

ANNUAL UPDATE 2022/23



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changing climate

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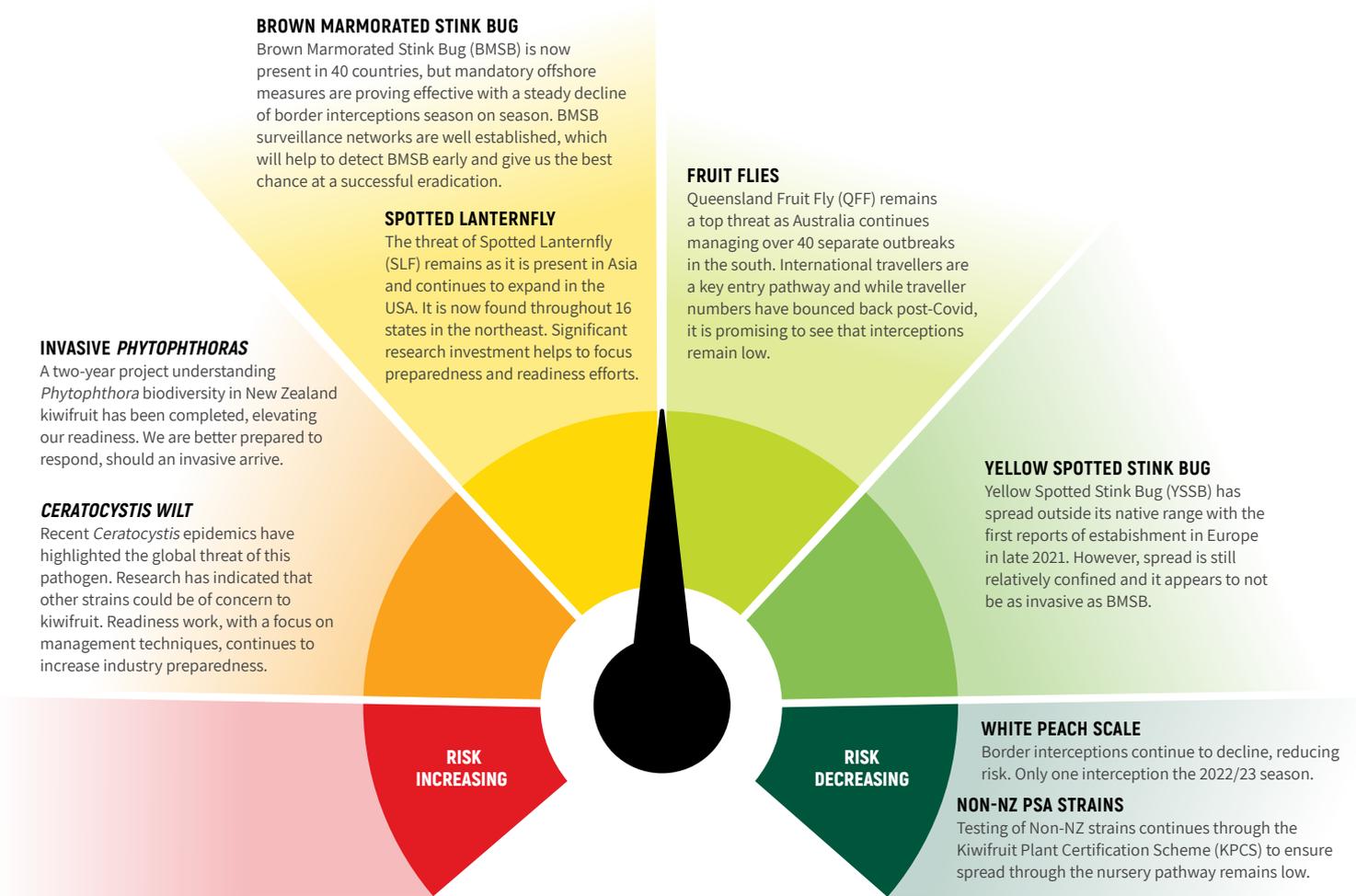
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How biosecurity risk is changing



How KVH is influencing biosecurity risk

BIOSECURITY AWARENESS

- Kiwifruit's "Most Unwanted" collateral has been updated, featuring eight organisms identified as the biggest biosecurity threats to New Zealand's kiwifruit industry, increasing awareness. The poster and flyers are great tools for increasing awareness of our top threats and how to report sightings.
- It has been a tough 12 months for the growing community and wider industry, with many external challenges taking priority, including a number of unforeseen climatic events. KVH understands this, and has ensured focus on biosecurity as part of day-to-day best practice on-orchard isn't lost.
- Along with regular publications and newsletters, a new kiwifruit pest calendar specifically for growers has been launched to help raise awareness of threats at high-risk times, and their identifying features.

UNDERSTANDING OUR EMERGING RISKS

- KVH continues to work closely with the Ministry for Primary Industries (MPI), science community, kiwifruit growers and other industries (both locally and around the world) to learn more about global biosecurity threats and better understand risks.
- The Kiwifruit Risk Framework project has been initiated through Zespri Innovation. This development of an automated risk analysis system that is transparent, scalable, and fast is a significant step for our industry and wider biosecurity.

READY TO RESPOND

- KVH, with support from Biosecurity New Zealand, ran a response scenario to help enhance our industry's biosecurity capability in late 2022. Training like this helps increase individuals ability and confidence in the event they are called upon in a response - the better prepared and more capable we are as industry, the more chance we have of successfully responding to a biosecurity incursion.
- A multi-year project, through Zespri Innovation, is looking to design a fit for purpose surveillance system for the kiwifruit industry to help detect threats early enough to ensure we have the best chance at a successful eradication.

ON-ORCHARD BIOSECURITY

- KVH has been working with growers and contractors to ensure they have a biosecurity plan in place for their orchard and/or business that ensures staff and visitors are aware of, and minimising, potential biosecurity risk.
- When growers report unusual vine symptoms KVH ensures samples are submitted for testing. There were 47 unusual symptom reports made and followed up within the last 12 months.

Note: Green on the dashboards indicates where we are well prepared, red indicates where improvement is needed.

What's happening around the world?

UNITED STATES OF AMERICA

- Spotted Lanternfly (SLF) spread continues. It is now present across 16 states in the northeast USA and population levels are said to be increasing. This spread has been linked to ongoing climatic changes; with less intensive winters and warm springs resulting in less overwintering mortality and earlier emergence.
- While Brown Marmorated Stink Bug (BMSB) populations are no longer exploding as was seen in some previous seasons, growers remain vigilant and consistently manage this pest to ensure significant impacts are avoided.
- In late 2022, California state government established two separate quarantine zones to tackle invasive fruit flies. One for Mexican Fruit fly in San Diego and another tackling an Oriental Fruit Fly outbreak in San Jose. This comes just after lifting quarantine for an eradication of Oriental Fruit fly first discovered in 2021.

EUROPE

- Outbreaks of Med fly have been reported in parts of Europe. Spain's record temperatures in summer resulted in an outbreak level population not previously seen.
- Yellow Legged-Hornet continues to spread across Europe, expanding its habitat by more than 80 kilometres per year. A recent study has revealed that their widespread infestation in Europe was likely the result of just a single wasp making the jump from China to France.
- A strain of *Xylella fastidiosa* is spreading fast through a range of hosts in Portugal, raising the alarm throughout the country and neighbouring Spain. As per European Union directives, all plants infected with *Xylella* have been destroyed.

SOUTH AMERICA

- Mediterranean Fruit Fly (Med fly) outbreaks continue to occur in Chile. Currently there are nine locations across five affected regions.
- The Chilean and Argentinian governments are collaborating to combat fruit fly incursions through Sterile Insect Technique (SIT) releases. Between 1,500 and 4,500 sterile flies are released per hectare two to three times per week. These are used as a preventative measure; whereby sterile flies are released over areas at risk of outbreaks to try and eliminate any emerging populations as soon as they arise.

Keeping pace with change: Biosecurity risk constantly changes as new organisms are discovered, expand their host range, or invade new geographic areas. This map illustrates some of the key events over the past 12 months that influence risk for the New Zealand kiwifruit industry, and are closely monitored by KVH, using our international research and intelligence networks.

ITALY

- Oriental Fruit Fly has been found in some orchards in Naples. So far, these appear to be the first findings on a regional and national scale, while at a European scale, other findings have been reported at some entry points in France on imported fruit.
- Italy continues to release the Samurai Wasp to combat BMSB. After three years of releases, they have discovered it overwintering, suggesting it is establishing natural populations in the environment. Its parasitism rates are increasing year-on-year which is promising.
- KVDS has been in the spotlight for Italian kiwifruit growers for the last few years. Research into water, soil and vine management has been their focus with positive results seen amongst growers. With environmental conditions playing a big factor, maintaining a watch on climatic conditions will be important going forward.

CHINA

- KVH and Zespri are continuing to collaborate and fund research based in China. Recently completed projects include understanding impacts of SLF on kiwifruit and the release of the Samurai Wasp in kiwifruit to help inform a control programme for BMSB.

AUSTRALIA

- South Australia has been battling Queensland Fruit Fly for over two years now and currently have more than 40 outbreaks across the region. A free, self-baiting programme with commercial growers has begun, to try and minimise population numbers.
- Expansion of the National Sterile Insect Technology (SIT) facility in South Australia is now underway, helping to drive down fruit fly numbers. The existing site produces up to 20 million sterile flies a week but has reached capacity as sterile flies are being released weekly as part of the response to the current outbreaks.
- Australia continues with stringent border measures to keep BMSB out of the country. In several cases, biosecurity officials have ordered infested vessels to depart to other countries to be fumigated before returning to Australia to unload.

NEW ZEALAND

- There were no fruit fly interceptions at our borders for the 2022/23 high-risk season.
- BMSB numbers at our borders are continuing to decline season on season, however, the risk remains high. There were 44 live finds during the 2022/23 high-risk season, compared to 63 the previous season.
- The BMSB national surveillance programme includes 172 traps at 86 sites (including 10 traps funded by KVH) to provide early warning of incursions.
- Additionally, KVH piloted an industry led BMSB surveillance network for the 2022/23 season. This included two traps at nine kiwifruit packing facilities across Mount Maunganui and Te Puke. No BMSB were detected.
- Fall Armyworm continues to spread. Biosecurity New Zealand has recently shifted from an eradication phase into long-term management of the pest and 250 traps have been deployed all over New Zealand, primarily in and around maize and sweet corn crops. No impacts to kiwifruit have been reported.



Foreword from the Board Chair



The most robust approach to biosecurity risk management is knowing what pest and disease threats are out there on the horizon, stopping them at the border (or even better – offshore), and being well prepared for what does manage to make its way to our shores and orchards.

It isn't easy, and we're all very familiar with the term 'there is no such thing as zero risk'. In fact, the risks are high. We have growing volumes of imports and mail; people and cruise ships regularly visiting our ports; and thousands of travellers (and their luggage and goods) arriving at our airports every day. We also of course have more natural biosecurity risk related to climate, weather, and wind.

KVH monitors these pathways and their potential risks on behalf of New Zealand's kiwifruit industry. This is done in partnership with the wider horticultural sector as well as government, to ensure we are well prepared and ready to respond if needs be.

A big part of responding to risk events is having the ability and capability to adapt to the change that they bring with them. This Annual Update for the last 12 months highlights how KVH and the kiwifruit growing community are aware of and adapting to what is happening, and what could happen, in terms of the risk posed by some of our industry's biggest biosecurity threats.

The National Kiwifruit Pathway Management Plan and next phase of Psa management detailed on

pages 8-11 are examples of KVH and the industry adapting now, through a legal framework, to ensure greater protection from risk, while at the same time creating benefits for growers of less rules and regulations, and increased pragmatism.

The development and implementation of the new Pathway Plan has been a big project and as a Board we have been delighted to see it come to fruition.

'Biosecurity and climatic changes' on pages 12-13 is a fascinating read into adaptation in both a current and future sense. New threats we refer to as sleeper pests that have a greater chance of getting to our shores, and successfully establishing due to change in climate, are something we cannot take our attention off.

And of course, through early 2023 weather events had a huge effect on the kiwifruit growing community. On pages 14-15 the team discuss impacts of wet weather on plant and vine health, and mitigations to adopt over the medium to long term that will minimise potential for disease and subsequent spread.

We are in a time of change. The way we live, work, and grow food for the world is constantly evolving. However, our biosecurity values are strong, and they provide the foundation – strategically and operationally – for successfully adapting to any changes we are faced with. I hope you enjoy reading this Annual Update and the articles that detail KVH's work in this area.

Last but not least, I personally also have change in my near future. This is my last column and Annual Update for KVH.

I have been honoured to have served on the KVH Board and I am thankful for the past six years, including five as Board Chair, and I am thankful for the support received from across the industry during that time.

Biosecurity is integral to the ongoing success and sustainability of our industry, and I will continue to support both the KVH Board and team as the organisation evolves and provides ongoing leadership.

Special thanks to all past and present KVH Board members and staff, and the current KVH team led by Leanne. Your hard work and dedication has not and does not go unnoticed.

I am proud to have been a part of KVH's story and I look forward to the next chapters. I'm not leaving, just 'adapting'. This is not farewell, just mā te wā. See you again, more than likely soon.

Foreword from the Chief Executive



The last 12 months have been productive and successful for the KVH team, with implementation of the new National Kiwifruit Pathway Management Plan and the move into the next phase of Psa management two notable achievements.

They are of course just the tip of the iceberg in terms of KVH activities over the year and any kind of list would be exhaustive, but I do want to give them special mention as they are big pieces of work that as the Board Chair mentioned in his column, reflect our ability as an organisation – and industry – to evolve and adapt to changes in biosecurity risk.

You'll read in the following articles how and why we have implemented the new Pathway Plan over the last 12 months, and the fact that with the new Plan the timing has been right for the industry to move into a new phase of longer-term Psa management.

For much of the last year KVH and Zespri worked together to ensure that from 1 April 2023, when the new phase formally took effect, our kiwifruit growing community could be assured of KVH continuing to manage all high-risk activities related to Psa (such as detection of spread and new variants) and that on-orchard support and best practice advice would continue to be available, but now co-ordinated and produced by Zespri.

KVH and Zespri jointly ran several Psa workshops in growing regions to talk through these changes and the reasons for them, and it was immensely pleasing to see them so well received. Thank you to all those who joined us.

With the creation and implementation of the new Pathway Plan we are enhancing our ability to manage wider biosecurity risk (instead of Psa only) on all our internal pathways, but as you'll read in this Annual Update, there are many other ways in which KVH is working to manage and limit the impacts of biosecurity threats – because as the Board Chair mentioned, there is never zero risk and there is never a single magic bullet for stopping threats coming our way.

I hope you enjoy this year's update and reading about the work of the KVH team. We have all had a very busy 12 months and your ongoing support of the organisation and team is appreciated. It has been a challenging time for growers, with many unexpected weather events heavily affecting orchards and businesses and reminding us all – as per pages 14-15 – of how such events can affect plant and vine health and the good practices we can have in place for mitigation. We look forward to continuing to work alongside you as we build on the work already underway in this space.

Thank you to the KVH Board for your dedication and expert input, and to NZKGI and Zespri for your continued commitment to the importance of response and readiness efforts and the work of KVH.

Lastly, on behalf of myself and the KVH team, I would like to acknowledge the outgoing Board Chair and thank him for his time with the organisation. Dave, your contribution has been immense and your impact immeasurable – particularly at the height of the Psa response. I am sure I speak for many across the New Zealand kiwifruit industry in saying that we are thankful for your governance, technical and scientific knowledge, as well as your guidance and friendship.

New Pathway Plan provides better biosecurity protection

The kiwifruit industry's National Pathway Management Plan is now in place, ensuring that if a kiwifruit pathogen were to arrive, we can reduce impacts on growers.

After several years of development in consultation with the kiwifruit growing community, the new Plan came into effect from 1 April 2022 and has been progressively implemented over the last 12 months, providing much better biosecurity protection.

We need to be as prepared as possible and ready to respond to the next biosecurity event. The new Pathway Plan provides extra assurance that we are.

By implementing the new Plan, we have – as an industry – lifted our biosecurity practices and reduced potential harm from our greatest threats.

The biosecurity practices already in place are good and have increased significantly over the years, but they have been largely focused on Psa only and could leave us vulnerable in the event of any new incursions that spread differently.

While the Pathway Plan retains elements needed for Psa protection (including controlling movements of high-risk pathways to the South Island and the ability to implement increased measures in response to any new variant detections) it doesn't specifically focus on any single pest or disease, and instead covers a wide range of threats and gives us a way to pragmatically manage their pathways - such as young plants, budwood, and pollen for example.

The risk associated with each pathway varies, and will also vary over time, depending on the organism of concern. Certain mitigations, such as traceability and good biosecurity practices, are required across all pathways and where additional risk remains, monitoring for specific or generic symptoms may also be needed. Sometimes, these practices may still not be sufficient to reduce risk to an acceptable level and an additional layer of testing or treatment might be required, which the Plan allows us to implement.

One of the key aspects of the Pathway Plan is on-orchard biosecurity planning and the requirement for growers to have a plan that is appropriate for their property.

This isn't new (there was a requirement under the old National Psa-V Pest Management Plan for growers to have an orchard management plan for Psa) but has been broadened to manage risk associated with a wider range of threats.

KVH has a kiwifruit grower's on-orchard biosecurity plan template which is aligned with the requirements of the new Pathway Plan and can be completed on paper or online at kvh.org.nz. Contractors are required to have biosecurity



plans too. Those who are part of the Zespri Gap/Compliance Assessment Verification (CAV) will have a biosecurity plan included as part of CAV requirements, and this will be audited. You can see a template CAV biosecurity plan on the KVH website.

If you're a contractor not currently part of the Zespri CAV, you need to create and complete a biosecurity plan that you can present to growers. KVH has created a useful template, available on the website at kvh.org.nz, which you can type into or print and handwrite. We've made this template editable as you may also choose to adapt it to suit your needs, and include other requirements, such as health and safety protocols for example.

The Pathway Plan is significant and something the kiwifruit industry can be proud of. It's the first national plan of its kind implemented under the Biosecurity Act and shows the continued biosecurity proactiveness of our industry, as well as being an important step forward in the way we manage the risk of unwanted threats.

WHAT HAPPENED TO THE NPMP?

The Psa-V National Pest Management Plan (NPMP) was implemented in May 2013 for a 10-year term to reduce the impact and spread of Psa – it set out rules which have been largely effective, as evidenced by the fact that Psa has not been detected in the South Island.

After a one-year overlap with the new Pathway Plan, the NPMP expired in May 2023.

Like the new Pathway Plan, the NPMP was a regulatory tool under the Biosecurity Act. The key difference is that the NPMP was specific to Psa only, whereas the new Pathway Plan enables the whole industry to better manage a broader range of biosecurity threats.

An independent review of the NPMP has been undertaken so that we can learn more about its elements of success, as well as any insights for improvement that we can incorporate into the way we implement the new Pathway Plan.



CASE STUDY: MANAGING RISK OF PSA VARIANTS?

A recent KVH-led investigation into the detection of a new form of Psa used research commissioned by Zespri Innovation and undertaken by Plant & Food Research (PFR) to understand potential risk and control tools available with the introduction of the new Pathway Management Plan and as the industry moves into the next phase of Psa management.

In February 2023 KVH announced that results from ongoing research and monitoring confirmed the Psa variant first detected in mid-2022 is not a more virulent form nor is there any evidence to suggest it will be associated with any increased impact to growers.

KVH and Zespri Innovation had research commissioned to further understand the variant after it was detected on a small number of properties through the regular review and sequencing of historical Psa samples.

This research included plant assays and inoculations, and combined with regular field observations, found no differences in Psa symptoms and severity between the two strains.

These results are reassuring and highlight the importance of KVH's science-based monitoring programme for new forms of Psa as well as the robust processes we have in place for preventing spread if these appear.

The research results, which have been collated and formally produced into a scientific report available from KVH, also provide future value as a reference point in the event of further variants and will add to our knowledge about any potential significance they may have on our industry.

KVH thanks growers and staff at properties where the variant was detected for their co-operation and support of our activities,

particularly precautionary measures to manage movement of any risk items from these properties.

This work is an example of KVH's ongoing role in managing all high-risk activities as the industry moves to the next phase of Psa management with the introduction of the new Pathway Management Plan and phasing out of the Psa NPMP.

Importantly, the investigation highlighted the importance of growers keeping traceability data in a form that can be quickly accessed and used by KVH for these purposes. Biosecurity functionality within the well-used Onside app is an option KVH encourages growers use, as it can allow faster and more accurate data collection.

GROWERS GLANCE: THE FIVE THINGS YOU NEED TO KNOW

Complete an on-orchard biosecurity plan

This can be done using the KVH template, either hand-written in the printed booklet or online at kvh.org.nz. A copy is required at GAP audit.

Source clean plant material

Source plants, budwood, compost, and pollen from suppliers who meet requirements. Check this via the KVH website or look for KPCS or Plant Pass logos. Keep good traceability records that show where plant material ends up on the orchard.

Suppliers with KPCS or Plant Pass certification are examples of those you can be assured have met all requirements and rules of the Pathway Plan.

Moving goods between islands?

Check with KVH before moving risk goods from the North to South Islands or vice versa – additional controls apply.



Here's what you need to do to meet the requirements of the new Pathway Plan.

Make sure contractors have a biosecurity plan

Contractors are required to have a biosecurity plan that shows how they reduce risk to your orchard. CAV contractors have biosecurity built into their accreditation. Those who aren't part of CAV will have a simple one-page biosecurity plan from the KVH website.

Supply clean plant material

If supplying plants, budwood or pollen to other orchards, register with KVH to join the KPCS, so we can start tracing in an incursion. Always follow best practice including monitoring for unusual symptoms and keeping good records - for traceability and audits. Onside has functionality for this.

Industry moves to longer term management of Psa

Images: KVH and Zespri visited growers across the regions to talk about the new phase of Psa management in February and March 2023.



Just over a decade since the initial response to Psa in New Zealand, the kiwifruit industry continues to lead the way with development of a more fit-for-purpose and long-term strategy for managing the disease.

Management of high-risk activities like limiting spread and impacts continues, as does production of on-orchard best practice advice. Who does what, and where to access tools, has been enhanced.

For many years, the kiwifruit industry has been at the forefront of biosecurity and pest management. This proactiveness and future thinking continued with the introduction of the industry's new Pathway Management Plan and phasing out of the National Psa-V Pest Management Plan (NPMP), as you can read more about on pages 8-9.

With the introduction of the new Pathway Plan legislation, we have streamlined and simplified biosecurity rules and regulations, so they are more pragmatic and provide protection against a wider range of biosecurity threats. This has provided the opportune time to move into a new phase of Psa protection and longer-term management, effective from 1 April 2023.

KVH and Zespri worked together for some time in preparation for this new phase to ensure a seamless transition for growers, and so that the very best support is utilised and provided moving forward.

While much stays the same and there is little change for growers - particularly in terms of detecting, reporting, and managing any new spread of Psa - advice and technical resources are starting to look quite different, with small changes in responsibilities for production.

As the industry's dedicated biosecurity body, KVH retains all high-risk management of Psa and preparedness for any new variants. Psa remains a specified organism in the new Pathway Plan, which ensures we continue to have the ability to manage the spread of the disease within New Zealand and respond to new forms should they be found.

This is particularly important to those growing regions where there is currently no Psa, such as the South Island.

Any reports of spread, or concern around potential new Psa variants, should be reported to KVH at info@kvh.org.nz as they normally would.

The Weather & Disease Portal remains available on the KVH website currently, including the popular disease risk reports that can be automatically emailed to you on the days of the week you choose. In time, this will fully transition to the Zespri Canopy.

KVH Regional Co-ordinators are available for all biosecurity concerns including Psa and are a valuable local source of knowledge and support.

To be consistent with other crop protection responsibilities for pests already present in New Zealand, Zespri now coordinates support to growers to manage the impact of Psa on-orchard.

This includes listing and updating available Psa crop protection products in the Zespri Crop Protection Standard; monitoring and providing justified approvals; and providing grass-roots practical grower advice on product compatibility and optimal use - including for new varietal releases. Resources and articles informing good practice on Psa management will continue to be shared in industry publications and research reports made available via the Zespri Canopy.

Zespri also now manages and produces the resources and tools that promote Psa management best practice.

Lastly, the Psa research programme continues to be maintained by the Zespri Innovation crop protection portfolio.



THE IMPORTANCE OF ONGOING PSA MANAGEMENT

The intent of the Psa NPMP was to achieve the successful recovery of the kiwifruit industry from Psa, and today we can say that this has been achieved through the combined efforts of many.

However, this success doesn't mean we can rest on our laurels. We need to continue the things we know to be important into the new phase.

Parts of the Far North and the South Island region remain free of Psa, and South Island orchardists continue to grow without the challenge of Psa impacts or the complexity of managing this disease. North Island growers also benefit, through the southern supply of Psa-free pollen, budwood and nursery plants.

Clean budwood allows North Island nurseries to produce Kiwifruit Plant Certification Scheme (KPCS) fully certified plants, giving new

developments the best possible start. The Zespri new variety programme is similarly supported by the sourcing of Psa-free budwood and the development of the RubyRed tissue culture pathway will soon also provide Psa-free budwood for future licence releases.

Biennial monitoring for genetic changes in Psa isolates has kept tabs on how Psa is changing over time - we look to see if new or deleted genetic elements have resulted in changes that could pose a future risk of resistance to control products or increase the ability of Psa to cause disease across our cultivars. We have and will continue to include samples from sites where growers suspect a lack of control and as part of our continuing role will follow up on any Psa variants of interest to ensure they do not represent any potential increase in impacts.

We have learnt to live with and manage Psa, but we also live in a world of constant flux, where we need to have robust monitoring and preparedness systems in place, so that we are always able to identify and respond to risk.



ACCESSING PSA-RELATED SUPPORT

IF I WANT TO ...	WHAT DO I DO?
Access current and up-to-date Psa resources, management information, and spray information	Co-ordinated and managed by Zespri, made available within the Canopy and in industry publications (Kiwifruit Journal, Kiwiflier) as well as at events and workshops
Have a visit from a technical expert to help me manage Psa on-orchard	Speak with your post-harvest technical representative or grower liaison team
Report a potential new detection of Psa, or new spread	No change: contact KVH
Report a potential detection of a new Psa variant or any other unusual symptom	No change: contact KVH
Use the Psa risk model and other tools within the online Weather & Disease Portal	No change: visit kvh.org.nz (we'll let you know when this fully transitions to the Canopy)
Access Psa research reports released up until 1 April 2023	No change: visit kvh.org.nz
Access Psa resources and spray information released up until 1 April 2023	No change: visit kvh.org.nz

Impacts of a changing climate on biosecurity

Our climate is changing - a fact that is hard to refute.

At its most basic level climate change is thought of as “a warming world”, but there are a range of elements, aside from increasing temperatures, that could have significant impacts on biosecurity risk. These might include altered rainfall patterns and increased frequency of extreme weather events, such as droughts, floods, and storms.

Climate change is often discussed on a global scale, but it is also leading to shifting climate patterns both nationally and regionally.

We all know that the environment is an integral player in our ability to grow good kiwifruit. It also has a pivotal role to understanding the potential threat of future biosecurity risks.

Ultimately, climate change will present us with an array of new biosecurity challenges in the future, likely including an increasing risk of new pests and diseases that are currently prevented by our climatic conditions.

New Zealand’s temperate climate means that some tropical and sub-tropical high-risk biosecurity threats are currently unable to establish here. A warmer climate would likely mean that some of these unwanted pests could permanently establish in New Zealand in the future.

Existing pests will change distribution patterns and may behave differently under predicted future climates. For example, sleeper pests (i.e., those pests that are established but kept at bay by an unsuitable climate) will become active, or pathogens like *Phytophthora*, where impacts are somewhat localised/sporadic, will find more favourable conditions for widespread damages.

There will also be opportunities for new crop types to be grown commercially in areas of New Zealand previously thought unfavourable. This has the potential to bring an array of pests and diseases that current crops have not been exposed to.

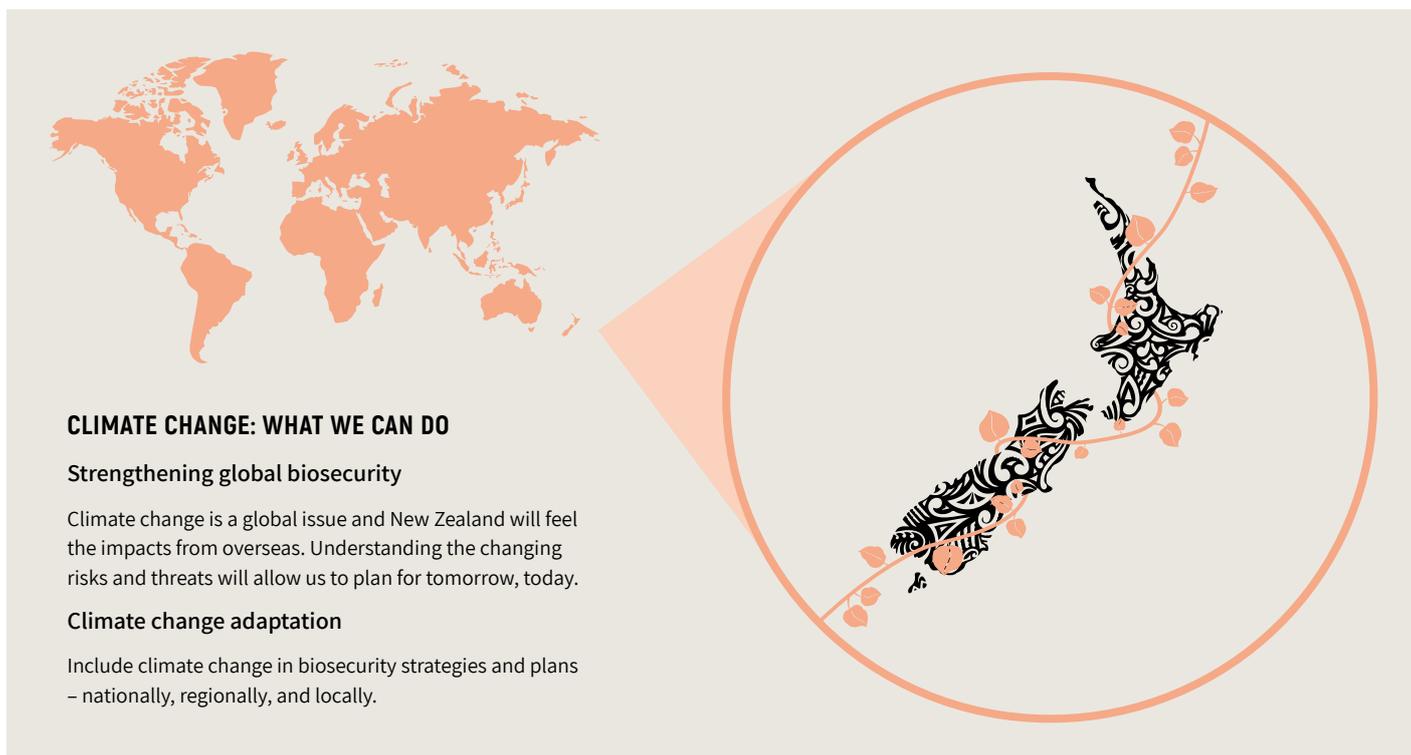
Existing crops, such as kiwifruit, will grow in those areas previously considered marginal as local climates change. This shifting of crops could increase exposure to different pests and diseases or make them less resilient due to ‘climate stress’.

KVH’s goal is to make sure our biosecurity strategies are adaptable so we can effectively manage the changing risk profiles and uncertainties driven by climate change. Because of the large uncertainty and unpredictability in this area of study, we continue to utilise a range of methods to ensure we continue to be a biosecurity resilient industry.

Receiving information from people working on-the-ground will be critical to developing effective biosecurity strategies. Useful information about how pests and diseases are responding to changes needs to be collected and shared. KVH have developed a passive reporting system, fondly known as “unusual symptom reporting” which allows us to track any changes in current pest distributions or impacts and gives us the best chance of detecting anything new.

Utilising tools and techniques already developed to help predict future scenarios is also a priority. There has been great work already undertaken here in New Zealand to help foresee possible biosecurity trends, such as a new digital mapping tool that compares our climate with others globally under a range of current and future changeable climate scenarios.

Research, science, and innovation will play an important role in climate change adaptation. Changing climates is a focus of the Zespri Biosecurity Innovation portfolio to ensure that investment in research is appropriate and adaptable to the changing risks due to climate change.



CLIMATE CHANGE: WHAT WE CAN DO

Strengthening global biosecurity

Climate change is a global issue and New Zealand will feel the impacts from overseas. Understanding the changing risks and threats will allow us to plan for tomorrow, today.

Climate change adaptation

Include climate change in biosecurity strategies and plans – nationally, regionally, and locally.



CASE STUDY: TROPICAL ARMYWORM

Many attribute biosecurity threats to those pests that aren't present in New Zealand. However, not all future biosecurity threats will arise from afar; many, currently harmless, pests that are already present in New Zealand may become a problem under climate change.

It is important to recognise that potential future pests and disease problems might be "sleeping" in New Zealand, awaiting environmental changes which will allow them to spread and thrive. An example is Tropical Armyworm (TAW).

"POTENTIAL FUTURE PESTS AND DISEASES MIGHT BE 'SLEEPING' IN NEW ZEALAND, AWAITING ENVIRONMENTAL CHANGES TO SPREAD AND THRIVE."

While this pest can be found throughout many northern regions, outbreaks (when caterpillars move like an army through crops and pastures) are considered uncommon. While kiwifruit is not its preferred choice of crop, this pest has been known to devastate an orchard from time to time, usually when TAW favoured food is not readily available. The caterpillars tend to march out of crops and pastures in search of food.

However, the combination of factors that trigger outbreaks will become more common under future climate change scenarios – including above average summer and autumn temperatures, which allows for additional generations to develop.

Additionally, TAW populations can be kept in check by predation from other insects, such as wasps. It is thought that changing climatic conditions, such as high rainfall and/or flooding, may disrupt the natural parasitoid life cycle (that is, there are fewer of the wasps to feed on the armyworm), increasing the likelihood to army populations forming.



Images: TAW damage on kiwifruit leaves (left); TAW attacking fallen kiwifruit (right).
Credit: Zespri.

Wet weather, wet plants: the impacts

This year the huge weather events of Gabrielle and Hale became etched in our memories, creating impacts which call for major decisions on how best to manage orchards across all our regions going forward.

We are faced with 10, 20, and 50-year weather events almost every year somewhere in the country - messaging to every region the need to prepare and adapt to our new weather space.

Alongside the major events of this past year, the battle of wet week after wet week has resulted in water and soil challenges that can pick away at the resilience of vines.

Vine stress due to wet weather, either sudden or ongoing, can tip vine health balance leading to a higher presence of and exposure to organisms that can be pathogenic to vines. This season both scenarios have prompted reporting of unusual symptoms.

Of the 47 unusual symptoms reported to KVH over the last 12 months, 33 were from sites with vine challenges and 50% of these directly related to infections in trunk bases and roots. Most of these in some way tracked back to water management.

Lesser effects were those due to root nibblers, such as *Phythium* and *Fusarium sp.* which can invade roots and cause dieback. Orchard follow-ups suggested root stress like that seen where over-irrigation (i.e., too much water applied or poorly placed drippers) was the culprit. This season ongoing rainfall likely caused similar effects.

Planting too deep, or not correctly teasing out root systems to allow interchange of water, air and nutrients was another likely cause of stressed plants, often leading to collar rots.

Failure to manage high grass swards around young plants through wet humid periods also resulted

in young plants being invaded by *Phythium* and *Fusarium* again, as well as the more challenging *Phytophthora littorale*.

Most challenging though this season, has been the rise in plant collapse associated with *Phytophthora*, a group of micro-organisms known as water moulds or oomycetes. Related to algae, *Phytophthora* have spores that can persist in most horticultural soils for many years surviving both dry conditions and lack of hosts.

In wet conditions released zoospores swim in the soil water, finding and invading healthy root tips then grow rapidly through the root system, often also infecting plant stems. Vines under stress can exude hormones which attract these spores, so plants affected by excess water can become more vulnerable to these infections.



*Image: These plants had been repeatedly challenged by standing water, with root systems likely affected by anoxic conditions. *Phytophthora* was identified in soil and plant tissue samples.*

CASE STUDY: **PHYTOPHTHORA**

This year, major plant losses (35% in some blocks) were reported from two young development sites in Te Puke and Kerikeri.

Both orchards were contoured, and had some drainage installed. Compost was used at planting, and plant root systems were noted as vigorous.

For these sites, plants had failed to fire in spring, or failed from November onwards after excessively wet winter and spring conditions. Plants on sloping terrain as well as those in areas where water pooled were affected suggesting poor soil structure also played a part.

Phytophthora and *Phytophthora* were found either in the roots or soil associated with the roots. Each of these are significant pathogens and the likely cause of this vine decline. Spores of *Phytophthora* are easily spread in water moving over or through the soil so can affect many vines.



Image: Planted on sloping terrain, these plants were similarly affected by excessive water due to the poorly draining contoured soils. *Phytophthora* was found in soil and plant tissue.

Mitigation

Structural drainage and improving soil structure were seen as priorities, as was disposal of infected material.

Replanting on mounds to ensure water drainage away from root crowns and a possible move to Bounty rootstock were other options.

As these pathogens infect vines of any age and are easily spread by the activities of people (via movement of contaminated plants, soil, equipment and footwear for example), biosecurity measures were also recommended, particularly washdown ahead of movements to other orchards.

Supporting tools

Sampling and diagnostics of unusual vine symptoms provides growers with additional facts on which to base “return to health and production” strategies.

The kiwifruit industry’s Weather and Disease Portal tools similarly provide valuable data, allowing review of rainfall, humidity, evapo-transpiration and temperatures to compare weather patterns across years.

Biosecurity research insights

Phytophthora root rot diseases affect close to 5,000 plant species globally and limit the production of many fruit crops and forestry species.

Listed in the world’s top 10 most destructive oomycetes, and amongst the 100 worst invasive species worldwide, invasive *Phytophthora* similarly rank on KVH’s list of Kiwifruit’s Most Unwanted.

KVH, Zespri and Plant & Food Research have worked together on a survey of *Phytophthora* species to improve our knowledge of species associated with kiwifruit. KVH and the Ministry for Primary Industries (MPI) have also worked together to prepare an industry *Phytophthora* Readiness Plan and have held an industry simulation to help inform how we would respond to a new invasive species. You can read more about this on pages 18-19.

**PROTECT
OUR VINES!**

**SPOT
THE
SIGNS!**



SPOT IT



SNAP IT



REPORT IT

**IF YOU SPOT ANYTHING NEW
OR UNUSUAL
ON KIWIFRUIT VINES CALL KVH
0800 665 825
OR EMAIL INFO@KVH.ORG.NZ**

www.kvh.org.nz

Reining-in wild kiwifruit vines

They're able to harbour pests and diseases and can aggressively take over native vegetation, harming local ecosystems.

But with continued efforts from KVH, landowners, conservation groups, and regional councils, we can track and limit wild kiwifruit vines, protecting the kiwifruit industry and our natural environment.

The wild kiwifruit programme focuses on implementing effective weed management techniques to control populations and prevent spread. In this update, we explore the latest developments, successes, and challenges in wild

kiwifruit management and share strategies for looking after our industry and preserving New Zealand's unique biodiversity.

Over the last year, contractors destroyed more than 13,000 wild kiwifruit vines across the Bay of Plenty, Manawatu-Whanganui and Tasman regions. An additional 3.5 hectares of matted vines, where counting individual vines isn't practical, were also destroyed.

This year in the Bay of Plenty alone, infestations on 180 properties have been destroyed. A further 236 properties await control - no small task for landowners and our contractors.

With such a large volume of work underway, at multiple sites, KVH saw the opportunity to provide improved and more streamlined guidance. This resulted in the development of a new online resource in 2022, encouraging best practice and covering recommended equipment, herbicide use and control methods. This has been well received and is freely available.

Also completed in 2022 was an independent review looking into the spread, impacts, and management of wild kiwifruit in New Zealand. The review found that the proportion of vines larger in diameter has steadily been climbing in recent years, indicating a growing wild population



despite current efforts. In response KVH has developed a five-year plan based on the review's recommendations, with immediate action taken to increase control and surveillance effort.

Available evidence also suggests that strong growth in the wild population is due to ongoing seed inputs, whether directly or indirectly, from commercial orchards. Going forward KVH will be investigating feasibility of improving orchard hygiene and fruit processing procedures to limit the number of seeds reaching wild habitats. If implemented, much less investment in direct wild vine control will be needed to suppress the wild population.

Please help us by doing your part to pick and mulch all remaining fruit on vines; cover all reject fruit; avoid discarding kiwifruit plant material and rubbish into gullies; and let KVH or your regional council know about any wild kiwifruit infestations you have on your property.

Funding assistance for control is available and if you wish to undertake control yourself, please use the KVH Good Practice Guidelines for Wild Kiwifruit Vine Control for best results, available at kvh.org.nz.



Image: Rubbish in gullies makes control increasingly costly and complicated.

HOW TO HELP PREVENT WILD KIWIFRUIT ESTABLISHING

Growers:

Remove unpicked fruit from vines and mulch as soon as possible. This prevents mass feeding by birds and allows the fruit to compost as quickly as possible.

Post-harvest operators:

Cover bins of reject fruit to prevent birds feeding on ripening fruit.

Farmers:

Cover stockpiles of fruit with shade cloth, windbreak netting or something similar to prevent birds from getting to any fruit. Feed out only what will be eaten by stock at one time to prevent birds from eating leftovers.

Members of the public:

Be very careful with the disposal of kiwifruit, particularly while out in the bush.

Ensuring our response capability

READY TO RESPOND

Like all biosecurity systems, New Zealand's faces challenges and is constantly adapting to ensure it continues to work appropriately to minimise risk. However, despite best efforts, there is never zero risk and pests sometimes sneak through the border layer. The way we respond to these incursions is integral to minimising any potential harm to our industry.

In the event of a major response, a wide range of organisations are likely to be called upon to assist, each with their own responsibilities and tasks. We must be ready to work closely with each other.

Events like fruit fly incursions and *Mycoplasma bovis*, have demonstrated that biosecurity responses can be large, complex, and fast-moving. But by planning for responses well, we give ourselves the best chance at success.



Images: Teams taking part in Simulation Huakiwi, testing biosecurity response plans.

COLLABORATION IS KEY TO SUCCESS

A key lesson from the Psa response was that full collaboration between government and industry is essential during the early stages of any incursion.

The Government Industry Agreement for Biosecurity Readiness and Response (known as GIA) enables primary industry sectors to formalise partnerships with government on readiness and response activities.

These partnerships are a foundation for successfully preparing for and responding to specific biosecurity threats. KVH represents the kiwifruit industry in GIA where we have representatives on several pest specific councils, such as fruit fly and Brown Marmorated Stink Bug (BMSB), as well as our own kiwifruit specific partnership.

Exercises and simulations are another essential component of biosecurity preparedness, as they ensure continuous enhancement of personnel skills, tools, and systems. Exercise "Harvest Shield" is a recent example, run under the BMSB GIA partnership to strengthen our response capability. Biosecurity New Zealand, response providers (who will run field activities), and industry, including several members from KVH, all participated. It was a great opportunity to work together, align our expectations and test key components of our joint BMSB response plan.

BUILDING CAPABILITY THROUGH CIMS

The Coordinated Incident Management System, or CIMS as it is commonly known, is a framework of team structures, functions, processes, and terminology that is applied to biosecurity/emergency responses. This framework enables biosecurity responders to work together more efficiently, share information, and coordinate their activities to achieve a common goal.

One of the primary benefits of training under the CIMS framework is improved operations among different groups, which allows for seamless coordination during response efforts. The driving premise is that the faster we can hit the ground running together on day one of a biosecurity response, the better our chances at success.

Building internal capability is a key focus of KVH as we understand the importance of strengthening our own knowledge, skills, and confidence in a response scenario. The KVH team have all been through the various stages of CIMS training, as have wider industry members which we strongly encourage.

BUILDING INDUSTRY CONFIDENCE

In late 2022 around 60 people from across the kiwifruit industry came together to test and refresh their biosecurity response skills through an interactive response exercise dedicated to kiwifruit.

Hosted by KVH, with support from Biosecurity New Zealand, participants had the opportunity to see how the components of a biosecurity response work in real life – including all the different functions, teams, and roles under CIMS – and how they all fit together to ensure the response achieves its goals, and limits impacts on our growers and businesses.

The scenario, which involved detection and investigation of a new invasive *Phytophthora*, involved each team testing all elements of best biosecurity practice, such as reporting; investigation and diagnostics; traceability; and engagement with key audiences.

"THE INITIAL RESPONSE TO PSA-V WAS LED BY MAF (NOW MPI) AND, IN EFFECT, ZESPRI. BUT IT WAS QUITE APPARENT THAT THERE WERE DUAL RESPONSES RATHER THAN A SINGLE COORDINATED ONE."

SAPERE REPORT 2014



CASE STUDY: BAYGOLD RAISING THE BAR

Within the last year, Blair Reeve, General Manager at Baygold has taken part in two response training exercises, increasing not only his own capability but also that of his fellow senior managers, who see the value of biosecurity preparedness to their business. Here Blair tells us about his experience.

When I turned up for the kiwifruit industry scenario day I was shocked at how many people were there – it was really exciting, especially because there were also lots of Ministry for Primary Industries (MPI) staff who had come along to help run it.

I got a lot out of seeing the big picture in action and how all the teams/functions interact, particularly learning about sequencing of tasks and actions – that was a big lesson because I was learning very quickly how one team receives intel, needs to confirm it, and then decides on a course of action before correct and reliable action can be taken by another team. When a response is moving quickly, and scenarios are rapidly changing this takes skill to get right and I learnt a lot about how important the response model and its processes are in this space.

I got so much value out of the day, and I then took up the opportunity to do some CIMS training to build on it. This was invaluable and I've since been able to create a biosecurity module at Baygold for all staff that focused on how important biosecurity risk management is and why we need to get it right.

Overall, I would say that everyone has a place and a role in a biosecurity response and you should put your hand up to train – it isn't scary, it's actually quite reassuring. People running responses know what they are talking about, these guys are experts, and the way they bring examples of an incursion to life is brilliant. You'll walk away knowing more about how it works, the language that is used, how you would slot into a team and not be overwhelmed, and most importantly how you can help ensure a response is successful and growers are protected.

CASE STUDY: TRACEABILITY AT THE TOUCH OF A BUTTON

KVH and Onside have been working together to create digital traceability functionality for growers and the wider kiwifruit industry.

Most pests and diseases are spread through plant, vehicle, and people movement. Our partnership with Onside makes it easier to track and manage visitors – as well as the plant material they move with them – across properties and orchards with just a few basic biosecurity questions.

As well as making record keeping and GAP requirements easier for growers, the functionality also provides KVH with a traceability dashboard that will help us predict and manage impacts of a biosecurity threat in the event of an incursion.

The dashboard visually displays tracks of plant and people movements between orchards and other key industry locations (such as, pack-houses, nurseries, pollen mills) allowing us to narrow down potential past and future movements more accurately and efficiently, drastically automating processes and enhancing investigation timings – which means we can take any necessary action much sooner.

In addition, the dashboard allows us to filter out unnecessary or unrelated data at the click of a button – such as movement type that isn't a vector, and date ranges out of scope etc – allowing us to focus on exactly the movement and people that might be affected.

Although the dashboard is a great digital tool, it is only as good as the data entered into it, so we remind growers that it is a legal requirement to track all plant movements on and off orchards, and Onside is a great digital option for doing this. Growers can still keep physical records of plant material movements, but this free digital option has been designed to simplify the process, all while providing the plant movement records you need as part of a GAP audit.

The information gathered within Onside can only be used by KVH during a biosecurity incursion. KVH cannot use this data for any other purpose.

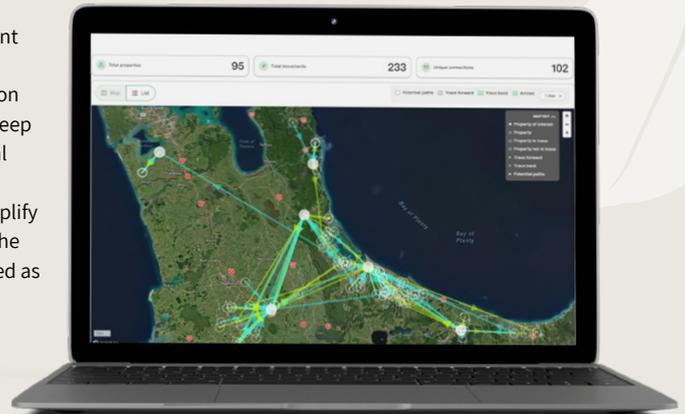


Image: Onside's ability to track movement and make sense of the data is instrumental during biosecurity response planning.

Biosecurity research and innovation

Investment in biosecurity research and innovation is a bit like an insurance policy – by having it in place now we can better protect and prepare for the potential impacts of unwanted pests and diseases in the future.

Without it, we'd likely find ourselves on the back foot and too far behind when an incursion happens.

Biosecurity science underpins our ability to be prepared for our biggest biosecurity threats. Research provides us with foresight and helps to ensure our resilience – not only by providing the knowledge to better manage a possible incursion, but also by giving us the practical know-how to develop tools that will help prevent or slow their spread and manage them in a sustainable way.

KVH and Zespri Innovation work collaboratively to undertake this work, with guidance and support from the Kiwifruit Biosecurity Advisory Group. This group provides expert advice and recommendations, ensuring that new projects and research outcomes align with the industry's Biosecurity Innovation Strategy, and objectives are met.

The group aims to reduce the risk and impact of future incursions to the kiwifruit industry by reviewing current and emerging kiwifruit biosecurity risks, identifying knowledge gaps, and prioritising research accordingly. Members are experts representing KVH, Zespri, the Ministry for Primary Industries (MPI), Plant & Food Research, Scion, and Lincoln University. There is also an external industry representative - currently from New Zealand Wine Growers.



THE KIWIFRUIT BIOSECURITY RESEARCH PORTFOLIO

The Kiwifruit Biosecurity Research Portfolio includes projects on pests and pathogens that potentially represent a significant threat to the kiwifruit industry and have not yet been reported within New Zealand.



PROJECT

KIWIFRUIT'S PHYTOPHTHORA BIODIVERSITY

AIM

To understand the diversity of *Phytophthora* species in New Zealand kiwifruit orchards.

FINDINGS

- 13 species of *Phytophthora* were found in kiwifruit orchards although only a small number of species were dominant.
- Some *Phytophthora* species were associated with diseased kiwifruit vines, particularly in poorly drained soils.

PRACTICAL OUTPUT

- Establishes a baseline knowledge of *Phytophthora* populations in New Zealand kiwifruit orchards.
- Provides a basis for detecting changes in species diversity that may occur within these orchards.
- Provides knowledge of when we need to respond to something new.

PROJECT

RELATIVE RESISTANCE OF KIWIFRUIT CULTIVARS TO THE BRAZILIAN CERATOCYSTIS STRAIN

AIM

To evaluate the resistance of New Zealand kiwifruit cultivars Bounty, Bruno, Hayward, and Gold3 to *Ceratocystis fimbriata*.

FINDINGS

- All New Zealand kiwifruit cultivars tested are susceptible to Brazilian *Ceratocystis fimbriata*.
- Bruno and Hayward were more tolerant to *Ceratocystis fimbriata* than Bounty and Gold3.
- Bruno rootstock was tested, and some genotypes showed high levels of resistance.

PRACTICAL OUTPUT

- Better understanding of the risk of Brazilian *Ceratocystis fimbriata* to our kiwifruit cultivars in New Zealand.
- Further testing of Bruno resistant genotypes in the field with naturally infected soil.

PROJECT

OCCURRENCE AND IMPACT OF SPOTTED LANTERNFLY (SLF) IN KIWIFRUIT

AIM

To determine the seasonal phenology of SLF and its potential impacts on kiwifruit orchards in China.

FINDINGS

- All life stages of SLF were present in kiwifruit.
- Alternate hosts, such as poplar, were favoured by adult SLF on the borders of orchards.
- Sooty mould wasn't observed on-orchard.

PRACTICAL OUTPUT

- Enhances our knowledge of this pest in kiwifruit.
- Better understanding of when and how we might target management techniques for the different life stages in kiwifruit.

PROJECT

FRUIT FLY IMPACT - ECONOMIC ANALYSIS

AIM

To model the economic impact on the kiwifruit industry of an incursion of an exotic fruit fly in Te Puke.

FINDINGS

- An incursion of an exotic fruit fly in Te Puke could cost the industry up to \$694million dollars in the scenarios modelled.
- Having a cold disinfestation treatment available could reduce the impact of an incursion by up to 40%.

PRACTICAL OUTPUT

- Reinforces the importance of preparedness and prevention to avoid a fruit fly incursion.
- Ensuring we maintain readiness through KiwiNet and other activities.

PROJECT

HOST SPECIFICITY OF DIFFERENT CERATOCYSTIS ISOLATES

AIM

To evaluate the pathogenicity to kiwifruit of 10 *Ceratocystis* isolates from other hosts.

FINDINGS

- *Ceratocystis* isolates tested from different hosts (e.g., mango, teak, eucalyptus, ohia) are pathogenic to kiwifruit.
- *Ceratocystis* isolates tested have different levels of aggressiveness in kiwifruit cultivars.

PRACTICAL OUTPUT

- Ensuring we maintain a wider lens on *Ceratocystis* than the Brazilian kiwifruit strain.
- Working with MPI to safeguard kiwifruit by managing possible entry pathways into New Zealand.
- Readiness outputs are effective for a wide range of *Ceratocystis*.

PROJECT

AERODYNAMIC TRAPS FOR BROWN MARMORATED STINK BUG (BMSB)

AIM

To improve trapping of BMSB in kiwifruit orchards with a new trapping system.

FINDINGS

- The aerodynamic trap consistently traps more adult bugs than the pyramid and sticky panel traps.
- The pyramid trap is significantly better at catching nymphs than the aerodynamic and sticky panel traps.

PRACTICAL OUTPUT

- These traps are being trialed as part of the 2023/24 BMSB National Surveillance System.
- Strengthens our surveillance efforts as an industry.

Psa research portfolio

THE KIWIFRUIT PSA RESEARCH PORTFOLIO

The Kiwifruit Psa Research Portfolio includes research projects designed to discover and deliver new tools to the Psa control toolbox; and continually inform and refine sustainable management practices for Psa across all kiwifruit varieties, growing methods, and regions.

VALUE

By investing in Psa research, science and innovation we continue to support the successful management of this impactful disease.

OUTREACH

Practical outputs of research are consolidated into good practice guidance, and project updates are made available to technical groups, and our growing community via publications, websites and at events. With the new phase of Psa management from 1 April 2023, this guidance is now co-ordinated by Zespri.

KVH has partnered with Zespri Innovation on Psa research for over 10 years to support growers in reducing the risk of Psa spreading to new growing locations, and in maintaining or lowering Psa risk levels on their orchards. Thanks to this strong investment, knowledge around management of Psa has grown significantly within the last decade and has been implemented on-orchard with great success.

Psa is managed across the industry through the combined efforts of growers, post-harvest and technical teams, KVH and Zespri. From 1 April 2023 the industry entered a new phase of longer term Psa management which solidified these industry-wide roles – more about this transition can be read on pages 10-11.

In light of this change, dedicated Psa research will now be part of Zespri's crop protection innovation portfolio, working with growers to improve pest and disease control on-orchard and increase orchard outputs.

KVH would like to acknowledge all those who contributed to the success of the Psa research portfolio and thank everyone for their time, dedication, and vigilance. The combined efforts of expert members (including representatives from KVH and Zespri), researchers and the experienced grower members who continued to bring a practical industry lens to discussions has served the industry well in navigating the challenging landscape of Psa.



READ MORE ABOUT THE NEW PHASE OF PSA MANAGEMENT ON PAGES 10-11, INCLUDING KVH'S CONTINUED ROLE IN MANAGING HIGH-RISK ACTIVITIES SUCH AS NEW DETECTIONS OF VARIANTS AND LIMITING SPREAD.

PROJECT
**POST-HARVEST
ACTIGARD
RESPONSES SHORT
AND LONG**

AIM
To identify responses of early and late harvest Hayward and Gold3 vines to Actigard applied post-harvest.

FINDINGS

- Application of Actigard post-harvest induced upregulation of “defence marker” genes in Hayward and Gold3.
- Leaf health was the strongest driver for vine responsiveness.
- Effects did not persist through to the following Spring.

PRACTICAL OUTPUT

- Supports the value of applying Actigard post-harvest for Psa protection.
- Confirms canopy health as the best guide for application decisions.
- Confirms Actigard should be reapplied in the following Spring for ongoing Psa protection.

PROJECT
**ANNUAL PRODUCT
RESISTANCE
MONITORING**

AIM
To identify the emergence of Streptomycin, Kasugamycin and copper resistance among Psa populations.

FINDINGS

- Streptomycin resistance was consistent with 2019-21 levels
- No Kasugamycin resistance was identified.
- Copper tolerance had a slow upward trend but no high levels of resistance to copper were detected.

PRACTICAL OUTPUT

- No indications of increased resistance to Streptomycin or Kasugamycin.
- No Psa isolates grew in the presence of copper when applied at field rates.

PROJECT
**GOLD3 ON BOUNTY
COST BENEFIT
ANALYSIS**

AIM
Case study to model production and financial implications of three Gold3-Bounty bud rot scenarios vs Gold3-Bruno.

FINDINGS

- Moderate (9%) and least (2%) Gold3-Bounty budrot scenarios achieved better returns than Gold3-Bruno.
- Returns for the worst (35%) Gold3-Bounty budrot scenario fell well below the Gold3-Bruno result.

PRACTICAL OUTPUT

- This small case study showed Gold3-Bounty delivers improved grower returns vs Gold3-Bruno, but results can be badly affected if Psa is not well managed.

PROJECT
**PSA GOOD PRACTICE
GUIDE**

AIM
Develop a good practice guide for Psa management.

FINDINGS

- Psa risk factors and prevention strategies are identified.
- Seasonal monitoring, hygiene, and cultural and crop protection advice is shared.

PRACTICAL OUTPUT

- The guide identifies Psa risk factors as well as mitigation strategies to help growers develop a site-specific Psa management plan.

PROJECT
**CONNECTING GROWER
WEATHER STATIONS**

AIM
To pilot the connection of data from grower weather stations to the Weather and Disease Portal.

FINDINGS

- Capability and accuracy of orchard weather station hardware varied but was calibrated successfully.
- Decision tool outputs were achieved from Harvest and Ricardo data providers.
- User experience was positive.

PRACTICAL OUTPUT

- Provides a proof of concept that access to Weather and Disease Portal tools can be extended to growers outside the industry weather station network.

PROJECT
**NEW PSA VARIANT
INVESTIGATION**

AIM
To design a PCR-based assay for Psa strains that have the HopF2 gene deleted, and to evaluate the relative infectivity of orchard-derived strains of this Psa variant compared to common form Psa strains.

FINDINGS

- A robust PCR assay was developed.
- Potted plant assays, conducted in greenhouse trials on Gold3 and Red19, found there were no overall differences in the ability of the Psa variant to infect and cause symptom expression of plants versus the common form Psa strains.

PRACTICAL OUTPUT

- The research concluded that there is unlikely to be any negative consequence of the new Psa variant in the orchard environment, supporting earlier field investigations. This project is detailed in full on pages 8-9, where we detail our continued risk management efforts under the new Pathway Plan.

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