

VEGETABLE GROWERS' ON-FARM BIOSECURITY MANUAL

GUIDE FOR OUTDOOR CROPS



ACKNOWLEDGEMENTS

Stakeholders:



Co-funder:



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Disclaimer:

While every effort has been made to ensure the information in this publication is accurate, the stakeholder groups do not accept any responsibility or liability for error of fact, omission, interpretation or opinion that may be present, nor for the consequences of any decisions based on this information. Information in this manual was accurate as at May 2020.

REPORT THE UNUSUAL



CATCH IT



SNAP IT

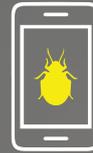


REPORT IT

MPI exotic pest and disease hotline

0800 80 99 66

FIND PEST



To download the app and learn more, head to:

www.findapest.nz

Help keep New Zealand free of new weeds and pests



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SECTION

01

INTRODUCTION

PRINCIPLES OF ON FARM BIOSECURITY

What is on-farm biosecurity?

Farm biosecurity measures help to protect your property from new and exotic pests, diseases and weeds, and minimises the impact of pests that have already established in New Zealand.

Farm biosecurity is a set of practices carried out to protect your property from unwanted pests and diseases.

What is the purpose of this manual?

This vegetable growers biosecurity manual guides vegetable growers on good on-farm biosecurity practices.

The manual allows growers to assess what biosecurity systems they have in place and directs growers to information sources and further steps to consider.

Why is good on-farm biosecurity important?

Poor biosecurity practices can lead to the introduction, spread and establishment of unwanted pests and diseases, on your property and others which you interact with. The better your biosecurity practices, the better your ability to manage pests and diseases, and protect your crops.

Biosecurity makes good financial sense:

1. We now share the costs of eradication with Government. The cost is much lower if the pest/disease is spotted early and only a small area needs to be treated.
2. Eradication will not always be possible once a pest/disease has spread and established.
3. New organisms have the potential to cause market access restrictions. The more confined a response, the better industry has at maintaining as much trade as possible. Vegetable exports were worth approximately \$700 million in 2019.

Examples of biosecurity responses in the vegetable and wider horticulture sector are included in section 12 Page 45. Some invasive pests we now have to control on an ongoing basis, whereas others have been successfully eradicated.

Building a Biosecurity Plan

It is recommended that all vegetable growing properties develop a biosecurity plan specific to their growing operations. A biosecurity plan is a document unique to a property which details on-farm biosecurity risks and the actions taken to address these risks.

Preparing an on-farm biosecurity plan has 6 steps:

1. Review property map
2. Identify biosecurity risk and actions to address
3. Prioritise
4. Communicate expectations
5. Implement
6. Review periodically

This manual is designed to assist a vegetable growing property with step two; the identification of biosecurity risks and considerations for mitigative actions.

To develop a biosecurity plan for your property, use this document alongside “Preparing a Farm Biosecurity Plan” (refer to page 41 for further details on where to find this resource).

Top Tip: to ensure biosecurity practices are integrated into your everyday activity, consider adding biosecurity plans, measures and goals into your business plan.

BASICS OF ON-FARM BIOSECURITY



Be aware of biosecurity risks

Be familiar with pests and symptoms of diseases that affect your crops so they can be correctly identified, or use a pest identification service provider.

- Contact your Product Group to find out what these are.
- Download the Find a Pest app for a list of priority pests and identification assistance.

Display posters which show common pests and diseases to help with identification (industry posters, fact sheets and app's like 'Find-A-Pest' are all useful tools).

Inspect the plants regularly for early detection of pests and diseases, and to identify any problems.

Monitor and record the movement of people, vehicles, plants and materials into the greenhouse.



Keep it clean

Practise good hygiene to prevent pests from arriving and moving around your farm.

Provide facilities for workers, visitors, vehicles and equipment for cleaning and decontamination before they enter, leave, or move around your farm.



Use high quality farm inputs

Use high quality seeds, plants, and production materials from reputable sources.



Check your crop

Monitor your crops regularly.

Know the usual appearance of your crop so you can recognise new or unusual pests or plant disease symptoms.



Keep records

Keep written and photographic records of unusual pest or plant observations.



Report the unusual

Report anything unusual immediately to the [MPI Pest and Disease Hotline](#) **0800 80 99 66**.

Prepare a farm biosecurity plan to reduce your risk.

Use "Preparing a Farm Biosecurity Plan" published by Horticulture NZ as a guide for your site biosecurity plan.

A man in a plaid shirt and cap is seen from behind, looking out over a field. The background is a bright, sunny outdoor setting with green foliage. A large white circle is overlaid on the image, containing the text 'SECTION 02'.

SECTION
02

MANAGING PEOPLE

People entering your site can spread pests, diseases and weeds.

Restricting the movement of people will reduce the risk of pests and diseases being introduced or spread on your farm.

	ACTIONS TO REDUCE RISK	ACTIONED
SIGNAGE	Signs are directing to:	
	<ul style="list-style-type: none"> designated parking areas 	
	<ul style="list-style-type: none"> where to sign-in 	
	<ul style="list-style-type: none"> wash-down facilities 	
	<ul style="list-style-type: none"> footbaths and sanitising areas 	
VISITORS AND STAFF	<ul style="list-style-type: none"> All staff should be aware of the biosecurity practices for the site 	
	<ul style="list-style-type: none"> People sign-in at one designated area, near the entrance, when they arrive on the farm 	
	<ul style="list-style-type: none"> Ask where visitors have been before they arrived (e.g other farms, greenhouses, or overseas) 	
	<ul style="list-style-type: none"> Biosecurity information is provided to visitors upon arrival (this can be integrated with Health and Safety introduction) 	

	ACTIONS TO REDUCE RISK	ACTIONED
<p>CONTRACTORS</p> <p>Contractors move from farm to farm and pose a higher risk than general visitors</p>	<p>Contractors should be given a comprehensive biosecurity introduction before entering your production sites. You and your contractor should both be aware of:</p>	
	<ul style="list-style-type: none"> • The biosecurity mitigation measures you expect them to implement before and after they work on your property 	
	<ul style="list-style-type: none"> • Where they were prior to your property and what actions they have taken to minimise potential biosecurity risks (e.g., washed down their vehicles, equipment, footwear etc) 	
	<ul style="list-style-type: none"> • Where they are working on the property, activity they are undertaking and how this information is documented 	
	<ul style="list-style-type: none"> • Any contractual biosecurity requirements or liabilities 	
<p>FACILITIES</p>	<ul style="list-style-type: none"> • People entering or leaving the site, or moving between areas, have access to the use of washing facilities - washbasins, footbaths, sanitiser 	
	<ul style="list-style-type: none"> • People entering the farm are provided with suitable protective clothing. This may include: boot covers, disposable overalls or other personal protective equipment 	



SECTION
03

VEHICLES AND EQUIPMENT

Soil and plant material attached to farm equipment and vehicles can spread pests, diseases and weeds around and between farms. It's important to keep vehicles, machinery and equipment clean. Having your own equipment will reduce the risk as sharing or borrowing equipment can introduce pests and diseases. When using contractors, ensure they are held to strict biosecurity practices for vehicle and equipment cleanliness.

	ACTIONS TO REDUCE RISK	ACTIONED
PARKING	<ul style="list-style-type: none">• A designated parking area is located away from production areas (and clearly marked)	
VEHICLES AND IMPLEMENTS	<ul style="list-style-type: none">• Are thoroughly cleaned before entering and moving between different areas of the farm or between properties (refer to the wash down code of practice)	
	<ul style="list-style-type: none">• In production areas, vehicle movements are kept to a minimum on designated vehicle tracks	
	<ul style="list-style-type: none">• Where applicable, a dedicated farm vehicle is used to carry visitors around the farm	



	ACTIONS TO REDUCE RISK	ACTIONED
EQUIPMENT including hand tools and produce bins	<ul style="list-style-type: none"> • Hand tools are cleaned and disinfected before and after use 	
	<ul style="list-style-type: none"> • Produce bins, crates, pallets and machinery are kept free of plant material 	
	<ul style="list-style-type: none"> • Where applicable clean and disinfect harvest equipment between crops 	
	<ul style="list-style-type: none"> • Separate tools and equipment used in infested or diseased areas (when this is not possible, disinfect) 	
	<ul style="list-style-type: none"> • Know where shared, borrowed or second-hand equipment has been used prior to use in production site 	
WASH-DOWN FACILITIES	<ul style="list-style-type: none"> • Wash-down facilities are available for cleaning and washing vehicles 	
	<ul style="list-style-type: none"> • To establish wash-down facilities for each site, refer to page 41 	

INFORMATION SHEET: WASHDOWN COP

KEEP IT CLEAN

Cleaning vehicles and equipment before it leaves your farm minimises the spread of weed seeds, soilborne diseases, and pests.

Wash-down facilities allow vehicles and equipment to be cleaned and contain the wastewater. Allocating a separate area for wash-downs restricts plant material, insects and soil from moving back into production areas or onto other farms.

Key steps:

Clean

- Clean incoming and outgoing vehicles and machinery to remove any plant debris and soil.
- Clean vehicles from the top down and dismantle as much as possible to gain access to internal spaces. Pay special attention to tyre treads and wheel arches.
- Use high pressure water or air hoses to clean vehicles and equipment before they are moved to new areas.
- Install a footbath for cleaning boots and shoes at entry to site and production areas.

Decontaminate

Apply a broad-spectrum decontaminating solution to vehicle surfaces where soil and plant material may stick. Use these solutions according to product label recommendations.

Rinse the wash-down area

Use high pressure water to wash debris into the sump or collection area before driving away.

Top Tip: Some disinfectants can discolour the paintwork of vehicles; ensure its effective but kind to the paintwork of vehicles that use it.

INFORMATION SHEET: WASH-DOWN FACILITIES

WHEN SETTING UP A WASH-DOWN AREA ON YOUR FARM, CONSIDER:

**Location**

An open area close to your farm entrance and away from growing areas.

**Drainage**

Wastewater, soil and debris flows into a sump or collection area so it doesn't enter waterways or irrigation systems.

**Size**

Large enough for large machines and vehicles to enter and move around.

**Cleaning equipment**

Dedicated high pressure hoses or compressed air for effective cleaning

**Surface**

Concrete or bitumen is best. Pests can incubate in the soil or on plant matter (grass and unsealed surfaces).

**Signage**

Make people aware of your wash-down facilities with clear signposting.

For more information, refer to "Minimising Soil Movement by Vehicles Off Farm: Code of Practice" (Access details page 41)



SECTION
04

FARM INPUTS

Farm inputs are items that are used on your farm and for growing and production (such as seed, fertiliser etc). These can be a source of weeds, pests and diseases.

	ACTIONS TO REDUCE RISK	ACTIONED
SEED & PLANTING MATERIAL	<ul style="list-style-type: none"> • High quality seed and planting material is purchased from reputable suppliers 	
	<ul style="list-style-type: none"> • New plant material is isolated from production areas 	
	<ul style="list-style-type: none"> • New plants are inspected before planting, and regularly checked during growth 	
GROWING MEDIA & NUTRIENTS	<ul style="list-style-type: none"> • High quality growing media, nutrient mixes, and mulches are purchased from reputable suppliers 	
	<ul style="list-style-type: none"> • Media, nutrients and mulch are inspected when they arrive, checking packaging/containers are clean and contaminate-free 	
	<ul style="list-style-type: none"> • Media, nutrients and mulch are stored appropriately - in containers or on an impermeable surface located away from production areas 	

	ACTIONS TO REDUCE RISK	ACTIONED
WATER Water contamination can spread pest and disease	<ul style="list-style-type: none"> • Irrigation water quality is monitored 	
	<ul style="list-style-type: none"> • Vegetation along the edges of waterways is monitored for early signs of new weeds, pests and diseases that could come onto the farm 	
	<ul style="list-style-type: none"> • Waterways on farm are protected from contamination 	
FERTILISER	<ul style="list-style-type: none"> • Certified fertilisers are used in production 	
	<ul style="list-style-type: none"> • Organic fertilisers (manure, compost) are inspected carefully for diseases, pests and weeds 	
HIVES Bees can be vectors for the spread of pests and disease.	<ul style="list-style-type: none"> • Hives and bees are sourced from a reputable supplier 	
	<ul style="list-style-type: none"> • Ask hive owner where the hives have been before they arrive on the site 	
	<ul style="list-style-type: none"> • Bee health is regularly checked 	

	ACTIONS TO REDUCE RISK	ACTIONED
<p>AGRICHEMICALS Agrichemical misuse can lead to resistance.</p>	<ul style="list-style-type: none"> Chemicals should be used according to the label 	
	<ul style="list-style-type: none"> Instructions on withholding periods for agrichemicals are followed and observed 	
	<ul style="list-style-type: none"> Training on the appropriate use of agrichemicals is provided 	
	<ul style="list-style-type: none"> Spray diaries are used to record agrichemical treatments 	
	<ul style="list-style-type: none"> Minimise spray drift. Advise neighbouring properties when spraying and ask them to advise you when they spray 	
<p>MIXED ANIMAL & CROP PRODUCTION Inputs from other crops or livestock on your farm could be sources of pest or disease.</p>	<ul style="list-style-type: none"> Other operations on farm are inspected to ensure they are not a source of pests and disease for vegetables and crops 	

SECTION

05

FARM OUTPUTS

Farm outputs are items that leave your production site, including vehicles, equipment, crops, and green waste products. Items leaving your farm could be a source of weeds, pests and diseases to other farms. Green waste especially can be a vector for spread of unwanted or risk pests, diseases and weeds.

	ACTIONS TO REDUCE RISK	ACTIONED
HARVESTING CROPS & PRODUCE	<ul style="list-style-type: none"> Excess soil and waste plant material are removed from machinery and equipment before leaving production site 	
	<ul style="list-style-type: none"> Only healthy crops and produce should continue to packhouse and market 	
	<ul style="list-style-type: none"> Harvest bins and containers are cleaned/disinfected between crops 	
	<ul style="list-style-type: none"> Transport vehicles are clean before the crops are loaded 	
POST HARVEST	<ul style="list-style-type: none"> Produce trucks are loaded on a sealed pad located away from production areas 	
	<ul style="list-style-type: none"> Crates, bins and packaging are clean before 'ready for market product' is packed 	
	<ul style="list-style-type: none"> Unsold and reject produce should be handled appropriately and stored separately from production areas and quality produce 	

	ACTIONS TO REDUCE RISK	ACTIONED
<p>POST-HARVEST WASTE (Green Waste)</p>	<ul style="list-style-type: none"> • Crop waste is properly disposed of to minimise risk of cross-contamination and pest build-up 	
	<ul style="list-style-type: none"> • Contaminant waste is disposed of immediately or contained and covered, away from production areas and waterways 	
	<ul style="list-style-type: none"> • Packhouse waste water is contained, treated or managed to reduce potential contaminant spread 	
	<ul style="list-style-type: none"> • Extra care is taken when destroying unwanted plant material from diseased crops 	



SECTION
06

PRODUCTION PRACTICES

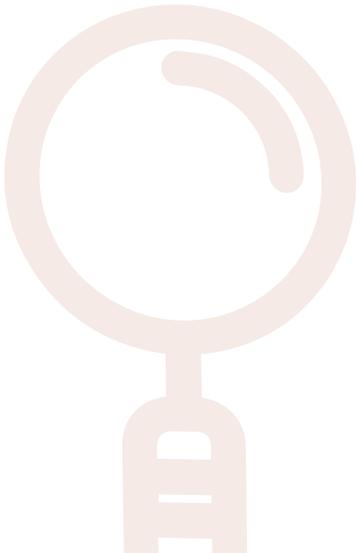
Planting and harvest are a period of high activity. Be vigilant and ensure that biosecurity practices are being maintained during this period and that best practice activity is followed. Best Practice should be followed at all times when engaging with commercial vegetable crops.

	ACTIONS TO REDUCE RISK	ACTIONED
WORK PROCEDURES	<ul style="list-style-type: none"> • The cleanest and youngest crops are worked with first, at the start of the day 	
	<ul style="list-style-type: none"> • Tasks with mature, muddy or risk crops should be completed at the end of the day 	
	<ul style="list-style-type: none"> • Any additional staff have been informed of biosecurity best practice for your work procedures 	
PRODUCTION, GROWING AND PROPAGATION	<ul style="list-style-type: none"> • Plants and seed for planting are sourced from a reputable supplier 	
	<ul style="list-style-type: none"> • Separate areas are designated for propagation and potting located away from production and growing areas 	
	<ul style="list-style-type: none"> • Plants entering the farm are inspected on arrival and before moving to production areas 	
	<ul style="list-style-type: none"> • Hand sanitiser is used before and after handling plant material or soil, or disposable gloves can be used and changed where necessary 	
	<ul style="list-style-type: none"> • Bench surfaces and tools used in propagation and potting areas are washed down and disinfected before and after use 	

	ACTIONS TO REDUCE RISK	ACTIONED
PLANT WASTE	<p>Develop waste stream procedures to dispose of risk plant material, taking into account the type of waste, the crop and the pest/ disease or weed of concern. Methods include:</p>	
	<ul style="list-style-type: none"> • Burning 	
	<ul style="list-style-type: none"> • Heat treatment 	
	<ul style="list-style-type: none"> • Containment for collection by reputable waste removal company 	
	<ul style="list-style-type: none"> • Controlled burial 	
	<ul style="list-style-type: none"> • Mulching or composting on site 	
	<ul style="list-style-type: none"> • Stock feed - for low risk material only 	

CROP MONITORING / PEST SURVEILLANCE

Routine checking of crops is essential for maintaining crop health and gives you the best chance of identifying a new pest before it becomes established.



MONITOR

Active monitoring and surveillance can provide early warning of potential problems. Be sure to:

- Check risk areas where new pests, diseases or weeds, could enter or establish including:
 - farm laneways,
 - near washdown areas
 - parking and loading areas.
- Increase the frequency of inspections during periods of higher risk (such as climatic events).
- Monitor fallow areas for new weeds and volunteer plants which can shelter pests between growing seasons. Sentinel plants can provide early warning signs of an emerging pest problem.
- Consult with your neighbours about any concerns or potential pests.
- Ensure all staff can recognise the appearance of a healthy crop and signs of crop distress or difference.
- Get expert assistance for your crop monitoring if required.



IDENTIFY

- Become familiar with pests that may affect your crops (refer to factsheets, charts and other support material).
- Display posters showing common pests and disease symptoms to help with identification.
- Check with your product group for exotic pests of concern for your crops.



RECORD

- Record the results of crop monitoring and surveillance, photograph anything of concern (including information such as date, observations, pests identified, block/growing area affected, infestation level, proposed treatment).
- Keep a record of when nothing is found also.



REPORT AND REACT

- Call MPI Exotic Pest and Disease Hotline 0800 99 66.
- Decontaminate any equipment, machinery or clothing which may have come in contact with the affected area.
- Do not move affected crops until pest, disease or weed is correctly identified, to ensure current handling, treatment or disposal and limit spread.



Become familiar with the signs of pest infestation and plant diseases

COMMON SYMPTOMS INCLUDE:

- Stem/leaf wilt
- Leaf chlorosis/mottling
- Puncture wounds, chewing marks, or leaf mines on leaves
- Reduced crop size and yield
- Underdeveloped root systems
- Mildew, indicated by powdery growth on leaves
- Decayed roots, leaves, stems, fruit

Photo: Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, #5512807, Bugwood.org

Photo Detail: Cabbage plants with downy mildew on the older leaves.



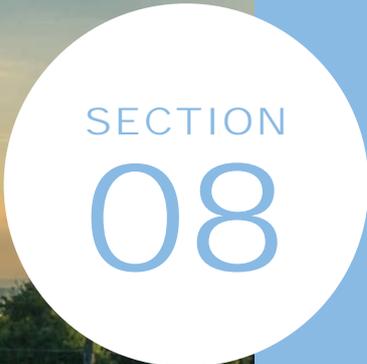
SECTION
07

MANAGE YOUR PROPERTY

It is your responsibility to be aware of the biosecurity risks and practices for your properties or production sites. The overall approach to managing your farms biosecurity should be detailed in an on-farm biosecurity plan

	ACTIONS TO REDUCE RISK	ACTIONED
PRODUCTION SITE	<ul style="list-style-type: none"> • One main entrance is used with signage and parking for visitors and staff 	
	<ul style="list-style-type: none"> • Access to production areas is limited to staff and restricted personnel 	
	<ul style="list-style-type: none"> • Inspections are regularly conducted for pests, diseases, weeds and feral animals 	
	<ul style="list-style-type: none"> • Property perimeter is fenced to limit the movement of people, vehicles equipment and animals around your property 	
	<ul style="list-style-type: none"> • The farm has been mapped out and biosecurity risk areas have been identified 	
	<ul style="list-style-type: none"> • A Biosecurity Plan has been developed for the production site (refer pg 41) 	
YOUR NEIGHBOURING PROPERTIES	<ul style="list-style-type: none"> • Neighbouring properties are monitored so that they do not become a risk to the farm 	
	<ul style="list-style-type: none"> • Boundaries are checked regularly 	

	ACTIONS TO REDUCE RISK	ACTIONED
RUBBISH Rubbish dumps attract vermin that can carry disease	<ul style="list-style-type: none"> • Non-organic rubbish disposal areas are located away from production areas 	
	<ul style="list-style-type: none"> • Rubbish is dealt with appropriately to prevent it from attracting animals and vermin 	
PROPERTY DAMAGE after adverse weather events	<ul style="list-style-type: none"> • Inspect property (once safe to do so) after an event before allowing people on site 	
	<ul style="list-style-type: none"> • Conduct and record ongoing property inspections <ul style="list-style-type: none"> - Note areas of damage or concern and address - Waterways are regularly checked to make sure they are flowing 	
	<ul style="list-style-type: none"> • In event of flood <ul style="list-style-type: none"> - Soil erosion and water movement across your property is regularly checked, e.g. after a flood - Check for new weeds where flood waters may have run across your land from neighbouring properties. - Disease can be spread by contaminated surface run-off 	



SECTION
08

ANIMALS AND WEEDS

Birds, feral animals and vermin can spread and harbour pests and diseases, damage crops, and contaminate waterways.

	ACTIONS TO REDUCE RISK	ACTIONED
BIRDS, ANIMALS & VERMIN	<ul style="list-style-type: none"> • Use bird deterrents 	
	<ul style="list-style-type: none"> • Maintain your fences to prevent animal movement onto property 	
	<ul style="list-style-type: none"> • Develop a control programme for vermin and involve your neighbour 	
	<ul style="list-style-type: none"> • Dispose of dead vermin and animals properly and promptly 	
WEEDS & UNWANTED PLANTS	<ul style="list-style-type: none"> • Remove weeds and volunteer plants from production areas as they can harbour pests or diseases 	
	<ul style="list-style-type: none"> • Ensure that crop destruction and follow-up controls remove all unwanted plants in paddocks and boundary fence lines 	
	<ul style="list-style-type: none"> • Develop a weed management plan for your farm 	
MIXED ANIMAL AND CROP PRODUCTION	<ul style="list-style-type: none"> • Keep livestock confined and away from waterways, production and storage areas 	
	<ul style="list-style-type: none"> • Control stock movement, establish buffer zones between stock areas and crop/water areas 	



SECTION

09

TRAINING, PLANNING AND RECORD KEEPING

Ensure your production sites have biosecurity plans in place which staff and contactors are trained in. Biosecurity activities and risks should be recorded as a part of everyday activity.

	ACTIONS TO REDUCE RISK	ACTIONED
PLANNING	<ul style="list-style-type: none"> • A farm biosecurity plan has been developed for the your production site and regularly reviewed with staff 	
	<ul style="list-style-type: none"> • Develop a biosecurity risk register for your organisation, including the pests of concern and the potential impacts 	
TRAINING	<ul style="list-style-type: none"> • Farm biosecurity is included as part of staff training and farm planning activities and regular refresher sessions are conducted. <p>Staff training includes:</p> <ul style="list-style-type: none"> - recognition of unusual pest/diseases/weeds - understanding of biosecurity good practice on your site - recordkeeping and reporting for your site - making biosecurity measures a habit - how to inform visitors of farm biosecurity practices 	
	<p>Keep information visible as a biosecurity reminder e.g. posters up on shed walls or farm offices</p>	

	ACTIONS TO REDUCE RISK	ACTIONED
RECORD KEEPING What records should be kept	<ul style="list-style-type: none">• Production site visitors	
	<ul style="list-style-type: none">• Vehicle and equipment washing	
	<ul style="list-style-type: none">• Farm inputs (sources, suppliers, what its being used for)	
	<ul style="list-style-type: none">• Spray diaries and fertiliser records	
	<ul style="list-style-type: none">• Risk waste disposal method and reasoning	
	<ul style="list-style-type: none">• Crop scouting activities	

TRACEABILITY

The key to any successful biosecurity plan is a strong traceability system which allows any pests or diseases to be tracked from the point of entry to the production area to the potential point of exit. Traceability protocols are the most important part of on-farm biosecurity. In case of any outbreak or incursion, a production site should be able to detail all interaction with the area of outbreak. All vehicles, contractors and staff who have been in contact with the crop, and what they had been in contact with prior to the crop or production area of interest, should be recorded. If recordkeeping is done correctly traceability should be straight forward when its required.

KEEP RECORDS AND RETAIN DOCUMENTATION FOR TRACEABILITY

Records should be kept for:

- Production sites visitors including contractors (who, when, where and a contact number)
- Vehicle and equipment washing
- Farm inputs (sources, suppliers, what its being used for).
- Seeds and plants: variety, crop class, purchase date, sources, planting location (block number, site, etc).
- Fertiliser and agrichemical application rates and reasoning
- Risk waste disposal method and reasoning
- Crop scouting activities (presence of pest/diseases/weeds) and record pest absences as well. Always used trained crop scouts and a set reporting format for external scouts.

Recording formats should be standardised and where applicable, should be used by all people who visiting the production site.

Documentation of production inputs, testing results, etc should be maintained for full output traceability.

SECTION

10

ADDITIONAL
RESOURCES

ADDITIONAL RESOURCES

Preparing an on farm biosecurity plan (2019):

www.hortnz.co.nz/our-work/biosecurity/preparing-an-on-farm-biosecurity-plan/

Minimising soil movement by vehicles off farm (2019): head to www.vri.org.nz/search, search using the term “Washdown Code of Practice”

Vegetables New Zealand Inc biosecurity resources (including signage, factsheets and additional guidance): www.freshvegetables.co.nz/biosecurity/exotic-pests/about-our-biosecurity-alerts/

Tomatoes New Zealand – Resources for tomato site biosecurity (factsheets, Biosecurity Plan and checklist, factsheets, posters): <https://www.tomatoesnz.co.nz/biosecurity/resources-and-fact-sheets/>

To review the priority exotic pests for your crops, visit your product group websites:

- Vegetables New Zealand
<https://www.freshvegetables.co.nz/biosecurity/exotic-pests/fact-sheets/>
- Onions New Zealand
www.onionsnz.com/member-navigation/industry-protection/biosecurity/
- Tomatoes New Zealand
www.tomatoesnz.co.nz/biosecurity/
- Process Vegetables New Zealand
www.processvegetables.co.nz/biosecurity/

For additional general biosecurity information:

- Biosecurity New Zealand Website
www.mpi.govt.nz/biosecuritynz
- GIA New Zealand
www.gia.org.nz

SECTION

11

GOVERNMENT AND PRODUCT GROUPS ROLE IN BIOSECURITY

Biosecurity is important to New Zealand and its primary industries. This includes having the right measures in place to prepare, respond to and, if needed, manage pest or disease incursions on an ongoing basis.

Ministry for Primary Industries

The Ministry for Primary Industries (MPI) is the government agency responsible for New Zealand's Biosecurity. The Biosecurity New Zealand department is focused on protecting the country and reducing risks.

Biosecurity New Zealand's focus is on stopping pests and diseases at the border, before they get to New Zealand, and eradicating or managing the impact of those already here. With the help of New Zealanders, they ensure the value of New Zealand's primary industries are maintained.

The role of MPI following an incursion is to lead the response and eradication programme, and to conduct continual surveillance.

Government Industry Agreement for Biosecurity Readiness and Response (GIA)

The Government Industry Agreement for Biosecurity Readiness and Response (GIA) operates as a partnership between primary industry and government to manage pests and diseases that could badly damage New Zealand's primary industries, economy, and environment.

Under GIA, Signatories share the decision-making, responsibilities and costs of preparing for – and responding to – biosecurity incursions. By working in partnership, industry and government can achieve better biosecurity outcomes. The GIA Deed outlines the principles for the partnership and the commitments that each industry organisation makes to the wider biosecurity system and to improve biosecurity capacity and capability in readiness and response.

Product Groups Role in GIA

Each industry organisation negotiates and agrees the priority pests and diseases of most concern to them and agree actions to minimise the risk and impact of an incursion, or prepare for and manage a response in the event than an incursion occurs. Signing a GIA allows these product groups to be formally involved in the decisions for managing their biosecurity risks and during a response in the event of an incursion.

Vegetable groups that have signed a GIA deed are:

- Onions New Zealand Inc.
- Process Vegetables New Zealand Inc.
- Tomatoes NZ Inc.
- Vegetables New Zealand Inc.
- Potatoes New Zealand.

Product Groups Role in Biosecurity

Product groups play a key role in biosecurity by communicating biosecurity risks with grower members, completing biosecurity readiness work either within or over and above their GIA commitment. Biosecurity readiness work includes preparation of resources such as this on-farm biosecurity manual. Product groups also assist during biosecurity responses by supplying Ministry for Primary Industries with information and resources when required to respond to the biosecurity incursion.

Product groups act as a communication channel for growers and those directly effected by biosecurity incursions. This allows information to flow from those impacted by the biosecurity incursion to decision makers and back to the growers.



SECTION

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CASE STUDIES

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CASE STUDIES

Examples of biosecurity incursion

There have been many cases of biosecurity incursions in New Zealand horticulture. Some incursions have resulted in pest eradication, while others have not been eradicated.

These examples highlight the importance of good biosecurity management and being vigilant on your farm. Practising good biosecurity management on your farm reduces the risk of pest or disease establishment and potential spread, that could threaten crop and vegetable production in New Zealand.

Impacts of biosecurity incursions on growers:

- **Increased cost of production:** control and eradication of pest and diseases once found on a property is a costly exercise.
- **Significant loss of yield:** pest and diseases can stunt crop growth or decimate harvestable crop.
- **Loss of sell-able crop:** a pest or disease outbreak could leave a crop unfit for human consumption.
- **Loss of access to markets:** outbreaks of pest and diseases in New Zealand can limit international market access for not only the crop in question but also for potential host crops.
- **Loss of right to grow crops:** in some cases, pest eradication will be attempted by banning the production of crops in a certain area. See the Pea weevil case study as an example.

CASE STUDY 1

GREAT WHITE BUTTERFLY *Pieris brassicae*

Having the support of the public was important for the first successful eradication of an unwanted butterfly pest in the world.

The great white butterfly can threaten brassica crops and New Zealand native cress species. The caterpillars are voracious feeders and can quickly reduce plants to a skeleton, significantly reducing crop yields. Stock will also not graze on infested plants.

Photo: Mary C Legg, #5581696, Bugwood.org



Adults can fly hundreds of kilometres, and lay clusters of 30-100 tiny yellow eggs.



Caterpillars are easy to recognise because they feed together in large groups.



The wingspan of adults is approx. 60mm. Fully-grown caterpillars are 50mm long, pupae are 25mm long.

How did the great white butterfly enter New Zealand?

The great white butterfly was believed to have arrived as pupae on goods arriving at the Port of Nelson.

How long did it take to eradicate the great white butterfly?

It took six years to eradicate the great white butterfly. It was first discovered in Nelson in May 2010. The last butterfly was found in December 2014. Monitoring continued until June 2016 and it was officially declared eradicated in November 2016.

What strategies were used for eradication?

Keeping the public informed and on-side was an important eradication strategy. Department of Conservation rangers had strong support from the public and were given access to private property. The public were asked to report any sightings of the butterfly.

Eradication involved containing and suppressing the main butterfly population to reduce its movement, and other sub-populations and individual butterflies were eliminated to minimise the spread. Individual host plants were also removed and herbicides were used over larger areas of host plants.

Photos: (Middle) Dani Barchana, #5471997, Bugwood.org (Bottom) Hanna Royals, #5559879, Bugwood.org

Is surveillance for great white butterfly still continuing?

Plant and Food Research continues to survey brassica crops in the Nelson-Tasman region.

How much did it cost to eradicate the great white butterfly?

The total cost of eradicating the great white butterfly was almost \$5 million. This included a \$200,000 contribution from Vegetables New Zealand Inc.

Who was involved in the eradication programme?

The eradication programme was led by the Department of Conservation, and involved the Ministry for Primary Industries, Horticulture New Zealand, AgResearch, and Plant and Food Research.

The involvement of the Nelson community was a very important part of the programme.

“We knew this pest was a potential threat. If it spread, we would have to learn to live with it. We would have to spray more and our costs would go up. My advice would be to consult widely to understand the risk and find out what to do, talk to overseas growers and researchers as well as NZ experts, and don’t just accept the first piece of advice that comes along. You never know how things might turn out and who your allies might be. In this case, our industry would not have mounted an eradication on its own and it was only possible because DOC had some rare native brassicas they wanted to protect.”

Stuart Davis, vegetable grower, and former Vegetables NZ and VR&I board member.

CASE STUDY 2

PEA WEEVIL *Bruchus pisorum*



Major sacrifices made by commercial and domestic pea growers in the Wairarapa led to the world's first eradication of pea weevil.

Pea weevil is a threat to fresh peas and pea seed. New Zealand's pea crop is worth \$50m domestically, and \$73m in exports. With the rise in plant-based food products, the international demand for peas is increasing by 12% annually.

Pea weevil larvae feed on growing peas causing damage which reduces crop yield, seed germination rates, and seed quality. The infested peas become foul and are unfit for human consumption.

The pea weevil relies on the pea (*Pisum sativum*) for its entire lifecycle. Adult pea weevils overwinter in peas and as the temperature increases they emerge and fly to flowering pea plants where they lay their eggs on the pods. After 1-3 weeks, the larva hatch and burrow into the pea causing damage. Fresh or dried peas can carry pea weevils or their eggs. The weevils can survive up to two years in stored seeds.

Photo: Mariusz Sobieski, #5438869, Bugwood.org



Adults are brownish-grey in colour, with white flecks, and 4-4.5mm long.

Larvae are white/cream coloured with a brown head capsule, and 6mm long.

Photo: Natasha Wright,
#5203038, Bugwood.org



How did the pea weevil enter New Zealand?

Pea weevil was detected in pea seeds in the Wairarapa where ten percent of the national crop is produced.

What strategies were used to eradicate pea weevil?

Removing the pea weevil's food source was considered the best strategy for eradication. A two-year ban on commercial and residential pea growing was put in place. Growing snow peas, sugar snap peas, pea trellis and sprouts was also prohibited.

The movement of pea seeds, pea straw, and pea plantings was restricted, and pea plants were destroyed. Pea seeds and pea straw were also removed from sale in the region.

What long did it take to eradicate pea weevil?

It took four years to eradicate pea weevil. The pest was first discovered in March 2016, and declared eradicated in February 2020. Three years after the ban was implemented, pea weevil was no longer detected.

Two years without detecting pea weevil was needed before it could be declared eradicated, and growing peas could resume.

Is surveillance for pea weevil still continuing?

Surveillance for pea weevil continues in the Wairarapa and Canterbury regions, which are New Zealand's major pea growing areas.

What crops did farmers grow instead of growing peas?

During this time, farmers generally grew more of what they were already growing - alternate crops which included barley, wheat, oats, ryegrass seed, and forage brassica for livestock.

How much did it cost to eradicate the pea weevil?

During the pea growing ban, farmers were offered support and paid ex-gratia payments as compensation for loss of income.

Ongoing surveillance and maintaining traps costs approximately \$20,000 to \$30,000 annually.

Who was involved in the eradication programme?

The Ministry for Primary Industries led the eradication programme and continues to undertake surveillance. The eradication programme required the cooperation of commercial and residential pea growers, and also seed and garden suppliers.

“Any decision to ban pea growing would really affect my friends, neighbours, industry colleagues, and Wairarapa home gardeners. Being the only person on the governance group commercially growing peas was challenging at times. The key question was would a ban give us a real shot at eradication. Technical advice said it was possible, so the growing ban had my full support. I really pushed for a support package for growers to have alternative crop options and to be compensated so no-one was worse off. We've got some good options now which will make us more resilient. At the end of the day, we did the hard yards over the last four years but it's a really good success story.”

Karen Williams, arable grower, grower appointee on Biosecurity New Zealand's Pea Weevil Governance Group

CASE STUDY 3

IRIS YELLOW SPOT VIRUS



The disease, Iris Yellow Spot Virus, is widespread in New Zealand and so far has had little economic impact. The important economic hosts of Iris Yellow Spot Virus are onions, garlic, leek, shallots, and chives.

Iris Yellow Spot Virus is controlled by managing the presence of its vector – onion thrips - limiting the impact of the disease.

The outcome of not controlling the vector and therefore the disease, can lead to the inability of growing crops, increased production costs, and the loss of market access.

Iris Yellow Spot Virus is transmitted by onion thrips (*Thrips tabaci*). The virus is only acquired by the nymph and is only transmitted by the adult.

The degree of susceptibility varies among cultivars. Iris Yellow Spot Virus affects leaves, roots, bulbs and the whole plant, and can cause the complete loss of seed crops because the flower heads do not develop.

Photo: Ronald D. Gitaitis, #5472705, University of Georgia, Bugwood.org

**How was Iris Yellow Spot Virus detected?**

Iris Yellow Spot Virus was detected in onions and shallots in a disease survey in the Blenheim area when lesions were seen in brown onion seed plants. It was not found on garlic. The infected plants also had significant thrips damage but there were no IYSV symptoms.

Has Iris Yellow Spot Virus been eradicated?

Iris Yellow Spot Virus has not been eradicated from New Zealand.

How can the impact of Iris Yellow Spot Virus be limited?

The management of onion thrips is important in controlling Iris Yellow Spot Virus as the severity of the disease is related to the presence of the infected thrips.

Photo: Howard F. Schwartz, #5359789, Colorado State University, Bugwood.org



Good farm management practices will reduce the impact of Iris Yellow Spot Virus, and include: maintaining soil fertility and moisture to reduce plant stress; avoiding excessive use of nitrogen fertiliser which attracts onion thrips; removing weed reservoirs and volunteer plants as the virus could overwinter; removing and destroying infected plants; and practicing good hygiene.

Why is it important to manage the Iris Yellow Spot Virus vector?

Managing onion thrips reduces the spread of the disease. It has also been discovered that Iris Yellow Spot Virus can prolong the lifespan of onion thrips by approximately 20%, therefore potentially posing a greater threat if thrips control is inadequate.

Photo: Howard F. Schwartz, #5359793, Colorado State University, Bugwood.org

CASE STUDY 4

POINSETTIA THRIPS *Echinothrips americanus*



Poinsettia thrips is a pest of greenhouse and ornamental species. In New Zealand, it is not expected to survive outdoors because the climate is cooler.

Poinsettia thrips is a potential vector for viruses, and can impact on Integrated Pest Management (IPM) programmes.

Poinsettia thrips cause damage to host plants by chewing and feeding on the leaves. They target older leaves and woody stems rather than softer stemmed plants such as vegetables. They also feed on flower parts.

Poinsettia thrips cause damage similar to mites and other thrips species. Black spots on infested leaves are faecal droppings of the thrips.

Long distance spread is mostly by the movement of infested plant material or nursery stock.



Poinsettia thrips are small. Adults are about 1.7mm long, can fly and are dark brown/black in colour with a pale band across the body.



Larvae are light coloured compared to the adults. The nymphs spread by walking and hitchhiking on people and animals.



Where were Poinsettia thrips first discovered in New Zealand?

Poinsettia thrips were first found in an Auckland greenhouse in August 2017.

What strategy was used to eradicate Poinsettia thrips?

The affected greenhouse owner worked with the Ministry for Primary Industries to isolate the area of the greenhouse where the thrips were discovered, and thoroughly inspect all parts of the greenhouse and surrounding area. Trace back to try and find the source; and trace forward of movements from the site were carried out. All growers were asked to check their greenhouse crops and a fact sheet about the thrips was distributed to greenhouse growers and nurseries.

Inspections and treatment of the property was continued until there was sufficient evidence that the thrips had been eradicated.

A survey methodology was developed by entomologists, and industry crop scouts were trained in the survey methodology. The industry crop scouts then worked alongside MPI staff to survey for the presence of the thrips at a sample of several of the traced-forward sites during spring 2017.

Photo: (Bottom) Poinsettia thrips larvae. Image courtesy of Lance Osborne University of Florida.

How long did it take to eradicate Poinsettia thrips?

In May 2018, nine months after the initial discovery, the investigation ended after no further Poinsettia thrips were detected, and the population was declared “not known to be in New Zealand”.

Who was involved in the eradication programme?

GIA partners which could have been affected by an incursion of Poinsettia thrips - Tomatoes NZ Inc, Vegetables NZ Inc, as well as Kiwifruit Vine Health - were involved in the response.

This incursion and its investigation is an example of GIA partners working together with the Ministry for Primary Industries in a response and provided useful learnings.

“As a sector, we didn’t want a repeat of TPP [tomato potato psyllid]. The growers wouldn’t want to go through the same pain again. This wasn’t necessarily going to be a serious pest for tomatoes but we didn’t want another pest to try and control, or something that may threaten exports. It was also an opportunity to practise a GIA response scenario, working in partnership with MPI.”

**Helen Barnes, General Manager,
TomatoesNZ.**

CASE STUDY 5

QUEENSLAND FRUIT FLY *Bactrocera tryoni*

Photo: James Niland, Queensland Fruit Fly - *Bactrocera tryoni*, Flickr.com

Major problems would be encountered if fruit flies became established in New Zealand – the loss of market access to important overseas markets could occur.

The Queensland fruit fly is the most damaging horticultural pest in its native Australia, costing hundreds of millions of dollars in damage and control each year. New Zealand needs to stay alert to fruit flies because many vegetable and fruit crops would be susceptible.

The Queensland fruit fly causes damage when the larvae feed on the fruit host and cause it to rot. Adult fruit flies lay their eggs below the skin, which hatch into larvae in 2-3 days. The larvae live for 10-31 days and cause considerable damage during this time.

The Queensland fruit fly has a wide climate and host range. It feeds on over 200 different types of fruit and vegetables, though it particularly favours guava, mango, stonefruit, and tomatoes.

Other important species of fruit fly are: Oriental fruit fly (*Bactrocera dorsalis*), and Mediterranean fruit fly (*Ceratitidis capitata*).



QFF adults are reddish-brown coloured, and have distinct yellow markings and clear wings.



They grow to 6-8 mm long, and are a little larger than a house fly. The larvae grow to 8-11 mm long.

How do fruit flies enter New Zealand?

Larvae-infested fruit which is imported or carried by travellers are the main method of fruit fly entry into New Zealand. Imported fruit needs to meet import health standards and is inspected at the border. To restrict the traveller pathway, MPI's Biosecurity New Zealand has bins placed at international airports so passengers can dispose of any fruit.

How often has fruit fly been detected in New Zealand?

Queensland fruit fly (*Bactrocera tryoni*) has been detected several times in Auckland and Northland. The most recent discoveries were in 2019 in the Auckland North Shore suburbs of Devonport and Northcote. In the same year, the 'Tongan' fruit fly (*Bactrocera facialis*) was discovered in Ōtara in South Auckland. A small population was found in Grey Lynn, Auckland, in 2015. Each time, eradication was successful.

Photo: (Top) Pest and Diseases Image Library, #5459416, Bugwood.org (Bottom) Pest and Diseases Image Library, #5459411, Bugwood.org

What surveillance is in place to detect fruit fly?

The Ministry for Primary Industries has had a dedicated fruit fly trapping programme in place since the 1970s. There is a network of over 7,600 traps across the country, with approximately 4,500 traps in the Auckland area. The traps are generally located near airports, seaports, and in important horticultural areas. New Zealand spends \$1.6 million annually on fruit fly monitoring.

What happens in a response when fruit fly is detected?

Discovery of a fruit fly triggers a response which is co-ordinated by Biosecurity New Zealand. Controlled areas are declared, and restrictions are placed on the movement of fruit and vegetables in and out of these areas.

Trapping is intensified by installing more traps and placing bait in trees. When no further fruit flies are detected and the scientific requirements are met, only then can restrictions be lifted and successful eradication can be declared.

A large part of a response is keeping the public informed and undertaking measures to ensure their support. These activities include erecting signs around the controlled areas, dropping leaflets into letterboxes, and placing bins in convenient locations for residents to dispose of fruit and vegetable waste.

What are the restrictions placed on the movement of fruit and vegetables?

Any produce being exported that may be a Queensland fruit fly host must meet additional requirements to be eligible for export. Biosecurity New Zealand places an Export Restriction Zone (ERZ) around the area – any produce that could be a host material travelling through an ERZ and destined for export needs to be contained in an insect-proofed environment and additional documentation provided.

Residents living in any controlled areas are prevented from moving produce out of the area, and bins are provided for disposing of fruit and vegetable waste.

How much did it cost for the eradication programme?

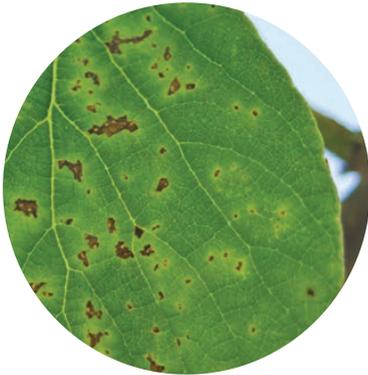
The Queensland fruit fly eradication operation on the North Shore of Auckland cost \$18 million, with 800 people employed in the trapping activities.

“As growers and exporters, it’s not knowing where or when the next fruit fly might turn up that worries us. We could get caught up in the restricted movement zones, causing extra effort and expense. If this pest got away in New Zealand, we’d lose market access and the ability to move tomatoes around the country, and that would impact the whole industry.”

**Simon Watson, NZ Hothouse
(Tomato grower and exporter)**

CASE STUDY 6

PSA *Pseudomonas syringae* pv. *actinidiae*



Psa is one of the most serious diseases of kiwifruit. Gold kiwifruit in New Zealand were particularly susceptible with 85% of vines removed and destroyed. Today, the kiwifruit industry has largely recovered by planting Psa-resistant varieties.

Kiwifruit is New Zealand's largest horticultural export industry with an export value of over \$2.3b (Fresh Facts 2019). At the time of the outbreak in 2010, the loss in exports was estimated to cost the industry \$930 million.

Psa is a bacteria that causes canker of green and gold kiwifruit, and kiwiberry. It does not directly affect the fruit but affects plant health and its viability. The disease often causes the vines to die. It first appears as brown leaf-spotting and in severe cases cankers develop on the vines which produce an exudate.

Psa is highly infectious and is spread by spores which are easily spread by heavy rain, strong winds, animals, people, and farm equipment. Harsh winters followed by hot summers are ideal conditions for Psa populations to increase.

Photo: Kiwifruit Vine Health, Psa-V Symptoms Guide

**How did Psa enter New Zealand and where was it detected?**

Psa is believed to have entered New Zealand in a shipment of pollen from China. It was first found on an orchard in Te Puke in November 2010, but was soon detected on other orchards in the North and South Island.

What strategies were used to eradicate Psa?

The initial intention was to contain and eradicate the disease by removing vines. When this was not possible, the industry worked to minimise damage and identify a pathway for recovery.

The Ministry for Primary Industries responded quickly, and the kiwifruit industry immediately organised a sector-wide response. Kiwifruit Vine Health was established to lead the response, and to re-establish the future of the industry. Kiwifruit Vine Health worked together with ZESPRI, Plant and Food Research, and industry members.

Photo: Kiwifruit Vine Health, Psa-V Symptoms Guide

How was the kiwifruit industry re-established?

Significant investments were made in research and development. Psa-resistant cultivars were developed by Plant and Food Research to replace susceptible varieties. Orchard management systems were also developed for the management of Psa-resistant cultivars.

Numerous resources were developed for growers, including risk assessment tools, best practice guidelines, and orchard and environment management tools, so that kiwifruit can be grown successfully in the presence of Psa.

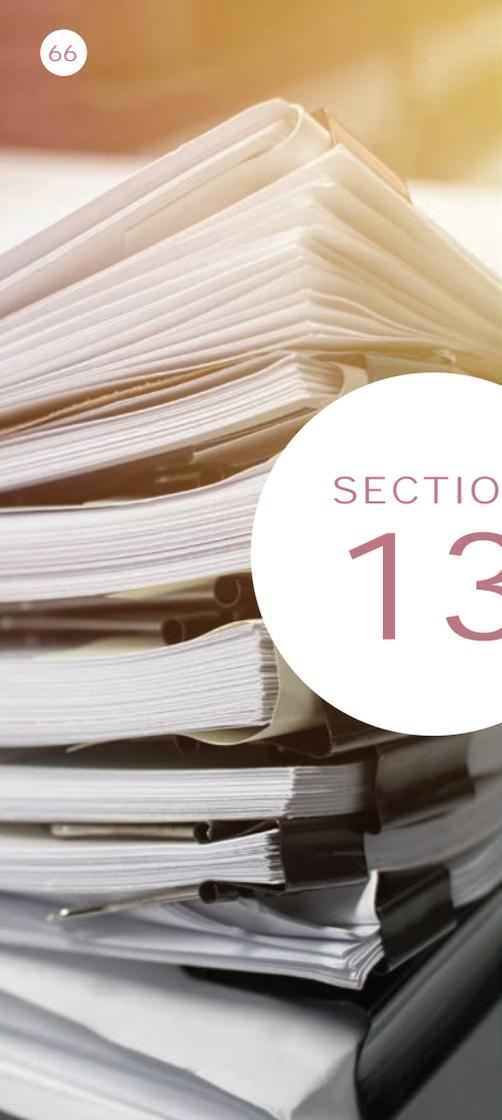
What support was available for growers?

The government agreed to a support package, and invested in Plant and Food Research to enable the research and development-led recovery of the industry. The banks also agreed to limit foreclosures on growers that were forced to remove their vines.

What is the future for the kiwifruit industry?

Today, the kiwifruit industry has more than recovered from the Psa outbreak. The value of exports is now greater than before the outbreak.

New Zealand scientists are also partnering with China to identify new sources of resistance to future-proof the industry.



SECTION

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REFERENCES

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GUIDE FOR OUTDOOR CROPS – PUBLISHED 2020

For additional copies of this resource or additional biosecurity information, please get in touch with your representative product group.

