email **mark.spees@horticulture.com.au**. Alternatively, you can phone the AUSVEG office on 03 9882 0277.

Hort Innovation Strategic levy investment

POTATO -PROCESSING FUND

Hort Innovation Strategic levy investment

## Hort Innovation Fresh Potato Fund Update

The potato Strategic Investment Plan (SIP) 2022-2026 provides a roadmap to guide Hort Innovation's investment of potato industry levies and Australian Government contributions, ensuring investment decisions are aligned with industry priorities.

The SIP's intent is to reduce the cost of production and improve the sustainability of production practices with effective management of pests, diseases, weeds and biosecurity threats. Growth in domestic and international consumer demand is also a focus for the potato industry.

Currently, both the fresh potato and processing potato research and development (R&D) funds have capacity to invest over the life of the SIP. Careful prioritisation of investment needs is required by industry over the next five years.

## OUTCOME 1

## **Extension and capability**

To manage knowledge, relationships, systems and processes required to communicate effectively with internal and external stakeholders.

#### Achieving the outcome will involve:

- A change in knowledge, attitude, skills, aspiration (KASA) and practice for grower/industry profitability and sustainability through use of best practice and innovation.
- Growers, value chain, media and governments being well informed on industry initiatives and achievements as a vital part of regional communities and networks.
- Increased on-farm use of R&D outputs which will build a more resilient industry in addition to improved networks and cross-industry collaboration.
- Proactive strategic and evidence-based decisionmaking in businesses and for industry on investment, priorities and risk management.

The four outcome areas of this SIP cover significant themes under which programs and investments will be focused.

## **Industry outcomes**

Outcome statements as identified and prioritised by the potato industry have been prepared under four key outcome areas:

- Extension and capability.
- Industry supply, productivity and sustainability.
- Demand creatin.
- Business insights.

## OUTCOME 2

## Industry supply, productivity and sustainability

To accelerate the application of production practices that optimise returns and reduce risk to growers.

## Achieving the outcome will involve:

- Accelerating widespread use of existing and new R&D findings and proven management practices that will help growers to reduce the costs and impacts associated with pests, weeds and diseases.
- Advances in productivity and biosecurity through a proactive and prepared industry.
- New knowledge and understanding of sustainable production systems for Australian potato growers including precision inputs, management of salinity, enhanced soil health and improved water and nutrient use efficiency.
- Proactively monitoring potential crop protection regulatory threats and having access to a broader suite of effective, socially acceptable and environmentally sound crop protection solutions.

## OUTCOME 3

## **Demand creation**

To maintain and strengthen consumer demand for fresh potatoes as the foundation for sustainable expansion of production and consumption in domestic and international markets.

#### Achieving the outcome will involve:

- Support product positioning with consistent quality, evidence of beneficial product nutrition attributes and responsible industry production practices.
- Identify and prioritise export and domestic market niches where there is demand and growth potential for competitive supply of quality Australian fresh potatoes.

## OUTCOME 4

## **Business insights**

To deliver data and insights that is foundational to achieving success in the other three outcome areas of demand creation – supply, productivity and sustainability as well as extension and capability.

Achieving the outcome will involve reliable baseline data and analysis to provide insights and understand current and emerging trends. Key investments will support the provision of consumer knowledge and tracking, trade data and independent reviews to enable better decisionmaking process at industry level and individual businesses.

These investments underpin and are complementary to delivery of the other outcome areas.

#### **\$636,597 has been invested by the Fresh Potato Fund** in the Strategic Investment Plan – July 2021–June 2022



## Investment expenditure analysis

Investments specific to the Hort Innovation Fresh Potato and Potato Processing Funds are guided by the potato Strategic Investment Plan (SIP). The SIP features four priority outcome areas that have been identified and agreed upon by the industry, and Hort Innovation works to invest in R&D initiatives that are aligned to these.

## \$508,514 has been invested by the Potato Processing Fund

in the Strategic Investment Plan – July 2021–June 2022



#### Find out more

Please visit horticulture.com.au to read the full Hort Innovation Potato 2022-2026 Strategic Investment Plan.

For further details or if you have any questions, please contact Hort Innovation Industry Strategic Partner

Mark Spees on 0439 574 173 or email mark.spees@horticulture.com.au. Alternatively, you can phone the AUSVEG office on 03 9882 0277.





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**Communications Manager** 

#### **Hort Innovation**

Level 7, 141 Walker Street North Sydney NSW 2060 Australia

Email: communications@horticulture.com.au

Phone: 02 8295 2300

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#### **TECHNICAL CONTENT**

Dr Jenny Ekman jenny.ekman@ahr.com.au

## EDITOR

Paulette Baumgartl paulette.baumgartl@ahr.com.au

#### PROJECT COORDINATOR

Peter O'Brien peterob@potatolink.com.au

## DESIGN

Jihee Park hello@jiheeparkcreative.com

## PUBLISHER

Applied Horticultural Research Pty Ltd www.ahr.com.au



Cover: Young potatoes in South Australia - Photo by Dr Jenny Ekman

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Fall armyworm has only been in Australia for two years, but has spread widely, with major impacts on some vegetable crops. What does this mean for potato growers? We ask the Spud GP.



# ORGANIC NUTRIENT SOURCES

## - Finding new ways to fertilise

Potatoes are a hungry crop. Maximising yield requires good plant nutrition. However, skyrocketing fertiliser costs have seen many growers search for ways to use inputs more efficiently. Another potential strategy is to supplement the potato plant diet with organic nutrient sources such as composts, green waste and manures. However, while these can provide benefits above and beyond nutrition, they are not without their own risks. Dr Jenny Ekman investigates.

## RECYCLED ORGANICS AND COMPOST

## What is compost anyway?

In the broadest sense, compost is any mixture of different organic materials that has been broken down by naturally occurring organisms. These include bacteria and fungi as well as larger organisms such as mites and worms.

However, there is much debate about the various terms used to describe composted materials. Recycled organics, green waste, FOGO and compost can all be used to refer to slightly different mixtures and processing methods.

## **Recycled organics**

Recycled organics (RO) can include a wide range of different materials, such as commercial green waste from landscaping, grass clippings, wood residues and sometimes the contents of kerbside collection bins. However, RO products generally do **not** include manure, other animal products, or food waste. This means they can be used freely without affecting certification to food safety programs such as Freshcare and HARPS.

The materials used to make RO products are usually shredded, mixed, stockpiled for up to six months and finally screened to remove contaminants before use. Recycled organics are often very high (>60%) in carbon, which means they are an excellent way to improve soil health. They are also usually cheap, with councils frequently keen to dispose of green waste this way (Figure 1).

There is no requirement for RO products to be high temperature pasteurised (heated through) as they are unlikely to contain human pathogens. While this makes them simple to produce, it means that weed seeds and other plant propagules may not be destroyed during the ageing process. There have also been issues with RO products containing physical contaminants, such as fragments of glass and plastic – especially if the raw materials include kerbside collections (Figure 2).

If the material has a high carbon:nitrogen (C:N) ratio (>30:1) this



**Figure 1.** Delivery and spreading of recycled organics at a vegetable farm in Cowra, NSW.



can increase drawdown of nitrogen from the soil. This is most likely if the RO is immature (still breaking down). The C:N ratio will depend on the materials in the mix (Table 1).

## Compost

Compost can include all of these ingredients, plus manures and other materials of animal origin (e.g. blood, bone and carcasses).

The high nutrient content of manures increases activity of microbes, so composting occurs more rapidly. Some high intensity 'in vessel' systems can turn organic materials into compost in only a few days. However composting more often takes several weeks or months.

Composts may also contain food wastes: some councils have introduced collection of food organics and garden organics (FOGO) within the same bin. Unfortunately, contamination rates in this material are relatively high; a 2020 study found that 8 to 32% of FOGO bins contained contaminants such as plastics, glass Figure 2. Any delivery of RO or compost must be checked to ensure it is free of contaminants such as plastic and glass.

Food safety programs allow compost to be used freely *IF* it is certified to Australian Standard (AS) 4454. This standard is not just about microbial food safety, but includes details about particle size, levels of contaminants, biological stability and nutrient content.

It also prescribes a minimum of five turns and at least 15 days above 55°C for mixtures containing materials of animal origin (Figures 3, 4). This is to ensure human pathogens and weed seeds are destroyed. If the mixture does NOT include any materials of animal origin, this is reduced to three turns and 9 days above 55°C.

Products which contain products of animal origin but have not been, or cannot be, certified against AS4454, are considered to be the same as untreated manures under most food standard codes. This means exclusion periods may apply between application and harvest.

Compost has higher nutrient values than recycled organics / green waste

 
 Table 1. The C:N values of some common compost ingredients. An ideal ratio for composting is approximately 30:1.

Material	C:N		
Wood chips	>600:1		
Sawdust	500:1		
Paper and cardboard	200:1		
Straw	90:1		
Corn stalks	50:1		
Nut shells	35:1		
Garden waste	30:1		
Fruit and vegetable wastes	25 to 40:1		
Grass clippings	15 to 20:1		
Seaweed	20:1		
Weeds	20:1		
Cattle manure	20:1		
Chicken litter (broiler)	10 to 20:1		
Chicken manure	7:1		

(Table 2) and generally contains around 40 to 50% organic matter.

The cost of compost is commonly \$50 to \$80 per cubic metre, although larger volumes are likely to attract a discount. Freight costs are clearly location dependant, while the cost of spreading is in the order of \$140/ha.

Application rates are usually 20 – 30m<sup>3</sup>/ha, although some intensive vegetable producers apply up to 50m<sup>3</sup>/ha. High rates are particularly beneficial in sandy soils, as the organic material stabilises the soil, helping raised beds retain their structure.



Figure 3. To be considered truly compost, the material needs to be turned regularly (left and centre, Images J. Ekman and V Brunton) and heat to at least 55°C in between turning events (right, Image: Rodale Institute).



Figure 4. Temperatures inside a compost pile containing manure. The core temperature needs to exceed 55°C for three consecutive days on five occasions, with the pile being turned after each heating event, for it to be considered properly composted in accordance with AS4454.

## Other costs and benefits of compost / recycled organics

In addition to nutrients (Table 2), the key benefits of adding either recycled organics or compost to soil include:

- Increased organic matter, and therefore improved soil structure and soil health
- Improved water infiltration and soil water holding capacity
- Increased soil biological activity
- Potential reduction in some soilborne diseases.

## POULTRY LITTER - MORE THAN JUST A NITROGEN SOURCE

Poultry litter is surely proof that one person's waste is another's windfall. Poultry litter is a relatively compact and cost-effective source of nitrogen. It also provides other nutrients, organic matter and carbohydrates that can improve plant and soil health.

Poultry litter sourced from broiler sheds is not just manure, but contains bedding material, feathers, blood, and potentially dirt or other materials. Litter from barn-based egg production and turkey manure can provide bulk organic material, but tends to be lower in nitrogen than litter from broiler sheds (G. Martin pers. com.).

	Green waste compost	Conventional compost
Organic matter	65 – 75%	30 – 50%
рН	6.8 – 7.7	6.0 - 7.6
C:N ratio	25:1 - 35:1	15:1 – 20:1
Nitrogen	1.2 – 1.6%	1.5 – 2.0%
Phosphorus	0.2%	0.6%
Potassium	1.0%	1.0 – 1.4%
Sulphur	2 – 3 kg/tonne	4 – 5 kg/tonne
Calcium	3.0 - 4.0%	3.0 - 4.0%
Magnesium	0.6%	0.6%

**Table 2.** Typical analysis of a recycled organic product (green waste) and a conventional compost. All values by dry weight. N.B. compost commonly contains 25-35% moisture. Data summarised from multiple sources.

## What goes in affects what comes out

Modern broiler chickens are incredibly efficient converters of feed to body mass – approximately 1.5kg of food produces 1kg of chicken. High feed use efficiency equals less waste, especially of the carbohydrates which could potentially nourish soil microbes.

Despite this efficiency, feed still accounts for up to 70% of the cost of raising chickens. The type of feed used is clearly going to affect the attributes of the manure. For example, broiler chickens were once fed mixtures of maize, soya, meat meals, offal, feather meal and tallow. However, modern mixes are predominantly grains plus vegetable proteins and oils. This predominantly vegetarian diet affects the nutrient balance within the litter.

Moreover, the life of a broiler chicken may be as little as six weeks, compared to 10 weeks a few decades ago. This factor, combined with dietary changes, has reduced average nitrogen levels in manure from 5.7% to approximately 3.5%. Modern litter also has 30% less phosphorus, lower levels of fats, carbohydrates, uric acid and enzymes than it once did<sup>1</sup>.

## **Bedding materials matter**

Chicken litter consists of both manure and bedding, at a ratio of about 55:45. The type of bedding material used



**Figure 5.** Adding compost to soils low in organic matter can increase root growth, as shown in these sweet corn seedlings grown with (left) and without (right) compost.

## **FOOD SAFETY AND MANURES**

Manures have been used to improve agricultural soil since the very start of human civilisation. As well as nutrients, manures add organic matter, increase soil bulk density, enhance structure, improve water holding capacity and stimulate soil biodiversity.

Unfortunately, manures can also contain human pathogens such as *Escherichia coli* (*E. coli*), *Salmonella* spp., *Listeria monocytogenes* and others. Products grown in manure amended soil can be contaminated by these bacteria, potentially causing severe illness or even death.

Fortunately, potatoes are always eaten cooked. This process kills any bacteria that may be on the skin or even inside the tuber flesh. As a result, potatoes are usually considered **low risk** with regard to potential contamination by human pathogens.

Human pathogens such as *E. coli* and *Salmonella* spp. are relatively poorly adapted to the soil environment. As a result, their populations in manure amended soil usually die-off over a matter of days or weeks, especially if temperature and UV intensity are high<sup>5</sup>. To take advantage of this decline most, if not all, food standards mandate an exclusion period between application of untreated manures and harvest of fresh produce, including ware potatoes.

Recently released Food Safety Guidelines by the Fresh Produce Safety Centre (fpsc-anz.com) recommend exclusion periods based on maximum air temperature. If the mean maximum (monthly) temperature during the growing period is above 20°C, then 45 days must elapse between application of manure and harvest. If the mean maximum temperature is below 20°C, then this exclusion period doubles to 90 days.

However, other standards are more restrictive. For example, GLOBALG.A.P. stipulates 60 days between application of manure and planting for all vegetable crops.

It is therefore important that before applying manures, or other amendments containing animal products, check the requirements of your food safety certification body, as well as local regulations.

It is also important to practise good hygiene when handling or spreading litter. This is to protect the health of workers and ensure it does not accidentally contaminate neighbouring crops or waterways.



Figure 6. Chicken litter from broiler sheds is not just manure, but includes feathers, bedding, blood, feed and other organic materials.

is likely to significantly alter the C:N balance and nutrient levels in the waste product. For example, litter from wood shavings has lower nitrogen content than that from rice hulls (G. Martin, pers. com.).

Another change is the more frequent recycling of the litter by re-use, layering or mixing. In the past, about 70% of Australian broiler chickens were grown on new bedding, with the remaining farms practicing partial re-use<sup>2</sup>.

In the US, litter may be re-used for up to 2 years before the sheds are fully cleared out. The bedding is windrowed inside the shed, allowing it to partially compost, before re-spreading for the next batch of birds<sup>3</sup>.

Australian growers appear to be recycling litter more frequently, altering both the volume and composition of material available (Table 3).

## **Availability of nutrients**

In addition to nitrogen, poultry litter contains phosphorus, potassium and micronutrients such as sulphur, calcium, magnesium, manganese, zinc and copper.

About 25% of the nitrogen (N) contained in litter is ammonium, which is readily plant available. The rest is uric acid, protein and urea. In the months following application an additional 25-35% of the nitrogen in the litter is converted to ammonium, making it available to plants.

Importantly, poultry litter needs to be incorporated into soil as soon as possible in order to preserve nitrogen held in the manure. Ideally, manure should be incorporated within 12 to 24 hours after spreading (Figure 9).

It is also essential to keep litter moist; piles should be kept covered to prevent drying out and protect the material from UV light, both of which increase volatilisation of ammonia.

If litter is not incorporated, either mechanically or with irrigation, then a significant portion of the available ammonium will be lost to the air. This may be up to 50%, especially if the soil is dry and/or the weather is warm.

Phosphorus (P) is relatively immobile in the soil, so it needs to be placed where crops need it. Surface application may not make P available in the plant root zone. Between 30-80% of the P in chicken manure is inorganic, which also limits its availability; the phosphorus in chicken litter may be more tightly bound than in chemical fertilisers (e.g. DAP), reducing availability during early crop growth.

In contrast, potassium (K) in litter is readily available and mobile in soil. As a result, 90% of the K in poultry litter is available to plants, compared to 30 to 80% of P.

## How much litter is good litter?

Chicken litter is usually sold and applied by the cubic metre. However, nutrient analysis is reported as % dry weight, so it is important to know moisture content. At typical levels of 20-30% moisture, a tonne of litter will weigh approximately 2.5m<sup>3</sup>.

This allows calculation of the nutrients in a m<sup>3</sup> of litter, and comparison with synthetic fertiliser.

For example, a cubic metre of litter that is 4% N, 1.3% P, 2% K, 26% moisture and weighs 400kg/m<sup>3</sup> will contain:

## 0.04 (N) x 0.74 x 400kg = 11.84kg N

Using this same calculation, it will also contain 3.85kg P and 5.92 kg K.

The trace elements in litter, as well the organic matter it contains, are useful as well, but harder to value monetarily. Note that 50% of N may be lost if the material is not used promptly.

According to Wiedemann (2015), an application of 2.5m<sup>3</sup> chicken litter is roughly equivalent to a 50kg/ha application of DAP (di-ammonium phosphate) or 70kg/ha application of CK 66 fertiliser, in terms of N and P supplied.

Once nutrient content has been estimated, application rates per hectare can be calculated. While spreaders can distribute down to about 2m<sup>3</sup>/ha, it is difficult to apply evenly. Rates of 4-5 m<sup>3</sup>/ha allow for better distribution.



**Figure 7.** The food that chickens eat affects the nutrient mix of their manure. (Image: Australian Chicken Meat Association).



Figure 8. Broiler chicken litter is generally piled up for a day or two, allowing some composting of the material even before it is removed from the shed (left, Image: Australian Chicken Meat Association), after which it is delivered to the farm for spreading (right).

	Chicken litter single use			Chicken	Turkov	Lover
	Straw*	Sawdust*	Wood shavings*	litter multi- use*	litter**	manure**
Moisture (%)	20	25	26	21	32	41
Total carbon	30 to 40%, lower in multi-use litter				39	33
Total nitrogen	4.0	3.8	3.9	4.0	3.8	5.8
Total phosphorus	1.1	1.2	1.3	1.7	1.7	2.2
Potassium	2.2	1.8	1.9	2.4	1.9	1.7
Magnesium	0.43	0.44	0.44	ND	0.46	0.49
Sulphur	0.63	0.5	0.5	0.6	0.49	0.45

Table 3. Typical nutrientvalues in chicken litterwith different beddingmaterials. Values bydry weight. FromWiedemann, 2015\* andGriffiths, 2011\*\*.

Litter contains low levels of chloride and sodium. A high application of 10m<sup>3</sup>/ha will add around 12 kg sodium, which will not influence salinity. However, repeated high applications can start to have negative impacts – as has been observed on some vegetable farms.

## **FEEDLOT FERTILISER**

Growers located close to feedlots may be able to access feedlot manure. Compared to poultry litter, fresh livestock manure is somewhat lower in nutrients, containing around 2.4% N (compared to 4% in poultry litter) and 0.75% P. It also contains approximately 0.5% sulphur and 0.02% zinc.

However, it is relatively high in potassium (K). Feedlot manure (semidry) contains approximately 2.6% K, which is similar to the levels found in chicken litter. Moreover, it remains stable during ageing and composting. Potato plants need huge amounts of potassium, taking up over 4 kg/ha/day during tuber bulking. While this is the period of greatest demand, it is also essential to have ample potassium present during stolon growth and tuber initiation. Feedlot manure added before planting can therefore be a good source of potassium for potato crops.

Release of ammonia and nitrous oxide (NO) is much less from livestock manure compared to chicken manure. Despite this, as with chicken litter, it is important to incorporate the manure into the soil as soon as possible to maximise avoid losing N to the air.

Most of the N in feedlot manure is in an organic form, but it is released more slowly than from poultry litter. According to a report by P. Wylie (2008) approximately 30-50% of N in feedlot manure becomes available to the plant over the first 12 months of application. This extended release may be useful for potato crops.

Distribution of feedlot manure is more difficult than poultry litter because of its lumpiness. It is collected by yard scrapers which lift manure compacted by many hooves and dried in the sun (Figure 10). The manure may therefore need to be aged and screened in order to be evenly distributed, especially if it is applied at relatively low rates e.g. 6 t/ha.

Feedlot manure has a C:N ratio of around 10:1, suggesting it is significantly lower than manure from free ranging, grass fed animals. As a result, it breaks down relatively rapidly. For comparison, chicken litter may be as high as 20:1. However, this also means it is a good source of organic matter, being rapidly absorbed into the soil.

Like chicken litter, cattle manure is a potential source of human pathogens.



Figure 9. Chicken litter should be kept moist and both spread (left) and incorporated (right) as soon as possible after delivery in order to minimise loss of nitrogen to the atmosphere (Images: L. Southam-Rogers).

It should be considered that the bacteria *Listeria monocytogenes* has occasionally been found in feedlot manure. *L. monocytogenes* is a natural soil dwelling organism, so is more persistent in soil than *E. coli* and *Salmonella* spp.<sup>ii</sup>. Risk of persistence can be minimised by composting the manure then incorporating thoroughly into the soil. *L. monocytogenes* populations decline most quickly in sandy soils at temperatures over 21°C<sup>4</sup>.

## PIGGERY SLURRY - NOT FOR POTATOES

Piggeries produce effluent, manure and used bedding materials. Unlike poultry litter and feedlot manure, most piggery wastes are collected and transported as either liquid effluent or sludge.

Piggery slurry is NOT RECOMMENDED for application to land used for horticulture. As it is liquid, it runs off more easily than solid wastes, potentially contaminating other crops and water sources. It can contain higher populations of human pathogens than other manures, as well as parasitic viruses and cysts, both of which can survive for extended periods in the environment. Slurry is also a poor carbon source, typically being only 4 to 5% dry matter.

Piggeries also periodically dispose of bedding materials, including sawdust, rice hulls, barley straw or wheat straw. These materials can add organic matter, but are generally low in nutrients.



Figure 10. Feedlot manure can be hard to distribute as it has been hard-packed by hooves (left). The material is scraped and mounded before removal from the pen (right) (Images: Meat and Livestock Australia).

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# SMART FARMING USING SIMPLE TECH

Not all technology is complicated or expensive. One of the best things to emerge from the digital revolution is the accessibility and mobility of technology. With vastly improved user interfaces, compact devices, and simplified apps, technology can be used almost anywhere, anytime, by anyone in thousands of applications. This includes agriculture, writes Ryan Hall.

## **KEY POINTS**

- A range of easy-to-use tools is available to growers to help with scouting and keeping track of crops
- Drones do not need to break the bank to be useful; simple applications can yield large savings of time and money
- A variety of smartphone applications are available to help potato growers
- Applications using satellite imagery can be used to optimise irrigation, monitor growth, and provide a historical record of an area



**Figure 1.** A drone being used to scout a potato crop in NSW

## DRONES/REMOTE SENSING

That small drone that has been sitting in the shed since it was unwrapped last Christmas could save you significant time and money, and could be an excellent tool for monitoring and assessment.

Drones have varying levels of use. Drones with multispectral cameras and other capabilities can provide significant information to a grower about how well a crop is growing, or help to quantify areas where growth is below expectations. However even a smaller drone with a decent camera (20-megapixel) can be useful to keep an eye on things.

Back in January of 2021, John Coulombe of Drone Training Solutions conducted a webinar with the Soil Wealth Integrated Crop Protection team. In his seminar, John outlined the various considerations and uses of drones on agricultural properties.

One of the major benefits of drones is that they are not limited by wet soil. Looking at your crop, or spotting trouble spots in the irrigation system, without trudging through miles of mud, is one great advantage. Drones are also fast. What might take an hour to walk through will only take 5 minutes with a drone.

"A great example of this is monitoring

irrigation. It's super easy to turn the irrigation on and send up your drone to make sure it's all working properly," John said.

"Need to check the levels on your dams? Send the drone out and have a look. Saves you fuel and time, and it can be a bit of fun at the same time."

So, what are some of the important things to know about drones?

John noted that there are some restrictions on use, including laws on where, when, and how you can fly.

"Insurance is also another thing to consider; check to see if your liability insurance covers things in the air. Most don't. It's important to be covered in the event something goes wrong and someone is hurt", John said.

As John points out, costs can be variable.

"A good drone with a 20-megapixel camera is a fantastic starting point. These can cost around \$2000. This is an investment that will soon pay for itself given the potential savings from identifying a problem early."

Drones are part of a set of management tools, best used in combination with satellite maps, soil maps, electromagnetic (EM) surveys, and historical knowledge.

It is also important to be aware of the rules and regulations of flying



**Figure 2.** Image captured by a drone highlighting a problem area and its extent. It still requires ground truthing to determine the cause of the problem

drones on your property. In most cases licenses are not required for small drones , but it is important to be across the rules and regulations. Find the most up-to-date information on the Civil Aviation Safety Authority (CASA) website.

## The importance of 'ground truthing'

Ground truthing, a term favoured by the ABC's Dr Karl, involves checking conditions with your own eyes and ears. In this context, it means going to a site identified by the drone to check the situation. The drone can identify potential issues quickly and easily, but will not necessarily reveal the exact problem.

## What about bigger drones?

There are several issues to consider before upgrading to a more serious drone. Drone restrictions are related to weight classes, which determine cost, function and importantly, licenses. The drones used for spraying are massive, with their 30 L tanks making them very heavy. As a result, extra training and licensing is required to operate them. While useful, these drones are expensive, costing upwards of \$20,000.

Further information on this is available on the CASA website (https://www. casa.gov.au).

## So why not a satellite?

The use of drones and satellites is not mutually exclusive. Satellites have their own advantages and disadvantages. One of the main limitations is cloud cover. If a satellite passes on a cloudy day no information can be captured. Depending on the frequency of passes this can mean days or even weeks until the next pass, which may be cloudy again. Drones mitigate this by flying low.

IrriSAT, which has been discussed previously by PotatoLink, is a free, satellite-based irrigation scheduling app that combines satellite images with weather data to estimate crop water use. With weekly satellite image updates and weather reports, crop water requirements can be predicted up to seven days in advance, helping to manage irrigation.

As with drone monitoring, ground truthing is also important when using satellite tools. Combining soil moisture probe data with IrriSAT facilitates ground truthing of estimated crop requirements against actual soil moisture levels. With this information about the water budget, when to irrigate and by how much, can be calculated.

While an important part of the tool,



there is more to IrriSAT than water budgeting. The normalised difference vegetation index (a measure of different wavelengths of light) or NDVI can be used to identify areas of problem growth.

Interpreting satellites requires some practice but tools like IrriSAT are a great help. For more information, see the PotatoLink website for a webinar and case study on IrriSAT. You can read about IrriSAT in the first edition of PotatoLink magazine, also available on the PotatoLink website.

## APPS

Ironically, most of us barely use our smartphone as a phone. Apps are what we want and there seems to be one for everything, including for the agricultural sector. While some are specific to potato crops, others are for broader use.

Two apps that caught our attention are DiagPOT and xarvio<sup>™</sup> SCOUTING.

**DiagPOT** is a free smartphone application available on both IOS and

Android platforms. The app was developed from the *Practical guide on diseases, pests and disorders of* 





Phytophthora infestans

Late blight

Causal agent and transmission

Potato late blight is caused by *Phytophthora* infestans which is not a fungus but a water mould also known as "oomycete". It produces mycelium which can be of two different type of strains: A1 and A2, that are of opposite sexual compatibility. The mating of the two sexually compatible strains, on a potato plant, may lead to the formation of oospores (photo 1). The latter are resistant organs which can survive in the soil for several years. Until now, this has been a rare event in Europe.

**Figure 3.** An example of how the app can be used. NOTE the information for late blight in this context is for France. For effective management of diseases and pests please ensure Australian resources are used.

*the potato*, and created and edited by a range of French organisations including the French Federation of Seed Potato Growers (FN3PT), French Association for Seeds and Seed Potatoes (GNIS), French Technical Institute for Cereals Forage and Potato Crops (ARVALIS-institut du Végétal), and the French Institute for Agricultural Research (INRA).

The application, which has an English language option, boasts a broad range of photos of pests, diseases, and physiological disorders. One of the best uses of the app is as a diagnostic tool, with 400 photos to help identify issues with plants or tubers. The app also includes an index of 150 diseases, pests, and disorders and 94 datasheets that cover causes, symptoms, risk factors and management of diseases, physiological disorders, and nutrient imbalances.

It should be noted that while the app is useful, it has been developed for French conditions; information may be less accurate for an Australian context. Nevertheless, it is a fantastic tool for that first step in recognising or understanding a problem. Consult an agronomist or another relevant professional before making decisions based on the app.

#### The free app, xarvio® SCOUTING,

developed by BASF Digital Farming,

uses advanced image recognition technology and machine learning to identify more than 400 weed



types, as well as damage caused by more than 400 different diseases, pests, and nutrient deficiencies.

In Australia, the focus of the app has been on its application to support the management of broadacre grain crops including canola, barley, and wheat. While it does not currently offer analytical features specifically for potato crops, growers are already



Figure 4. David Brunton using the Xarvio app to identify a weed

finding it useful, with its functionality increasing as more users add to the database.

To identify weeds, the app compares a photo taken within the apps' camera function with photos already loaded to the app's ever growing image database. If xarvio SCOUTING does not recognise a weed, users can easily record information about that species to enhance the apps' 'knowledge.'

Disease identification works the same way. The more the app is used in Australia, the more accurate it will become. xarvio SCOUTING also has a feature that documents images and results from local scouting trips. This information creates a local area history that can be reviewed at any time, helping alert users to emerging in-field problems.

Users can decide whether to share the in-field problems identified on their property as part of the anonymous collection of local area data. This information is made available to other local growers and agronomists via the app's unique radar function and in-app notifications. This can help them to take preventative action to protect their crops from a potential risk. This feature could be particularly useful for diseases such as late blight, where a community approach greatly improves overall disease management.

## CONCLUSION

Digital agriculture is no longer an idea of the future. It is here and available now, with new technologies and systems emerging every year. While the next 10 years will see major changes to the way potatoes are produced, it is important to remember that not all new technologies are complicated and expensive. Simple digital tools can have a great impact.



Figure 5. an example of Xarivo SCOUTING app being used to identify weeds

# **UPDATE FROM THE BOLWARRAH, VICTORIA, DEMONSTRATION SITE**

Rising prices, unreliable supply and the importance of using inputs as efficiently as possible, are top of every grower's mind. Reducing use of fertilisers and pesticides is not just good for sustainability, but also for farm profitability, reports Stephanie Tabone

## **THE BOLWARRAH SITE**

Bolwarrah is 30 km east of Ballarat. The soil is generally rather low in nutrients, especially phosphorus. As the site had previously been used for grazing and forestry, it was virgin ground for potato production.

These factors made it an ideal candidate for addition of mycorrhizal fungi. Naturally occurring populations were likely to be low, and nutrients were potentially limiting. Mycorrhizal fungi develop symbiotic relationships with their host plant. The plant provides food for the fungi (photosynthates), in exchange for the fungi supplying nutrients from the soil to the plant.

Many species of mycorrhizal fungi are well adapted to colonise potato plants. The product EndoPrime by Sumitomo Chemical contains four such species.

Processing potato grower Neville

Quinlan, with the support of agronomist and PotatoLink regional representative Stuart Grigg (Stuart Grigg Ag Hort Consulting), decided to trial EndoPrime in the 2021/2022 potato growing season. The product was applied to most of the paddock at planting in late October 2021, with a central area left untreated (Figure 1).

Mycorrhizae act as an extension of the plant's root system, effectively increasing the surface area of the roots. This is particularly useful for uptake of nutrients which are immobile in the soil, such as phosphate.

Application of a mycorrhizal product is most likely to provide benefits during the first 6-8 weeks of crop growth. This helps the mycorrhizae to establish and colonise the roots more quickly. As the crop progresses, naturally occurring mycorrhizae are likely to colonise untreated cropping areas, so long as environmental conditions are suitable.

Sap tests conducted on 16 January and 1 February provided a snapshot of the plants' nutrient status. Interestingly, phosphate levels were 15-20% higher in the EndoPrime treated area compared to the control (Figure 2).

This result suggested that the potato plant roots had been successfully colonised by the fungi. To test this, root samples were collected from the treated and untreated areas of the crop three weeks before harvest and processed for microscopic examination. This revealed that mycorrhizae had indeed colonised the roots, with both fungal hyphae and vesicles (bladder-like structures formed by the fungus) clearly visible within the cells (Figures 3, 4).

Crops are considered colonised when the percentage of roots with



**Figure 1.** Areas of the field treated with EndoPrime or left as untreated control.

Figure 3. Potato roots observed under a microscope showing colonisation of the cells by mycorrhizal hyphae and vesicles. These structures have been coloured orange in this image.



mycorrhizal fungi exceed 10%. Both treated and untreated plants exceeded this level. However, the rate of colonisation was higher in the area treated with EndoPrime (Figure 4). While biologicals can provide great results, some farming practices may need to change to create an environment in which they can thrive.





Products containing mycorrhizal fungi are usually applied at planting. If a fungicide is also required, then it is important to check compatibility with your supplier. For example, Sumitomo advises that EndoPrime can be used at the same time as several common fungicides. However, not all products and biologicals will be compatible. In some cases, results may be improved by applying fungicides at a different time, or in an area separated from the root zone, so as not to compromise efficacy of the biological.

It is also important to consider that full application rates of fertiliser will provide the plant with all the nutrition that it needs. If the plant does not need additional nutrients, it is less likely to form a strong association with the fungus.

While products such as EndoPrime may still provide a yield increase under a normal fertilisation program, results are likely to be most dramatic if nutrients are limited.

## **GETTING BEST RESULTS FROM PRODUCTS CONTAINING MYCORRHIZAL FUNGI**

## When to apply?

- When growing a crop that responds strongly to mycorrhizae such as potatoes
- After using a soil fumigant
- When soil nutrition is not ideal or limited
- If the field has been empty of vegetation for 6 months or more
- If crops have been grown which do not host mycorrhizal fungi, reducing natural populations in the soil
- When soil constraints are present such as sodicity or salinity
- After any significant cultivation
- When growing legumes, as mycorrhizal fungi and rhizobium are highly complementary

#### How to use?

- Ensure the spray, dip or drench solution is well agitated
- Apply at planting, or as early in the crop cycle as possible
- Ensure good contact between the inoculant and potato seed
- If applying through the irrigation system after planting, ensure enough water is applied to wash the material into the root zone
- Do not over fertilise the crop
- Apply enough to ensure colonisation; you can't 'overdose' with mycorrhizal fungi

# EAT MORE SPUDS FOR A HEALTHY GUT!

Busting the myths on the nutritional benefits of potatoes.

by Paulette Baumgartl

A bowl of roast potatoes, a cooling potato salad, or smooth mash are all favourites of the Australian table. Yet, many dated misconceptions continue to linger about potatoes and their health benefits.

Far from being a mere comforting and economic staple, potatoes pack a nutritional punch and are a healthy carbohydrate choice.

The Hort Innovation project (PU190002), *Educating health professionals about Australian potatoes*, set out to bust some of the myths about potatoes.

Instead, the aim was to deliver evidence-based nutritional information about Australian potato products to dietitians, nutritionists, naturopaths, GPs, students of health-related disciplines, as well as other health professionals such as personal trainers and health coaches.

Although primarily targeted to these groups, potato growers and the broader potato industry can also access all the data, resources, and information via the project's online platform (https://www. powerpackedpotato.com.au) for their own business development.

## HIGH IN FIBRE, LOW IN CARBS

To provide clear and evidence-backed information, an essential part of the project was to generate new, current data. The project team carried out nutrient testing (July to September 2020 with analysis performed by Agrifood Technology) on six varieties of potato (Crème Royale, Royal Blue, Sebago, Desiree, Cremoso, Dutch Cream) sourced from growing regions in South Australia, Western Australia, Tasmania, and Queensland, Potatoes were steamed before testing. Samples tested while hot for all nutrients, except resistant starch (RS). To test for RS the potatoes were steamed as usual, then chilled at 4°C for 2 hours and tested cold.

Potatoes are a greatly misunderstood vegetable. They are often dismissed as 'too fattening' by career dieters and banned from the *five a day* list because they are considered a starch.

## **KEY POINTS**

- This project generated new data on the nutritional vales of potatoes and forms the basis for evidencebased education for health, nutrition, and sports professionals
- Potatoes are much higher in fibre than previously believed, especially resistant starch
- When cooked and then cooled, resistance starch increases and GI decreases
- Potatoes are the main intake of resistance starch in Australian diets
- The full suite of resources generated from this project is available online

However, the new nutritional values obtained demonstrate that their nutrient profile is a lot more favourable than broadly perceived. Two particularly notable outcomes were **energy density** and **fibre content**.

Potatoes have a much lower energy density (or KJ value) and are much higher in dietary fibre than assumed. Critically, the fibre in potatoes is



high in resistant starch, which in turn lowers the glycaemic index of potatoes. Win, win and win!

## **Fibre**

As most Australians currently fall short of the recommended daily intake, understanding sources of dietary fibre is all-important.

Currently, dietary fibre values for potatoes are sourced from the Australian Food and Composition Database (AFCD). Examination reveals some incongruities with the AFCD data, and no comparative data for resistant starch in cooked and cooled potatoes. Information from this project therefore provides a valuable contribution to understanding the nutritional qualities of potatoes.

Compared to AFCD data, results for this project showed higher values of dietary fibre, as shown in Table 1.

These new insights into the value of potatoes will support health professionals in recommending the inclusion of potatoes into diets.

## Resistant starch and pre-biotics

Resistant starch has been identified as lacking in Australian diets. Resistant starch is considered a pre-biotic fibre because it cannot be broken down by usual digestive processes in the small intestine. It reaches the large intestine intact, where it is fermented by gut bacteria. It is excellent for gut health, providing the gut with lots of useful microbiota. There are many health benefits of prebiotics including:

- reduces prevalence and duration of infection and antibioticassociated diarrhoea
- reduces inflammation and symptoms associated with inflammatory bowel disease
- helps protect against colon cancer
- enhances bioavailability and uptake of minerals, including calcium, magnesium and possibly iron
- lowers risk factors for cardiovascular disease, and

promotes satiety and weight loss

Currently potatoes, followed by bananas, are Australian's primary source of resistant starch. We need to eat more potatoes!

## MYTH NO. 1 - POTATOES ARE BAD FOR BLOOD SUGAR

The glycaemic index (GI) is a ranking from 0 to 100 based on how quickly the carbohydrates in food are broken down into glucose. It is based on how much different foods raise blood sugar after they are eaten.

The lower the GI, the more slowly the energy contained in that food is released. This helps manage diabetes, as well as keeping us energised and feeling fuller for longer. Not the dreaded peaks and troughs of sugary foods!

Most people know that whole grain foods have a lower GI than their processed counterparts (that is, they are broken down more slowly). However few would realise that

FIBRE	Serving size: 1 medium potato, unpeeled (140g)					
	AFCD data			Project data		
	Average quantity per serve	% daily intake per serving	Average quantity per 100g	Average quantity per serve	% daily intake per serving	Average quantity per 100g
Total	2.7g	9g	2g	7.7g	26%	5.5g
Soluble				2.6g		1.9g
Insoluble				5.1g		3.6g
Resistance starch				2.2		1.6g

Table 1. Dietary fibre data from this project and AFCD data

potatoes are a low carbohydrate food, lower even than brown rice (Figure 1), and when prepared properly, can be a low GI food.

However, calculating GI in any food is harder than it seems. This is particularly true for potatoes, which have widely variable GIs, more so than any other food. Potatoes are often represented as high GI; however, it isn't that simple. The GI of potatoes is influenced by many factors. Variety, storage, age, and preparation can all affect the GI of potatoes.

While there is no clear pattern between the GI of potatoes cooked using different methods, cooling cooked potatoes for at least two hours increases the level of resistance starch (RS), which is associated with lower GI. Some studies have reported that GI after cooling is 28% lower, and if eaten with vinegar (hello European potato salad), GI is 31-43% lower than that of freshly boiled potatoes.

## MYTH NO. 2 - POTATOES ARE FATTENING BECAUSE THEY ARE HIGH IN CARBOHYDRATES

Despite many associating weight loss with no carb/low carb food, heathy carbohydrates are essential to a balanced diet. Potatoes are often sacrificed at the altar of rapid weight loss, or unfairly plonked into the 'sometime food' basket.

This is where the project team busted

myth number 2. Potatoes contain less carbohydrate and have a lower energy density than other mealtime carbohydrates such as pasta and rice. Because of their high water content, potatoes are far and away not a high carb food.

This is great news for calorie counters who can literally have their (oven baked) potato cake and eat it too!

## MYTH NO. 3 - POTATOES ARE BAD FOR THE ENVIRONMENT

Potatoes are not just good for us, they are also good for the planet. Potatoes are the world's fourth largest food crop and with a smaller carbon footprint than most other staples. Potato crops are less resource intensive than other carbohydrate-rich crops and require no processing before cooking. Furthermore, as potatoes are grown in from Atherton in the north to Tasmania in the south, all fresh potatoes available for purchase are grown in Australia, meaning that their carbon miles are also low.

Australians typically eat fewer potatoes per person per year than culturally and economically similar countries. Promoting the nutrition and environmental merits of this not-so-humble vegetable could shift consumption upwards.

## Good for the industry. Good for our health.



Figure 1. Energy density and carbohydrate content of common mealtime carbohydrates.

## **POTATOES POWER PERFORMANCE**

Every athlete knows that carbohydrates are essential fuel for top performance as well as post workout recovery. Potatoes provide the carbohydrates, potassium, and energy that strength and endurance athletes need to perform at their best.

At the recent World Potato Congress in Ireland, Dr Katherine Beals gave an inspirational talk into the benefits of potatoes for exercise. Dr Beals is an Associate Professor in Nutrition at the University of Utah, as well as holding a PhD in exercise science, so she has professional expertise on both topics.

Dr Beals gave several examples of studies where potatoes have been compared against artificial sports supplements as fuel for athletes.

In one trial, twelve cyclists were given either water, PowerBar Gels, or potato puree during a two-hour ride followed by a 10-mile time trial. Both the potato and the gels significantly improved their time trial performance compared to water alone, there being no difference in results between the two supplements<sup>1</sup>.

The researchers concluded that "potato ingestion during prolonged cycling is as effective as carbohydrate gels to support exercise performance in trained athletes"

In another experiment<sup>2</sup>, 16 recreational cyclists were given either potatoes or sports supplements after 90 minutes of cycling. The researchers measured levels of glycogen (glucose used for energy) in their muscles during a four-hour recovery period. The cyclists then completed a 20km time trial. Once again, potatoes were just as good as the sports supplements in helping muscle recovery as well as supporting time trial performance.

Other new research asked young men to do leg presses and knee extensions until they could do no more<sup>3</sup>. Potato protein and milk protein were identical in helping muscle recovery but, of course, potato provides a plantbased, environmentally friendly option.

According to Dr Beals, potatoes are simply the best fuel for exercise. Not only do they contain the carbohydrates needed for energy, but an average potato contains 3g of complete protein. This has high biological value, supporting muscle synthesis and tissue repair. Many will be also surprised to learn that potatoes contain more potassium than a banana (approx. 620mg vs 450mg).



Potassium is essential for correct muscle function, and must be replaced after sweating.

Perhaps that is why pro-rider Toms Skuijns, champion of Latvia and member of the Trek Segafredo cycling team, is an official potato ambassador of the World Potato Congress. Toms is a true believer in the power of potatoes; check out his YouTube video on the Potato Man of the Peleton (www.youtube.com/watch?v=NSbg\_ HzdhiY) and website (https://www.tomsskujins.com/ potato) for favourite potato recipes and tips, as well as his pride in being able to promote potatoes.

So clearly there is nothing humble about potatoes. Next time you're out exercising, don't reach for that sugary sports drink, choose a potato.

Ed. – I have tried this myself; on a recent bike ride, I pulled a couple of baked potatoes out of my jersey pocket while my buddies sucked on their gels. Sure, they looked at me strangely, but I found it a lot more satisfying than the sticky, sugary substances they were forcing down...



Toms Skuijns, the potato ambassador

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Research undertaken as part of this project was detailed and extensive. Full reports are available via the Hort Innovation website and at <a href="https://www.powerpackedpotato.com.au">https://www.powerpackedpotato.com.au</a>.

Article based on: Final Report: Educating health professionals about Australian potatoes - Project leader: Rachel Bowman; Delivery partner: Seedbed Media; Potato Nutrition: An evidence-based Approach, Compiled by Dr Jane Watson.

# LA NIÑA ALERT -THE HEIGHTENED RISK OF LATE BLIGHT

Plant diseases can change the world. The English took to drinking tea when their coffee plantations in Ceylon (now Sri Lanka) were wiped out by coffee rust in 1869. Both the Salem witch trials and – more arguably – the French Revolution have been blamed on ergot infection of rye, the toxin of which causes muscle spasms, mania and hallucinations. By Jenny Ekman

However, there is surely no plant disease which has had as big an impact on human history as late blight – *Phytophthora infestans*. We are all familiar with the terrible story of the Irish famine (1845-1849). The disease caused at least 1.5 million deaths from hunger and more than a million permanent emigrations, spreading the Irish people around the globe. The population of Ireland has never recovered.

Late blight remains one of the most destructive and costly plant diseases around the world today. It can cause complete crop loss within weeks, as well as have significant effects on quality and yield on surviving crops.

According to Agriculture Victoria senior research scientist Dr Rudolf (Dolf) de Boer, more pesticides are used worldwide for control of late blight on potatoes than for any other plant disease. There are also major issues with fungicide resistance, making it ever more difficult to control.

## WHAT IS PHYTOPHTHORA INFESTANS?

*P. infestans* is not actually a fungus but belongs to a group of organisms known as the oomycetes. These produce mobile, swimming spores called zoospores.

In most of the world there are two forms of *P. infestans*; the A1 and A2 'mating types.' The sexual stage of the life cycle occurs when compatible strains of A1 and A2 mating types both infect a plant. The two strains merge, producing oospores with recombined DNA. These oospores are very robust, potentially surviving many years in the soil without a host.

In Australia we only have the A1 type, a relic of the original Irish late blight pathogen. This means that the lifecycle occurs solely through asexual growth and division. As robust oospores are not produced, the pathogen can only survive in living host material.

This means that *P. infestans* can be more readily controlled through crop rotation here than in many countries. Lack of genetic variability also makes it more difficult for resistance to develop.

However, it does not mean the fungus does not present challenges. There are a number of highly aggressive strains of the A1 (and A2) mating types. For example, an A1 strain present in Papua New Guinea would likely create major issues if introduced here, potentially replacing our existing strain. Similarly, a very aggressive A2 strain has become dominant in Scottish crops. Although it can potentially produce oospores, this strain still mainly spreads through infected materials, possibly due to incompatibility with local A1 types.

## **HOW DOES IT SPREAD?**

The late blight pathogen was introduced to the Australian colonies on infected seed potatoes sometime in the 1840s. However it was not until the early 1900s that major epidemics occurred, the infection spreading from farm to farm on infected seed potatoes. These days the pathogen is most likely to survive in small pockets, most likely as latent infections in old tubers and pre-emergent sprouts.


**Figure 1.** P. infestans lifecycle. Note that only asexual reproduction occurs in Australia as the A2 type is not present.

After emergence, the pathogen follows the growth of the plant from the tuber to the young stems. Here it spreads onto the new foliage and sporulates. What look like upside-down trees of whitish sporangia emerge from leaf lesions and through the leaf stomata. The sporangia are then spread by wind, or in rain or irrigation water to neighbouring plants, fanning out into the crop.

While sporangia can germinate directly, they can also release swimming zoospores. The zoospores actively move through water films on the leaves down the stems, to be further spread by wind and rain.

Sporangia can also be washed down into the soil to infect tubers.

Modern farming practices greatly reduce the risk of spreading the Australian A1 strain in seed. However, spread is still possible, as latent infection of tubers is not detectable through visual inspection.

Typical infection cycles are only 5-7 days. Where free moisture is present, the pathogen can spread rapidly, with devastating effects. Between potato crops, the pathogen can survive in seed and waste tubers, volunteer potato plants and alternative Solanaceous hosts.

# WEATHER DRIVES DISEASE

Late blight generally occurs sporadically, being very much driven by weather conditions. "Typical late blight weather is warm and sultry," states Dr de Boer. "Lengthy periods of warm, still and humid overcast days with cool nights and warm days present the greatest risk of disease."

Dew is the number one issue. "Rain in itself does not pose the risk. Rather, it's the prevailing weather conditions that accompany the rainy periods which are the problem."

In most potato growing regions of Australia, conditions are too dry during spring through to autumn to cause high levels of disease, especially if humidity is low. However, predictions of a wetter than average November suggest that risk may be higher this year.

There is a strong correlation between wet seasons and outbreaks of late

blight. "La Niña is the link here," suggests Dr de Boer. "La Niña years are when I get the most phone calls about late blight." Outbreaks occurred between 1998-2000, 2010-2012 and now 2021-2022, all of which were La Niña cycles. While La Niña predominantly affects the north east, it can also bring late blight conducive conditions further south.

# WHERE DOES IT COME FROM?

Changing weather conditions means there are big gaps between outbreaks of late blight. But we know that the A1 strain can only survive on live materials – where does it go?

According to Dr de Boer "It most likely survives in pockets of very protected areas which have favourable microclimates. These allow the fungus to regularly complete its lifecycle during drier seasons. It may be present on old tubers, self-sown potatoes or other hosts such as kangaroo apples. But that's a big question mark".

Prof. Steven Johnson agrees. In his experience, epidemics don't start from

volunteer potatoes, but these plants will let an epidemic continue. "Late blight likes a young lunch, it prefers very actively growing tissue. Self-sown potatoes tend to be a little slower, so they get infected later in the season." While some mystery remains about where infection comes from, certainly the importance of using clean seed can't be overstated.

Because of the sporadic nature of conducive weather conditions, the pathogen experiences "boom" and "bust" cycles in the Australian environment. In a conducive season it will take some time for the population to build up from a very low base and the disease may not be so obvious. However, if followed by a second favourable year, the disease is likely to be much more serious. This resulted, for example, in a higher disease incidence the 2021/22 La Niña cycle compared with the 2019/20 cycle.

# LATE BLIGHT SYMPTOMS

In the early stages of infection, leaves develop pale, grey green lesions. These expand rapidly, turning brown to black with pale margins. Under very wet conditions the lesions become black and slimy. Necrotic lesions can also be found on the stems (Figure 2).

Under humid conditions white fuzz develops on the infected stems and undersides of the leaves (Figure 3). These contain the wind and rain borne sporangia, which spread to neighbouring plants. Once this occurs plants generally collapse, with the infected zone clearly visible as a patch of dead and dying plants.

The spores produced on the upper parts of the plant eventually wash down into the soil and infect the tubers. Initially, the tubers develop a tan-brown reddish or purplish rot just under the skin. Irregularly shaped, sunken areas develop, turning into wet and slimy lesions. Bacterial infections often then attack the tubers, causing complete collapse.



Figure 2. As the disease develops, pale grey lesions on the leaves expand and turn brown (a). Under very humid conditions (such as in the highlands of Java) these lesions can become black and slimy (b). Necrotic areas spread through the stems (c). Eventually the plant dies, as shown on this 4 week old, untreated 'Sequioa' plant (d). - Images: R. de Boer.



Figure 3. Under humid conditions, whitish sporangia containing zoospores emerge on leaf undersides, mainly around the active margins of the leaf lesions - Images: R. de Boer

# LATE BLIGHT IN AUSTRALIA

The epidemics of the early 1900s saw outbreaks occur across all Australian potato growing districts, from the Atherton tablelands, across to Perth and down to Tasmania. Fortunately for WA it has not been recorded since. In fact, since the 1980s control has improved around Australia, with outbreaks now concentrated in pockets of NSW, Victoria, South Australia and Tasmania.

After the 1909 outbreak plant pathologists looked at where else it could be found. They found the disease widely on potatoes, tomatoes and the weed kangaroo apple (*Solanum aviculare*) – which was frequently growing around and within potato production areas. Curiously, black nightshade plants (*Solanum nigrum*) growing in late blight affected crops were immune.

"It is important to note that the 1909-11 epidemic occurred with a La Niña weather event, just like the La Niña we are having at the moment," states Dr de Boer.

# KEEPING A2, AND NEW STRAINS OF A1, OUT

Not having the A2 strain in Australia is definitely a major advantage.

The A2 strain initially came out of Mexico, spreading first to the United States and Europe, but eventually – thanks to the trade in seed potatoes – to many other potato producing countries around the world. This means there is much wider genetic variability in pathogen populations in most countries outside Australia.

Dr DeBoer has worked extensively on identification of *P. infestans* strains. "These new strains are far more aggressive than the old clonal strains we had before." He explains "they have a shorter lifecycle; instead of having a turnaround of 4 to 7 days, this is reduced to 3 to 5 days or even quicker. Many are metalaxyl resistant, and some A2 strains are also 'resistance busting'; there's a strain kicking around the UK which has overcome resistance bred into new varieties. Wider genetics mean that these new strains are also more adaptable to wider temperature regimes, lower moisture and so on."

It is clearly critically important to keep A2, and new strains of A1, out of Australia. It is also important to regularly identify strains present in Australia to identify if incursion has occurred.

From 1998 – 2001 Dr de Boer led a HIA funded project examining the strains then present in Australia. "We got a lot of help from industry – chemical companies, agronomists and growers all collected samples. The pathogen was tested for mating type, metalaxyl resistance and DNA fingerprint analysis."

"All our samples were a single clone of A1 mating type (designated AU-1) and very sensitive to metalaxyl. It's the same genotype as the strain that caused the Irish famine (FAM-1). This was displaced by new strains elsewhere around the world by the 1950s, so is essentially a relic found only in Australia and New Zealand."

What this means is that there have been no new introductions of *P. infestans* to Australia in more than 100 years. This is undoubtedly due to the quarantine systems that were established in Australia in the early 1900s, including mandatory testing of seed since 1913. There have been no imports of unprocessed potatoes for several decades.

However, risk remains. The A2 strain is present in Indonesia, and various A1 strains are present in Thailand, PNG and East Timor. There is always the possibility of someone bringing back some oospores on their boots or a souvenir tuber in their bag.

# CONTROLLING LATE BLIGHT

Prevention is clearly the best method of control. This means using only certified seed, ensuring there are no volunteers left over from previous crops, and removing Solanaceous weeds, especially kangaroo apple.

Minimising any initial source of infection will delay spread during cropping. However, even a tiny amount of inoculum can spread exponentially under wet conditions, infecting the entire crop. When risk is high, they key questions are therefore:

- When to spray
- What to spray
- When to salvage

**When** to spray is often based on prediction modelling. According to Prof. Steven Johnson from the University of Maine, "We don't control late blight, we manage it. Going for zero tolerance is expensive and can be an unreasonable approach."

According to Prof. Johnson, the most important period is during early crop development. "If late blight gets a foothold during early growth, then you just can't keep up with it, as it develops exponentially early in the crop cycle." Once a large amount of inoculum is present in the field, no amount of fungicide will be able to hold it back.

This means that the intervals for subsequent applications should be weather driven. "So not every Friday night," says Prof. Johnson; "Calendar based spray schedules are not environmentally or economically sound."





Figure 4. Timing sprays appropriately

Figure 6. It is essential to cover the entire crop when applying fungicides. In this field the grower has left the edge of the crop unsprayed; this has allowed development of late blight, which can then spread to the remainder of the crop (Image: S.B. Johnson).

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What to spray includes choices of;

- Contact (protectant) fungicides, which don't move into the plant tissue e.g. chlorothalonil, mancozeb, fluazinam
- Translaminar fungicides, which move into the plant tissue but don't move within the plant vessels e.g. dimethomorph (Acrobat<sup>®</sup> SC)
  - Move slowly through the plant leaf from top to bottom
  - These have longer lasting effects than contact fungicides
- Systemic fungicides, which move into the plant tissue and around the entire plant
  - Most are upwardly mobile, so can protect new foliage as it emerges (e.g. Infinito<sup>®</sup>)
  - Some are also downwardly mobile (e.g. Ridomil Gold®)

Prof. Johnson suggests using either full or partial rates at different points in the season and emphasises the importance of putting the fungicide where and when it is needed. "You've got to replace eroded material," he says. "That could mean that just one extra application has a big impact on rates of disease." (Figure 4).

This is especially important when the plant is rapidly increasing its leaf area (Figure 5). "Early in the season the plant can double in size every three or four days. If you're putting on a protectant, the plant is going to outgrow it very quickly. This is when it's best to use a systemic, or at least one of the translaminar products, that can move with the new growth."

Getting good coverage is essential, so applicators need to understand their equipment. This means considering boom height, nozzle type and pattern, forward speed and using adequate water volume to fully cover the crop.

"I've seen crops where the grower didn't want to run the extra half pass with the boom spray to get right to the edge of the field, so those plants

got late blight. This then became a spreader row for the rest of the field," comments Prof. Johnson (Figure 6).

**Salvaging** involves regular checks for areas of late blight within the crop. For example, if seed introduces disease to one area of the field, it may be better to kill those plants to prevent spread, protecting the rest of the crop (Figure 7). Prof. Johnson suggests an area around 10x the size of the initial outbreak, to be sure to get good control.

"Late season finds are important as well. We don't get a lot of tuber infection when conditions are warm, so in this case you might want to go for an early kill rather than leaving the crop to full term," suggests Prof. Johnson.

# CONCLUSIONS

Late blight is something growers are likely going to have to deal with this season. As Prof. Johnson says "I'm pretty darn sure that you're going to have late blight this year, and it's going to come early. Certainly, in the Ballarat area, and east and west of Melbourne, you're starting out with a higher initial level of inoculum, and that's what is likely to drive any epidemic hard".

In central northern Tasmania late blight was a major issue last season, with infection occurring relatively early in the season. There are reports of yield losses up to 30%. There is a high risk that the pathogen has overwintered in / on other host plants or volunteer potatoes (Figure 8). Dr Nigel Crump from AuSPICA also sees an increased risk of late blight this year. "Generally in Victoria we see late blight fairly late in the season, as inoculum builds up. It's a community disease, rather than individual paddocks, and a community approach is important for control."

Early detection is essential, so checking the crop regularly when weather conditions are right for infection is critical. If late blight starts to get away, it's virtually unstoppable.

Testing services are available, so sending in samples to confirm presence of late blight is highly recommended. These will also help to confirm that we still only have the A1, metalaxyl-sensitive strain present.



**Figure 5.** The red lines indicate doubling of the plant canopy area. If forecasting indicates risk of disease is high, systemic or translaminar fungicides should be applied when leaf area is increasing rapidly, and protectants once new growth has slowed or ceased. Derived from data presented by Prof. Stephen Johnson.



Figure 8. Even a small increase in the initial level of inoculum can see late blight become a major issue much earlier in the season.



Figure 7. If an outbreak of late blight occurs within a field, the best option may be to kill those plants, rather than risk the disease spreading into the remainder of the crop. (Images: S.B. Johnson).

Dear Spud GP I've heard reports of fall armyworm in potato crops, how concerned should I be and what can I do? -Warren

# ASK THE SPUD GF

Head with inverted pale 'Y



Ontario MA



### Hi Warren

Fall armyworm (FAW) is definitely a significant threat to horticulture globally. Originally from the Americas, it was first detected in Australia in January 2020. It spread rapidly, travelling all the way from North Queensland to Tasmania in just 14 months.

While FAW favours maize, sweetcorn, sorghum and pastures, potatoes can still be affected. When populations of FAW are high, they may move into neighbouring potato crops and cause damage. It is important to know your risk. Areas with continual / high populations of FAW are more susceptible to damage. A map prepared by the CSIRO and Plant Health Australia indicates areas where it is most likely to be present and risk is highest (Figure 2).

The good news is that potatoes are not a preferred host for FAW, and that the insect does poorly when living in potato crops. Compared to maize, FAW has lower survival, is slower to mature, and produces fewer offspring when in potato crops.

For example, only half the baby

caterpillars make it to second instar in a potato crop, whereas nearly all of them survive to pupation when they are feeding on maize. Of those females do make it to adulthood, they lay an average of 444 eggs when raised on maize but only 136 after a diet of potato (Guo et. al, 2021).

In other words, the overall fecundity (maximum potential reproductive output) of FAW is dramatically reduced in potatoes (Figure 3).

So does this mean that there will be no damage to potatoes? Not really. There can still be feeding damage to



Figure 2. Potential areas at risk from FAW; adapted from original published by CSIRO and Plant Health Australia

the plant, and in a natural setting there may be other host plants around the potatoes which improve survival of the FAW larvae, increasing the adult population.

Chemical control is available for FAW. Check the Australian Pesticides and Veterinary Medicines Authority permits portal here (<u>https://portal.</u> <u>apvma.gov.au/permits</u>) and search Fall Armyworm to give a list of the available products. FAW has been noted for its ability to gain resistance to chemicals relatively quickly. Combat this by using IPM and following the AUSVEG Management of fall armyworm in vegetable crops in Australia guide.

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



Figure 4. AUSVEG FAW management guide QR code



Figure 3. When taken from egg to adult, less than 50% of the original population of FAW survives past the first instar larval stage on potatoes, whereas more than 95% of the insects survive to pupation on maize (left). Fecundity is also greatly reduced on potatoes, with the number of second-generation offspring approximately 10% of what it would be on a maize crop. Data derived from Guo et al., 2021.

#### **REFERENCES AND FURTHER READING**

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