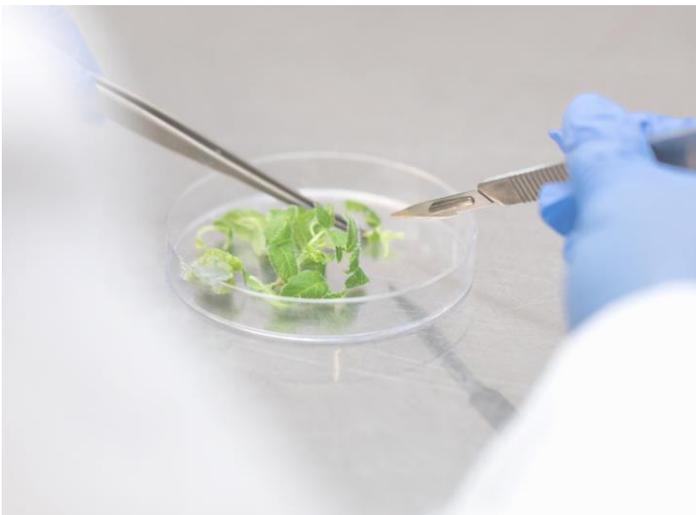


Seven-year review of the National Psa-V Pest Management Plan

May 2020



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1 Summary

May 2020 marked seven years since the National Psa-V Pest Management Plan (NPMP) was put in place and as such KVH is required to undertake a second internal non-statutory review. The first review was completed in 2016 and considered whether the NPMP was still needed; focused on ensuring it remained effective going forward; and identified improvements to align with ongoing Psa control challenges. This 2020 review provides comment on main aspects of the NPMP including achievements since 2016; provides updates on the focus of current research; and examines the funding required so that KVH can complete NPMP requirements.

The NPMP is due to terminate in May 2023, 10 years after it commenced. In 2019 KVH proposed a transition from the NPMP to a Pathway Management Plan (PMP). This proposal is currently being developed and consulted on with the kiwifruit industry. If accepted, KVH will likely recommend termination of the NPMP when the PMP becomes operable, which may be prior to the 2023 expiration date.

In the meantime, the KVH Board has confirmed the need to continue with a comprehensive Plan to combat the ongoing impacts of Psa-V; continue with initiatives such as the Kiwifruit Plant Certification Scheme (KPCS) for kiwifruit plant nurseries; maintain movement controls; and protect areas such as the South Island which remain free of Psa-V.

Comment on the main aspects of the NPMP:

a) Psa-V Risk Management Plans

Under the NPMP, all growers have a documented plan for how they will manage Psa on their property in the form of a Psa-V Orchard Management Plan which orchardists file with their GAP (Good Agricultural Practices) records. In 2019 KVH produced the Kiwifruit Grower Biosecurity Guidelines which recommend that in addition to the Psa-V Orchard Management Plan, growers develop an on-orchard biosecurity plan. The plan captures wider on-orchard biosecurity practices that serve the long-term needs of the industry while still including Psa-V specific management requirements to meet NPMP compliance.

b) Establishment of new Exclusion regions

KVH will continue to provide for new Exclusion regions, with the aim of protecting new growing regions and sites through movement controls of high-risk items. A new Exclusion region must meet specific criteria as set out in sections 3 and 7 of the Biosecurity (National Psa-V Pest Management Plan) Order 2013. The last Exclusion region created by KVH was the Far North, in 2016.

c) Boundaries of existing regions

In 2018, following consultation with growers and nurseries and consideration of submissions, KVH revoked all regional boundaries of Recovery regions in the North Island, creating one amalgamated region with geographically separate locations. The geographic area of the new Recovery region covered exactly the same area as the previous 14 individual Recovery regions. Requirements to comply with NPMP rules remain unchanged, but implementation has been streamlined and simplified.

d) Mandatory monitoring

It remains a mandatory requirement that all Psa not-detected orchards monitor vines yearly for Psa and provide monitoring results to KVH.

e) KVH movement controls and protocols

Movement controls and protocols remain appropriate to the Plan's objectives and the needs of the industry. A review of movement controls and protocols was completed in early 2020 with very few changes required. KVH has declared several South Island sites, located outside the South Island Exclusion region, to be Controlled Areas. This allows KVH to have more effective management of kiwifruit plant material movements (and movement of other risk items such as used machinery) to and from locations out of the main kiwifruit growing areas.

f) Abandoned/unmanaged orchards and wild kiwifruit

KVH is continuing with the existing approach to unmanaged and abandoned orchards, and wild kiwifruit. KVH and orchard owner cost-sharing for the removal of abandoned or unmanaged orchards is considered on a case-by-case basis. KVH has facilitated the removal of 130 abandoned orchards, while the owners of 22 unmanaged orchards have undertaken work to ensure their return to a managed state. NPMP rules have been pivotal in ensuring that biosecurity risk around unmanaged and abandoned orchards is addressed.

Regarding the management of wild kiwifruit, KVH has provided submissions to regional councils undertaking reviews of their Regional Pest Management Plans to ensure that wild kiwifruit is named as a pest plant which is required to be controlled within their respective regions, and that a KVH/Council/landowner sharing of control costs (similar to the approach in the Bay of Plenty) is a possible management option. Contractors currently destroy 20,000 wild kiwifruit vines annually. Most of this work is in the Bay of Plenty region, with lesser but regular work required in Gisborne, Whanganui, and Tasman regions.

g) Research & Development (R&D)

The desired outcome of the KVH/Zespri research programme is to find sustainable solutions that minimise the impacts of Psa-V and support the management of infected orchards to as full a productive capacity as possible. Further detail of the programme can be seen in section 7.

h) Psa Biosecurity Levy and additional funding for R&D

The NPMP is currently funded through a levy under section 100L of the Biosecurity Act, struck at 0.053 cents per kilogram (0.2 cents per tray equivalent) for Hayward green kiwifruit (*Actinidia chinensis* var. *deliciosa*), SunGold and Zespri Red kiwifruit (both *Actinidia chinensis* var. *chinensis*) for the 2019 export season to markets other than Australia. This is a further reduction in levy from the previous 0.16 cents per kilogram, reflecting the high tray volumes and lower costs of delivery of the NPMP work undertaken by KVH.

The KVH core NPMP budget for 2019/20 is \$791,146 for implementation.

Additional Zespri funding for R&D expenditure of up to a \$2.25 million programme is not reflected in the KVH budget.

The KVH budget is set at each KVH AGM, related to the resolution that sets the levy for the subsequent year.

2 Purpose

This paper records results of KVH's four-year non-statutory review of the NPMP, for the period May 2016 to April 2020.

3 Background

The NPMP is subject to a non-statutory review three and seven-years post implementation. The last review was completed in May 2016 and covered the period May 2013 to April 2016. The KVH Board viewed a three to four-year review cycle as good practice, and an ideal time at which to check-in and test that the NPMP is still delivering intended value, as well as whether any changes are needed.

KVH indicated at the time of the 2016 review that another would be completed in 2020. There is no legal or Ministerial requirement for this, and no specific issues have triggered this review. Although KVH intend the NPMP to transition to a PMP, a review is still timely and useful.

The NPMP is a legal instrument (an Order in Council – refer to legal overview of the NPMP below), which means KVH cannot vary the requirements of the Order; any substantive change to the Order itself must go through a regulatory review process and be approved by the Governor General.

3.1 Legal overview of the NPMP

The NPMP is an Order in Council, which is a notice of an administrative decision issued by the Governor General, and a legislative Order in relation to and authorised by an existing Act of Parliament. In this case the existing Act of Parliament that supports the Order is section 65 of the Biosecurity Act 1993.

The NPMP has two primary objectives:

1. Preventing the spread of Psa-V
2. Minimising its impact on kiwifruit production

In addition, there are eight secondary objectives, as follows:

1. Ensuring Exclusion regions are, and remain free of Psa-V
2. Establish on a regular basis that exclusion regions are free of Psa-V
3. Enable swift and decisive action to contain any outbreak in an exclusion region
4. Limiting further spread within and from Containment regions
5. Reduce where possible the distribution of Psa-V within Containment regions
6. Reduce inoculum levels in Recovery regions
7. Reduce the risk of Psa-V spreading from Recovery regions to other places
8. Supporting recovery of kiwifruit production in Recovery regions by minimising overall production losses and enabling successful establishment of new kiwifruit varieties

The Order requires the establishment of Exclusion, Containment, and Recovery growing regions based on specified conditions, and the undertaking of monitoring, managing diseased and abandoned orchards and wild kiwifruit plants, applying movement controls of risk items that may cause spread, and providing best practice Psa-V management in orchards.

There are rules (and accompanying powers) in order to implement the Plan, as follows:

1. Every orchard must have a Psa-V management plan
2. Every post-harvest operator must have and operate in accordance with a Psa-V risk management plan
3. Every person must report Psa-V within 48 hours of first recognising the symptoms
4. Information must be provided to KVH in order to monitor, trace, and identify when risks items have moved
5. An effective crop protection programme must be in place

6. Unmanaged orchard management
7. Abandoned orchard management

Lastly, there are criteria by which the Plan’s objectives can be monitored and measured as follows:

- Number(s) of the different types of regions, and how these change over time
- Number of new infections in Exclusion regions, and how these were likely caused
- Rate and pattern of spread within Containment regions
- Estimated impact on kiwifruit production
- Portion of orchards in which a Psa-V orchard management plan has been implemented
- Level of preparedness within Exclusion regions
- Management of unmanaged or abandoned orchards, and wild kiwifruit
- Compliance with movement controls
- Levels of awareness and compliance with requirements relating to Psa-V controls

Detail as to how each of these objectives have been met is detailed within Section 4, below.

4 Monitoring and measuring the Plan’s objectives

Comment on each of the criteria by which the Plan’s objectives can be monitored and measured:

<p>Situation (as of April 2020) – Key statistics & regional status</p> <ul style="list-style-type: none"> • 91% of orchards and 92% of kiwifruit growing areas (% of hectares on an orchard with Psa-V identified) are now known to be infected with Psa-V. • The South Island remains free of Psa-V as far as we know, and successfully excluding the bacteria from the island remains a key priority. The South Island currently represents 4.3% of total kiwifruit production and there is also strategic value in having an isolated region free of Psa to source pollen and budwood for both domestic and offshore production. • In July 2016, in line with the development of kiwifruit orchards, a new Exclusion region was formed in the Far North to protect kiwifruit production in this area. • Psa is now present in the Whangarei region but in limited distribution. In October 2018, the status of the region transitioned from Exclusion to Containment to reflect this. • The remaining kiwifruit growing regions within the North Island are all within the North Island Recovery region within which Psa-V is now widespread. • This North Island Recovery region includes kiwifruit orchards in Kerikeri, Auckland, Waikato, Bay of Plenty, Gisborne, Hawkes Bay and Whanganui regions. • KVH has declared five locations in the South Island to be Controlled Areas to limit any potential spread of Psa-V. • Greenfields development (planting of bare land) is continuing to increase. Zespri has indicated that there is likely to be a further three years of Gold3 licence release until 2022. The amount of release is reviewed annually and may extend beyond three years.

4.1 Change in Regional Status over time:

	2016	2017	2018	2019
Recovery regions	12	13	From 14 to 1 (following removal of internal boundaries)	1
Containment regions	2	2	1	1
Exclusion regions	3	2	2	2

Key status changes since 2016 review:

- Hawkes Bay transitioned from Containment to Recovery
- Whangarei transitioned from Exclusion to Containment
- Northwest Auckland transitioned from Containment to Recovery
- Single North Island Recovery region formed by amalgamation of 14 Recovery regions. Although amalgamated to one Recovery region, it remained spread over separate geographic locations – boundaries did not change.

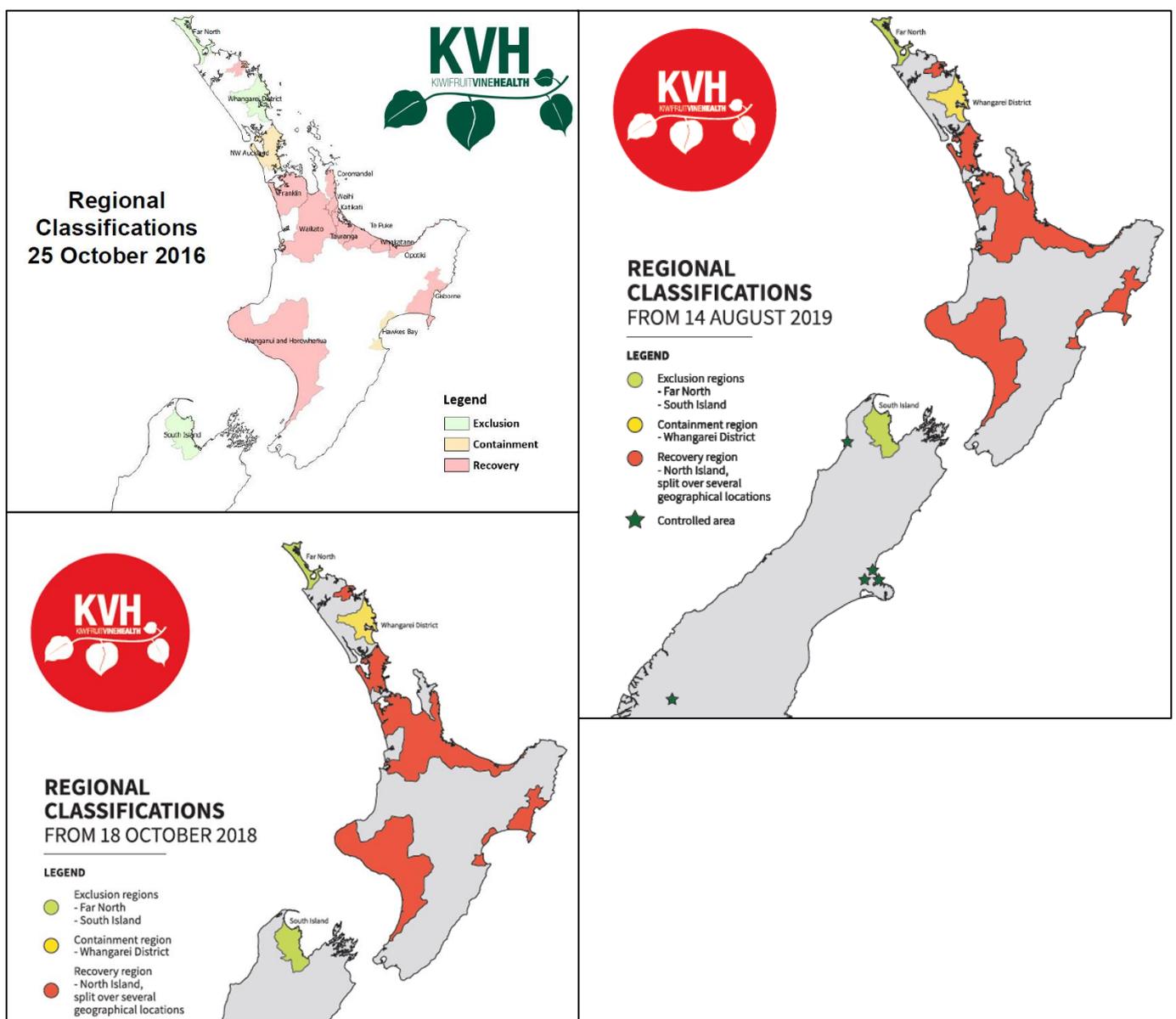


Figure 1. Changes in Regional Classifications since last NPMP review in 2016.

4.2 Number of new infections in Exclusion regions, and how these were likely caused:

- Since the 2016 review, there have been no Psa detections within the South Island or Far North Exclusion regions.
- Since 2016, Psa has been detected on nine orchards in the Whangarei region. The slow spread of Psa in the region illustrates a high level of compliance with NPMP movement controls, covering all plant material, machinery, and tools. While it is not known how the first infection within the region occurred it is highly likely that without movement controls in place infection would be much more widespread in the region. Whangarei transitioned from Exclusion to Containment in October 2018.

4.3 Rate and pattern of spread within Containment regions:

Psa is a windborne bacteria and once it enters a region short distance spread through wind and rain is difficult to prevent. The objective for Containment regions in the NPMP is to limit further spread and reduce distribution where possible. The effectiveness of the NPMP in slowing the spread of Psa can be clearly seen in North West Auckland and Whangarei, the most recent Containment regions.

Whangarei transitioned from Exclusion to Containment in October 2018. At the time of transition to Containment, there were three Psa positive orchards in the region and two years later in May 2020 there are still only nine positive orchards representing 22% of production hectares in the region. A region can transition to Recovery when 35% of production hectares are Psa positive. It is now almost four years since Psa was first detected in Whangarei and the bacteria is still not widespread.

In 2016 there were three orchards in the Northwest Auckland Containment region detected positive. By 2018 this had increased to 11 orchards. Again, spread was likely due to natural spread through wind and rain events.

4.4 Estimated impact on kiwifruit production:

The initial impact of Psa was calculated to be almost \$1B of lost growth for the industry (www.kvh.org.nz/vdb/document/91146). However, the introduction of a new more tolerant cultivar and improved knowledge and management practices by the industry supported by a comprehensive R&D programme has seen per hectare returns reach record levels. Psa is still having an impact, amplified in particular locations and seasons but the magnitude of this impact is largely unquantified and estimated to be about 5% annually through bud rot and loss of production canopy. A 5% loss of production at today's production figures equates to roughly \$100M per year.

The management of Psa also costs growers in agrichemical spray applications and labour. Psa management is largely about taking the time to be attentive to the orchard, monitoring for symptoms and cutting out infected material. This approach and the additional sprays are estimated to increase costs by 5% or about \$2k/ha.

4.5 Portion of orchards in which a Psa-V Orchard Management Plan has been implemented:

All orchards have a Psa-V Orchard Management Plan in place, through two mechanisms of oversight:

1. Those orchards who are part of Zespri GAP have this compliance (i.e. having completed a Psa-V Orchard Management Plan) checked at their annual audit. All orchards checked through the GAP process have completed plans.
2. The orchards who were not part of Zespri GAP were contacted individually. They have all sent in a copy of their Orchard Management Plans.

4.6 Level of preparedness within Exclusion regions:

- The South Island region has a detailed regional Psa incursion plan (updated March 2020). The Plan sets out the likely steps required to contain and, if possible, eradicate an incursion of Psa. It

details actions which would be required of growers, contractors and movements of risk items such as beehives and machinery.

- KVH has regular contact with the South Island KVH regional coordinator whose role is to assist KVH in supporting growers and help reduce the spread of Psa in regions where the disease is not widespread. The coordinator is made aware of all movements of risk items, such as second hand tractors from the North Island, into kiwifruit orchards in the South Island region and assists with inspection of items on arrival into the region.
- The Far North region contains one nursery producing small numbers of full certification plants and has been supplying export budwood. KVH is in regular contact with this nursery to ensure that all KVH movement control rules are complied with.

4.7 Management of unmanaged or abandoned orchards, and wild kiwifruit:

Since 2016 there has been a significant reduction in the number of unmanaged or abandoned orchards.

- Only two unmanaged orchards have been reported – the owners have complied with KVH requirements and ensured each orchard has returned to a managed state. In total, KVH has ensured 22 unmanaged orchards have met NPMP requirements since 2013.
- KVH has facilitated the removal of 130 abandoned orchards since 2013, with 11 of these since 2016. Three of these were in the South Island region and eight were within North Island Recovery regions. KVH and orchard owner cost-sharing is considered on a case-by-case basis. Cost sharing was agreed with four of the 11 orchard owners.

NPMP rules have been pivotal in ensuring that biosecurity risk around unmanaged and abandoned orchards is addressed.

- KVH has been working with regional councils since 2013 to ensure any wild kiwifruit vines are destroyed. KVH has provided submissions to six councils undertaking reviews of their Regional Pest Management Plans to ensure that wild kiwifruit is named as a pest plant which is required to be controlled, and that a KVH/Council/landowner cost-sharing of control costs (similar to the approach in the Bay of Plenty) is a possible management option. Wild kiwifruit is required to be controlled in five Regional Pest Management Plans. KVH may assist with control costs with other Councils on a case-by-case basis – infestations are seldom found in these areas.

Contractors destroy approximately 20,000 wild vines annually – most control work is undertaken in the Bay of Plenty but an increasing amount of work has been required in the Tasman region. The number of wild vines detected annually has increased from 15,000 in 2016 to approximately 20,000 currently.

Contractors complete most of this work in the Bay of Plenty, with lesser but regular work required in Gisborne, Whanganui, and Tasman regions.

4.8 Compliance with movement controls:

Since April 2016, KVH has completed the following actions to ensure that movement control rules for kiwifruit plant material and risk items such as machinery, are met:

- Six enterprises have been investigated for suspected sale or propagation of kiwifruit plant material and not being approved under the KVH Kiwifruit Plant Certification Scheme (KPCS). In all cases, the owners have withdrawn plants from sale and voluntarily destroyed the material. Four were given an option of joining the KPCS but chose not to.
- 24 nurseries are fully certified under the KPCS. A further 30 nurseries have restricted status under the Scheme and six nurseries are in progress toward their restricted status. Two nurseries were investigated for unpermitted plant movements and given warnings. All other nurseries have been compliant with plant movement rules and meeting plant health status requirements.

- Trade Me has withdrawn 16 listings of kiwifruit plant material. This action has prevented the movement of kiwifruit plants with unknown health status, to destinations which may be not-detected for Psa or other risk organisms.
- KVH provided 14 permissions for the movement of machinery or tools into or between Exclusion and/or Containment regions, or into or out of Controlled areas.
- Four compost manufacturers have been approved to make and/or spread compost containing kiwifruit plant material or reject fruit.
- Four permissions have been provided to apiarists to move hives into regions where restrictions exist. Conditions usually require hives to be located to a halfway safe location for a prescribed period.

4.9 Levels of awareness and compliance with requirements relating to Psa-V controls:

KVH regularly publishes awareness articles and updates directly related to the NPMP. The KVH Bulletin is produced every two weeks and has 2234 subscribers – most of whom are kiwifruit growers. From a 2018 grower survey, 80% of respondents said that they referred to the KVH Bulletin as their preferred communication channel with KVH.

KVH operates a website which includes best-practice information for growers, spray information, NPMP protocols, movement controls and associated legislation, research and development projects, etc.

Google analytics for the KVH website over the last 12 months (1 May 2019 – 1 May 2020) show:

- 30,324 visitors to the website
- 93,336 page views of the website
- The top page visited is the Psa risk model login page, with 11,563 views
- The next most visited page is the spray information page with 3,588 views

KVH has adopted an educative/awareness approach (rather than an inspectorial-type approach) with the kiwifruit grower and post-harvest community to ensure that a culture of managing Psa, managing risk items (e.g. plants and machinery), and “doing the right thing” becomes the normal way of operating. There is a high level of peer pressure across the entire kiwifruit industry to comply with NPMP rules. If any kiwifruit orchard becomes unmanaged, neighbouring growers will contact KVH without delay. NPMP rules around orchard management actions and timeframes are invaluable for ensuring unmanaged orchards are quickly remedied as per NPMP requirements.

The kiwifruit industry has provided funding, on a case-by-case basis, to assist growers with the cost of removing an abandoned orchard. This assistance has, in almost every case, negated the need for escalating compliance to a prosecution or Notice of Direction level. There have been five Notices of Direction and one warning of prosecution undertaken by KVH since 2013. There have been four Restricted Place Notices applied since 2013, mostly associated with kiwifruit plant movements not allowed under the NPMP.

Every year KVH contacts growers who have no record of applying any KVH-approved protectant products (such as Nordox copper for Psa control) to their orchards. Since 2016, KVH has checked 62 orchards with no spray records. Most had in fact applied a product but not entered dates and product information into the Zespri spray diary. These orchardists received a reminder of their NPMP requirements. 16 orchardists were provided with an exemption; all of these orchards were well-managed with very low levels of Psa, not threatening the health of neighbouring orchards.

5. Does the industry still need an NPMP?

5.1 Do our Psa-V management objectives, based on what we have learned and where we are today, still align with NPMP objectives set out in the Order in Council?

In 2020, KVH is operating in a very different landscape to 2013 when the NPMP was introduced, yet objectives of management are still strongly aligned with that of the NPMP.

The NPMP has been highly successful in slowing the long distance spread of Psa, and there are still orchards free of the disease, a Containment region where Psa is in limited distribution (Whangarei), and two Exclusion regions where the pathogen is absent altogether (Far North and South Island). For these orchards and regions management is focused on maintaining all necessary protections to prevent further spread.

However, in most growing regions Psa is now widespread with over 91% of orchards known to be infected. In these Recovery regions there is little value in preventing spread of the common form of Psa between orchards, rather than supporting growers to maximise returns in a Psa positive environment with best practice advice backed by science.

So, while Psa-V has spread significantly since 2013, the objectives of management are still strongly aligned with the primary objective of the NPMP, which is to reduce the harmful effects of Psa-V on economic well-being by:

- a) Preventing its spread; and
- b) Minimising its impact on kiwifruit production.

The programme's focus has shifted increasingly toward preventing spread of forms of Psa that are more likely to be a problem than the common (original) New Zealand Psa-V biovar; that is, strains that are resistant to chemical control tools, more virulent or have a wider host range than the common New Zealand strain of Psa-V (refer to the current situation/explanation of these below).

Movement of plant material from Psa positive orchards or nurseries may require additional diagnostic testing to determine if any Psa present is:

- The New Zealand Biovar (Psa 3 or Psa-V) or other international biovars Psa1 (Japan, Italy) and Psa2 (Korea)

noting that within Psa3 we can also test for the New Zealand vs non-New Zealand forms;

- Streptomycin resistance
- Copper resistance

This testing is now routine for all kiwifruit nurseries within the KPCS prior to dispatch, which serves as a surveillance tool for the occurrence of new forms in addition to mitigating further spread of unwanted forms.

2020 situation – Monitoring for new forms of Psa-V

The potential for new forms of Psa-V to emerge that are tolerant or resistant to crop protection products was raised by experts and recognised by KVH at a very early stage, with a streptomycin and copper resistance testing programme initiated in 2011. Copper and streptomycin resistance or tolerance to *Pseudomonas* has been recorded overseas and in New Zealand. Likewise, the potential for development or introduction of more virulent biovars of Psa was also recognised at an early stage.

The following is a quote from Dr Joel Vanneste (Plant and Food Research, 2015):

The New Zealand Psa population is evolving due to mutations, reorganisation of their genetic material, and exchange of genetic material with local New Zealand plant associated bacteria (those are natural phenomenon which we cannot predict or prevent). In addition, there is always the risk of introduction of new biovars of Psa (some of them might not have been characterised yet). This means that Psa could acquire some characteristics which make it more of a problem than it already is. For example, strains could become resistant to antibiotics and copper, could be more virulent or have an

extended host range.

Low level copper resistant strains of Psa-V have been found in 66 orchards to date; 41 of these orchards are in the Te Puke region, and eight in Whakatane. The others are spread across Recovery regions. Copper resistance is incremental in its development. Importantly, to date we have seen no indication of any failure of copper to control Psa on orchards that have tested positive for these new strains; and they are showing no increase in Psa symptoms.

There are two main mechanisms that cause streptomycin and copper resistance:

- i. Bacteria present in the environment carry genes for resistance, which through horizontal gene transfer can be transferred to Psa. Typically these genes are held on plasmids which easily move from one bacterial species to another.
- ii. A spontaneous chromosomal mutation occurs naturally during bacterial growth. During DNA copying, sometimes mistakes are made, and some mistakes in the gene *rpsL* can make bacteria resistant to streptomycin. This resistance will be maintained in progeny - but not transferred to neighbouring bacteria.

Our understanding of chemical resistance development/the emergence of new Psa-V biovars and implications for management is itself emerging.

As well as risk associated with changes to the New Zealand Psa-V biovar, New Zealand does not have some of the other known Psa-V biovars that occur offshore. Different outbreaks of Psa have been caused by five related, but genetically distinct lineages of *Pseudomonas syringae actinidiae* and it is likely that many more exist in wild kiwifruit populations. Psa1 (Japan, Italy) and Psa2 (Korea), are of particular concern as these biovars may be more virulent against Hayward cultivars than the New Zealand Psa-V biovar. KVH and Zespri are currently seeking to arrange offshore pathogenicity screening to determine the relative virulence of these Psa biovars against New Zealand kiwifruit cultivars.

To date our strategies/approach to managing Psa-V risk has not significantly changed in response to discovery of new forms; rather this has reinforced the on-going importance of effective application of crop protection products (in accordance with label requirements), managing vine health, hygiene practices, control over movement of high-risk items (particularly kiwifruit plant material), and removing reservoirs for disease (e.g. wild kiwifruit and abandoned orchards) etc. However, significant changes may yet be required, for example, if efficacy of existing crop protection tools is undermined, if impacts on existing or future cultivars change and/or if new hosts emerge. Timely understanding of such requirements and responsiveness/capacity to rapidly implement changes remain key.

A further consideration relating to the programme's focus on preventing spread is protecting greenfields developments beyond traditional growing regions or at remote locations within existing growing regions (as above).

5.2 If we did not have an NPMP what would we not be able to do that we need to in the foreseeable future? What would we be missing out on?

Eight key things that KVH needs to be able to do and that justify the need for an NPMP, are as follows:

A. Responsiveness to new forms of Psa that may be more problematic than the Psa-V we have been dealing with historically – covered above. This includes ability to put in place control measures to contain or slow the spread of new forms, as KVH has done recently with streptomycin resistance and copper tolerance cases. Most growers and post-harvest operators have cooperated, but not all, and legal tools have been essential to protect the wider industry.

B. Ability to manage risk associated with abandoned orchards – the NPMP establishes clear legal requirements on landowners or occupiers to remedy abandoned orchards and gives KVH ability to remove these and recover costs. Importantly, it also gives KVH the ability to access land to investigate reports of potential abandoned orchards. In practice, access to land has to typically be

granted and agreements (including cost-sharing) have been reached with landowners (and in some cases regional councils) without any need for legal action. However, KVH has dealt with some difficult landowners and the existence of legal tools has been essential to reaching such agreement in many if not most cases.

All the 130 recorded (since 2013) abandoned orchards have now been completely removed. Some were removed prior to 2016 are subject to active monitoring (to ensure removal has been successful). New reports of abandoned orchards have recently become less frequent (there have only been three abandoned orchards reported to KVH in the last year). However, there will always be a risk of marginal orchards being abandoned in the future, especially if the market fluctuates and the price of Hayward comes down, or if Psa-V or other disease and/or environmental pressures have cumulative impact.

The need to deal with pest and disease issues associated with abandoned orchards is not unique to the kiwifruit industry. Pipfruit is the only other industry that has any statutory ability to address abandoned orchard issues, by virtue of having two Regional Pest Management Plans (Phytosanitary Plans) in place covering their major growing regions - Hawke's Bay and the Nelson-Tasman regions. KVH could replicate Pipfruit New Zealand's approach, but the cost and time associated with doing so across kiwifruit growing regions would be high and very inefficient relative to the current NPMP approach.

C. Ability to manage risk associated with unmanaged orchards - the NPMP establishes the requirement for growers to keep their orchard(s) in a managed state, so they don't unreasonably put other growers at risk. This is more subjective territory, however there are minimum requirements all growers must meet.

Of the 22 unmanaged orchards reported since 2013, all are resolved. It is not uncommon for an unmanaged orchard report to be an extension of existing conflict between neighbours. In practice, access to land has been granted and voluntary agreements have been reached to return orchards to a managed state, but again the existence of legal tools has been essential to reaching such agreement in more difficult cases, particularly where there is significant conflict.

The only tools other industries have available to achieve this are typically supply agreements and peer pressure.

D. Controlling wild kiwifruit – while there is no specific rule in the NPMP requiring the control of wild kiwifruit, KVH has the ability (through use of general powers) to deal to wild kiwifruit populations on public or private land where these present a risk.

KVH typically works in partnership with regional councils to jointly manage wild kiwifruit populations, given dual threat of wild kiwifruit to both industry (disease risk) and the public (biodiversity threat). To date most regional councils have been willing to take the lead on any compliance action, using their Regional Pest Management Plans (most of which include wild kiwifruit). However, not all councils cooperate with KVH and some are exclusively interested in control of wild kiwifruit where there is a threat to biodiversity. Current arrangements cannot be taken for granted and fostering strong relationships and partnerships with councils to achieve mutual benefits remains important. Without the NPMP our industry will be entirely reliant on regional councils to enable control of wild kiwifruit populations, which are a potential risk as a reservoir for both Psa-V and other pests and diseases.

Over the last three years more than 48,000 wild kiwifruit vines have been controlled in the Bay of Plenty across approximately 250 properties.

E. Ability to control movement of risk items (including the Kiwifruit Plant Certification Scheme) – the NPMP gives KVH the ability to control the movement of high-risk items by associated industries (e.g. nursery plants, pollen) as well as within our industry (e.g. budwood). This is through the ability to establish and enforce movement control notices (with corresponding protocols), either generally as we have at the level of growing regions, or in relation to specific places as we have for serious compliance issues (e.g. restricted place notice on North Island plants moved to the South Island).

While the NPMP can only be used to manage risk of Psa-V, in practice KVH can leverage off this as we have with the KPCS to cover wider biosecurity issues (i.e. the NPMP provides the legal foundation that makes it illegal for nurseries to supply our industry unless they achieve KVH certification for their product).

Achieving any form of certification without a legal foundation is extremely difficult as other horticulture industries have found.

Without the NPMP the KPCS is likely to erode over time, and our ability to improve management of risks associated with other pathways (e.g. pollen, budwood) are likely to be undermined.

The alternative to control risk items if we do not have an NPMP is to transition to a National Pathway Management Plan. With the NPMP due to terminate in May 2023, KVH is progressing the transition to such a plan, as with a focus on pathway management, KVH will be able to more effectively manage a range of threat organisms to the kiwifruit industry.

F. Understanding and minimising Psa-V impacts on future new cultivars – as a pan-industry body KVH provides independent advice to help growers understand how tolerant new varieties are to Psa-V, and to understand any differences in management practices needed to minimise Psa-V impact on new varieties. This includes side-by-side trials, independent monitoring of new varieties pre-commercialisation, and targeted advice to growers on practices to reduce impact on specific new varieties.

G. Ability to fund Psa-V research – research to date has been possible through use of both the NPMP levy and Zespri funds. For now, the NPMP allows for ongoing research either funded by the NPMP levy and/or Zespri.

H. Ability to export budwood and pollen (international quarantine requirements) – several importing countries' phytosanitary requirements are linked to the NPMP, only allowing export of plant material (e.g. budwood, pollen) from Exclusion regions. An example of this is Japan's requirement for a Phytosanitary Certificate with the additional declaration "This budwood (nursery stock) originates from an Exclusion region as defined under the New Zealand Biosecurity (National Psa-V Pest Management Plan) Order 2013". International phytosanitary requirements would have to be renegotiated with importing countries to enable continued export of New Zealand plant material if the NPMP was removed. At best this would lead to temporary delays in exports (months and possibly years), but with risk that importing countries view removal of the NPMP as opportunity to suspend such pathways. This puts at risk the opportunity for varietal owners and others seeking to establish facilities in newly established Exclusion regions (e.g. Christchurch and Northland have been identified as a potential options) to create a sustainable pipeline for such exports.

6. Research & Development Programme

Background

R&D remains a critical component in the fight against Psa-V. The programme increases technical knowledge and delivers growers with tools and techniques that may be used to combat the disease directly, or enable affected growers to remain productive in the presence of Psa-V.

KVH and Zespri are committed to research and development forming a critical part of the long-term management programme and collaboratively creating the strategic direction for Psa research and development.

Any advice provided by KVH or enforcement action undertaken and enabled through NPMP rules, must be backed by sound scientific knowledge, rationale and application. The R&D programme ensures that knowledge is as current as possible.

Opportunities to further strengthen the R&D programme and ensure NPMP requirements are relevant and scientifically justifiable

The R&D programme is overseen by a Psa Steering Group, which is responsible for assessing project proposals, assisting with strategic direction setting, and providing feedback from industry regarding gaps that need filling.

Five research programmes currently direct research effort, with individual projects aligned within each programme. Project progress is monitored against results focussed milestones. This allows for programme updates and recommendations for growers as results come to hand.

KVH, through the collaborative Psa Steering Group, has commissioned Zespri to manage the day-to-day operation of the R&D programme, and to ensure effective management structures are in place to effectively plan, organise and monitor the programme. Some of the research, especially field activities, may be done in-house by Zespri, but most will be done through a range of research partners both within and outside of New Zealand.

The five programmes under Horizon 1 (2018-2020) have the common goal of further future-proofing the industry against Psa-V as follows:

Programme 1: New cultivars

This programme focuses on assuring access to and understanding of the susceptibility of the new varieties in the cultivar development programme. The aim is to continually prompt and support work towards cultivars with tolerance to Psa.

Programme 2: Orchard practices

This programme is designed to identify management and cultural practices that minimise disease under any orchard environment. A specific project following paired orchards from four growing regions, over three-four years is in place for Gold3. The research will help develop strategies for long-term orchard productivity and profitability.

Programme 3: Control products

This programme looks to ensure growers have access to an effective suite of control options to offset the effects of Psa. Identification of complementary relationships between chemical/biological products, management options and cultivars is targeted, with identification of best practice guidelines to optimise efficacy and cost/benefit of entire spray programmes envisioned. Research into superior and sustainable (future proof) control products remains a top priority.

Programme 4: Disease cycle

This programme incorporates knowledge of the factors influencing disease to maximise the efficacy of combined control options with existing cultivars. It will incorporate knowledge of susceptibility by cultivar, environmental influence, drivers of pathogenicity, and understanding of populations of Psa-V internal and external to the plant.

Programme 5: Psa-V evolution and monitoring

This programme identifies genetic targets within Psa-V for future disease control. A monitoring programme for genetic changes will be maintained. Research will aim to understand the drivers for resistance development to help inform how disease can be reduced.

Communication of outcomes.

Communication of research outcomes to extension specialists and the grower, to maintain Psa-V awareness and support continuous industry improvement in Psa-V management, is one of the main intentions of the Psa-V R&D Programme.

End user adoption of advances in knowledge and techniques is seen as a key method of minimising the impact of Psa-V on the industry. Research reports and best practice advice are freely available to the New Zealand industry through the KVH website. Other pathways for information transfer to end-users include post-harvest technical support, Zespri's Canopy website, the Kiwifruit Journal and Zespri Global Extension team events and publications. An annual Psa R&D update is held and when sufficient new research is available Psa-V Symposiums also run.

Reporting

Zespri reports on the research programme to KVH and NZ kiwifruit growers by:

- i. Reports to KVH on overall progress by way of KVH Board papers
- ii. Reporting to KVH on financial scheduling on project payments

iii. Exception reporting of project milestones.

7. KVH proposal to transition from a NPMP to a Pathway Management Plan

The Biosecurity (National Psa-V Pest Management Plan) Order 2013 states that the NPMP will terminate on the 10th anniversary after becoming operable. The termination date is 17 May 2023 and as such KVH is looking at a new regulation framework to better manage biosecurity risk to the New Zealand kiwifruit industry.

Rather than seeking to renew the NPMP, KVH has initiated development of a National Pathway Management Plan (Pathway Plan) proposal under the Biosecurity Act. A Pathway Plan is considered to be well suited for the kiwifruit industry as it allows for the management of a full range of biosecurity threats across pathways by which diseases or pests are transmitted, rather than focusing on a single organism such as Psa.

KVH proposes that the Plan will replace the current Psa-V NPMP as it will retain the important elements needed for Psa protection (e.g. controlling movements of high-risk pathways to the South Island) but also improve biosecurity preparedness for other threats through more effective pathway management, which includes:

- surveillance to detect new or emerging risks;
- pathway hygiene and traceability; and
- preventing or slowing the spread of risk organisms.

KVH anticipate that the Pathway Plan will be implemented before the NPMP expiration date of May 2023, in which case the NPMP will most likely be terminated at that point.

8. Conclusions

While the kiwifruit industry's recovery from Psa-V impacts has been impressive to date, the NPMP is still required to provide ongoing disease management support to affected growers, and to prevent spread of the pathogen to those orchards and regions that are currently unaffected by the pathogen.

New forms of Psa are now a reality to manage, and as an industry we are still learning about the nature of these and management implications. Without an NPMP, and in the absence of a replacement management strategy such as a Pathway Plan, our industry loses key tools needed to respond to these, loses its ability to deal with abandoned and unmanaged orchards, loses its ability to control movement of risk items and operate risk management schemes (such as the KPCS) and creates reliance on ongoing support of regional councils to deal with wild kiwifruit.

Discontinuing the NPMP also removes the associated levy funding stream, and some of this resource would need to be replaced to ensure sufficient KVH capacity is in place to effectively respond to incursions. Some disruption to exports of kiwifruit plant material are also likely to result.

The requirements in the NPMP remain relevant and valid, even though Psa-V is now more widespread than when the Plan was implemented. The KVH Board's focus and objectives today are still encompassed by the current NPMP, and such changes in focus will usefully be reflected in future reviews of the annual NPMP Operational Plans.

9. Termination of the NPMP

As mentioned above, the Biosecurity Order 2013 states that the NPMP will terminate on the 10th anniversary after becoming operable. The termination date is then 17 May 2023, unless this occurs earlier as a result of implementation of the Pathway Plan.