

Final Report

Investigating on Farm HACCP Programs for Managing Plant Pests in Biosecurity Concern – An Options Paper

Project leader:

Grant Telford

Delivery partner:

Biosecurity Solutions Australia Pty Ltd

Project code:

VG15051

Project:

Investigating on Farm HACCP Programs for Managing Plant Pests of Biosecurity Concern – An Options Paper

Disclaimer:

Horticulture Innovation Australia Limited (Hort Innovation) makes no representations and expressly disclaims all warranties (to the extent permitted by law) about the accuracy, completeness, or currency of information in this Final Report.

Users of this Final Report should take independent action to confirm any information in this Final Report before relying on that information in any way.

Reliance on any information provided by Hort Innovation is entirely at your own risk. Hort Innovation is not responsible for, and will not be liable for, any loss, damage, claim, expense, cost (including legal costs) or other liability arising in any way (including from Hort Innovation or any other person's negligence or otherwise) from your use or non-use of the Final Report or from reliance on information contained in the Final Report or that Hort Innovation provides to you by any other means.

Funding statement:

This project has been funded by Hort Innovation, using the vegetable research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

Publishing details:

ISBN 978 0 7341 4411 9

Published and distributed by: Hort Innovation

Level 8
1 Chifley Square
Sydney NSW 2000

Telephone: (02) 8295 2300

www.horticulture.com.au

© Copyright 2018 Horticulture Innovation Australia

Contents

1	Summary	3
2	Keywords.....	3
3	Introduction	4
4	Methodology.....	5
4.1	Inform findings by establishing a project reference group and through stakeholder consultation	5
4.2	Identify system requirements.....	5
4.3	Evaluate existing on-farm risk mitigation and assurance systems.....	6
4.4	Identify options and propose a recommended option	6
5	Outputs.....	6
5.1	Project Reference Group consultation.....	6
5.2	System requirements	7
5.3	Evaluation of existing on-farm risk mitigation and assurance systems	19
5.4	Options and recommended option.....	25
6	Outcomes	28
7	Evaluation and Discussion	29
8	Recommendations	30
8.1	General.....	30
8.2	Quality management and continual improvement framework.....	30
8.3	Risk management framework - procedures.....	30
8.4	Forms and records	31
8.5	Methods to deal with user specific risk	31
8.6	Market access tools	31
8.7	Governance and administration	31
8.8	Audits and auditing for assurance purposes.....	32
8.9	System supply and distribution.....	32
8.10	Supporting tools.....	32
8.11	Education and training.....	32
9	Scientific Refereed Publications	33
10	IP/Commercialisation	33
11	References.....	33
12	Acknowledgements.....	34
13	Appendices	34

1 Summary

Australian vegetable producers are not unfamiliar with practices and systems introduced to minimise risk to their business. Systems to minimise food safety risk, which also provide assurance to customers, have been widely in use in Australia since the 1990's. Food commodities produced must be safe, suitable to eat, and suitable to market. Pest and disease infestation of a biosecurity concern also poses risk to vegetable producers in the same way that poor food safety and quality poses a risk, however pest and disease infestation can be permanent and wide reaching.

On-farm biosecurity is one way a vegetable producer can take steps to reduce biosecurity risk. Precautionary practices applied across a farm can help protect against risk to production, however taking these steps alone does not provide assurance to a customer that biosecurity risks have been controlled to an acceptable level. Biosecurity risk mitigation is not typically demanded by customers, however a level of assurance is provided through compliance to regulatory requirements placed on at-risk commodities by State, Territory and International governments.

The purpose of this research was to investigate and report on options for on-farm Hazard Analysis Critical Control Points (HACCP) based programs for managing plant pests of biosecurity concern to assist in controlling biosecurity risk. Research outcomes have led to a number of recommendations.

It is logical to expect that a vegetable producer would demand that any system that is produced to deal with biosecurity risk would fit into existing risk mitigation systems implemented on-farm and that any system proposed would be supported, minimise cost, and maximize benefit to the user. An analysis of existing biosecurity programs and initiatives, and other systems used to mitigate risk, suggests that it is possible to develop a system to address biosecurity risk that achieves these objectives.

The development of an on-farm biosecurity system for vegetable or other food producing horticultural producers must consider an overarching quality management type framework that is consistent with existing food based risk management systems used both within Australia and abroad. Procedures developed and applied at and across HACCPs must be fit for purpose, reasonable and practical, informed by best practice research outcomes, and comply with national and international standards. Procedures must also provide for and authorise the use of approved methods to control specific risk based on a pest, a crop, and an area to appropriately address these risks and allow demonstrated compliance with domestic or international market access requirements.

Administration and governance of an on-farm biosecurity system must be considered carefully and not create a conflict of interest between user groups or existing on-farm systems. Ultimately, who should administer the system should be based on demonstrated competency in this area, cost effectiveness and in consideration of the system developed. The selection of auditors and auditing services should occur based on compliance to auditing standards, system requirements and cost efficiency. Specific industry groups must be considered for provision of support services including technical services and education and training for their own members.

It is recommended that significant time and cost savings in the development and implementation of an on-farm biosecurity system could be achieved through negotiation with the Nursery & Garden Industry Australia in possible integration into elements of the BioSecure HACCP certification system, which has been developed to provide guidance in biosecurity best practice and market access opportunities for horticultural nursery production users. Other tools such as Growcom's Hort360 initiative could also best considered as a precursor best practice online training tool.

2 Keywords

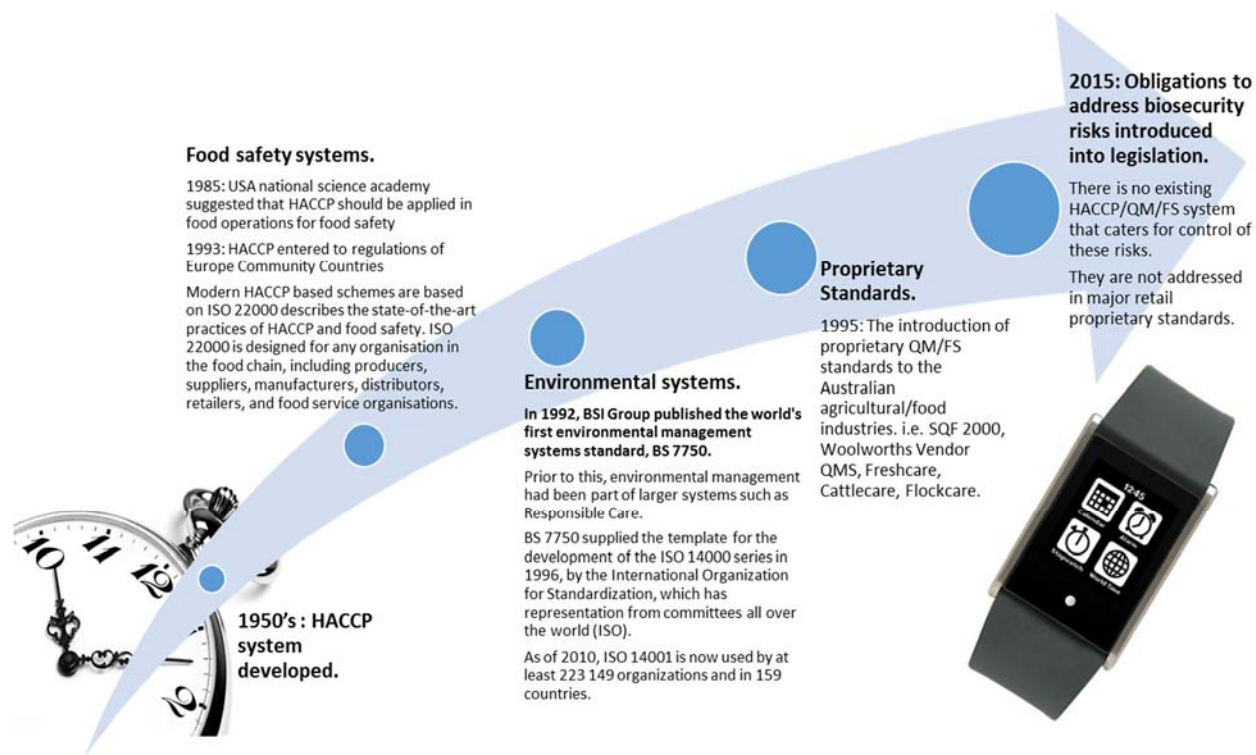
Biosecurity; Vegetables; Assurance; Market Access; Australia

3 Introduction

Since the 1950's, on-farm food chain risk management systems have been developed based on quality management principles. Specific requirements incorporated within legislation have transitioned the systems to be based on ISO/HACCP standards.

These have been adopted and modified as propriety standards to meet the requirements of major retailers, and/or as prescriptive procedures to meet the needs of government. Current best practice food chain supply security systems, i.e. food safety, quality and environmental stewardship systems, are based loosely on auditable international and national standards such as AS/NZS ISO 22000, 9001 and 14001, or propriety standards based on these such as Freshcare and Woolworths Vendor Quality Assurance.

Biosecurity is now being identified as a key risk to the food chain with added impetus placed on persons, through legislation, to take practical and reasonable steps to address biosecurity risks within their control.



It is clear that biosecurity is a risk to food chain security like food safety and quality. Many biosecurity risks are similar to food safety and quality risks. Biosecurity risk management starts with good biosecurity practices in the same way food quality, food safety and environmental management starts with good agricultural practices. Good biosecurity practices are steps that a producer can take to reduce a biosecurity risk from occurring. These practices are usually simple and form the foundation on which to build a modern biosecurity system.

The Australian vegetable industry, State and Territory governments and the Australian government, Plant Health Australia, Horticulture Innovation Australia (HIA) and other organisations have developed resources supporting good biosecurity practice. A number of industries have also produced biosecurity plans or manuals. These plans promote 'good on-farm biosecurity practices' and provide a sound foundation to addressing biosecurity risk, however there is no agreed standard or governance arrangements for on-farm biosecurity (i.e. implementation, support, maintenance, audit or certification).

A system approach builds on good biosecurity practices and incorporates risk management. A system approach utilises quality management principles and is customer focused to provide assurances that biosecurity risks have been identified, assessed and controlled in a reasonable and cost effective manner. Consequently, good biosecurity practice alone falls short of providing a contemporary and consistent risk based 'system' approach to on-farm biosecurity and a means to demonstrate that biosecurity obligations or market access/customer requirements are being met.

Well-structured on-farm biosecurity systems based on risk management principles have the potential to address relevant responsibilities for vegetable industry producers across the biosecurity continuum, control these biosecurity risks, and 'value add' to existing quality systems by providing for future domestic and international market access opportunities. Further, continual improvement systems continue to demonstrate increased economy and efficiency and flexibility to respond to new risks when implemented as part of a proactive overall business management strategy.

Adoption of an on-farm biosecurity system approach by the vegetable industry for accreditation to meet market access requirements is targeted at industry members who are confident of securing an economic and/or competitive advantage under an industry based system. Industry adoption will be driven by a system that meets business and customer requirements in a cost effective and value adding way.

The aim of this project is to provide options for future development of a risk management based on-farm biosecurity system that addresses these requirements and provides a sustainable and foundational basis for ongoing biosecurity related research and development.

4 Methodology

The project methodology that was applied was as follows.

4.1 Inform findings by establishing a project reference group and through stakeholder consultation

A project reference group was established in association with Horticulture Innovation Australia (HIA) to facilitate feedback on key aspects of the project. Other stakeholder representatives were also identified and consulted to confirm assumptions and clarify requirements.

4.2 Identify system requirements

The research team undertook a review of national and international standards to identify a quality management framework and applicable risk mitigation requirements to address risk at critical control points and support appropriate development of an on-farm biosecurity system.

The research team then performed an analysis of how these standards and requirements might contribute to an on-farm biosecurity system framework for both risk mitigation and assurance purposes.

Legislative requirements that relate to on-farm biosecurity systems and system development are unique factors and are not directly addressed within either quality management or contemporary risk management standards. Legislative requirements for biosecurity and biosecurity assurance purposes, including market access accreditation, certification and auditing were identified and reviewed.

Governance requirements and supporting tools and services were reviewed, both in terms of an on-farm biosecurity system used for best practice and for market assurance purposes.

4.3 Evaluate existing on-farm risk mitigation and assurance systems

Existing on-farm risk mitigation and assurance systems that could be used to support development of a system for the Australian vegetable growers were identified and reviewed. The research team then compared systems, and assessed each system against requirements. Synergies, differences and gaps between systems were identified.

4.4 Identify options and propose a recommended option

Options were identified and strengths, weakness opportunities and threats were considered primarily for the direct user but also for customers and for industry/stakeholders. Criteria for analysis included simplicity of industry adoption, existing government and inter-government requirements, any additional requirements associated with negotiation, upgrade of infrastructure, training and system development.

Based on analysis, a recommended option was identified.

5 Outputs

5.1 Project Reference Group consultation

The project reference group was established to provide opinion on matters related to key considerations identified as a result of evaluation and analysis of on-farm biosecurity requirements.

This approach is consistent with modern quality management system requirements for design and development planning for a system (Standards Australia, 2016b).

The project reference group included:

- Two representatives of the Australian vegetable Industry (AUSVEG) with a detailed understanding of the industry organisation, industry practices and industry capability.

The role of these representatives was to provide advice on issues that could affect the industry as a whole and where required, provide advice on the feasibility of proposed solutions.

- Two industry development officers/managers, one located in the Northern Territory and one servicing a growing area in Queensland, to provide advice on the practical implementation of any proposed system option in their growing area.

The role of these members was to provide advice on ease of implementation and perceived economic benefit to ensure that solutions proposed could be used and useful based on knowledge of their area.

- Two grower representatives, one responsible for operations within Queensland and New South Wales and one to provide advice on the practical implementation of any proposed system option on their farm.

The role of these members was to provide advice on ease of implementation and perceived economic benefit to ensure that solutions proposed could be used and useful.

- Two representative of HIA to provide advice, feedback and guidance where required.

The role of the HIA representatives were to oversight project progress.

The feedback mechanism applied was in the form of an-online feedback survey which provided for response either by on-line completion or printing of the survey and return by email. Where clarification of a response was sought, clarification of that response was sought by email or by telephone phone.

The survey that was developed was grouped across key areas and included a total of 53 questions with opportunity to provide additional comment for each key area.

All participants from HIA and AUSVEG, and one industry development representative responded in full. A summary table of key areas, purpose, questions and response type description is provided as Appendix 1. A copy of the survey is provided as Appendix 2. A survey response summary is included as Appendix 3.

Responses provided were considered in research analysis, evaluation and recommendations.

5.2 System requirements

For an on-farm biosecurity system directed at controlling risk that must also have provision to demonstrate to a customer that stated requirements have been complied with, it is important to examine both process management and process control as part of an over-arching system framework. For assurance purposes it must also comply with the requirements of government, have adequate governance and administration structure and provide for supporting tools and services.

5.2.1 Quality management

The purpose of adopting a quality management system is to enable a producer is to deliver a consistent product that meets customer expectations and to continually improve business practice. Customer expectations include the expectations of regulating bodies who demand compliance with applicable statutory and regulatory requirements.

To determine a suitable quality framework for an on-farm biosecurity system it is appropriate to consider AS ISO 22000:2005 Food safety management systems— Requirements for any organization in the food chain (Standards Australia, 2004) and AS/NZS ISO9001:2016 Quality Management Systems - Requirements (Standards Australia, 2016b) as possible quality models.

For on-farm food production, customers typically demand an approach from a supplier that is consistent with the ISO 22000 standard and supported by elements of Hazard Analysis Critical Control Points (HACCP) analysis. ISO 22000 is specifically directed at addressing food safety risks.

Requirements built loosely on this standard are applied domestically through retail food safety proprietary standards, for example - Freshcare (Freshcare Ltd, 2009), the WQA Quality Assurance Standard (Woolworths Ltd, 2013) and SQF (Safe Quality Food Institute, 2014) and internationally through food safety schemes such as GLOBALG.A.P. (GLOBALG.A.P. 2014).

There is no established standard for implementing a quality managements system directed specifically towards biosecurity, however the international standard ISO 9001 Quality Management Systems - Requirements, provides a 'default' approach to quality management which is directed at any businesses regardless of the type of product produced and its intended purpose.

Some insight into quality management system application for on-farm biosecurity for assurance purposes might be gathered through examination of the rules for operation of the Interstate Certification Assurance (ICA) Scheme. The ICA Scheme is a biosecurity focussed national certification assurance scheme which allows primary producers and associated industries to become accredited to certify that specific commodities and items have been produced, treated and/or inspected in a manner that satisfies the quarantine and movement requirements for entry into another state or territory. The ICA Scheme is governed by nationally agreed rules documented as the Rules for the Operation of the ICA Scheme (Subcommittee on Domestic Quarantine and Market Access, 2016). These rules are aligned generally to ISO 9001 and were first modelled on AS/NZS ISO 9002:1994. They include operating requirements for the Scheme including rules for the development and documentation of market access Operational Procedures.

Despite which standard is the desirable standard on which to structure an on-farm biosecurity quality management system the high level structure of ISO 9001 and ISO 22000 and other comparable standards including the ISO 14001 environmental management standard (Standards Australia, 2004) is the same. A comparison of high level quality management application across biosecurity and food safety systems is included as Appendix 4.

High level quality management elements include documentation to support and implement quality policy and quality objectives, control of documents and control of records, internal audit/ review, corrective action and control of nonconforming product (and preventative action by default) and training.

Typically, procedures to document how a business applies these high level elements would be captured within an on-farm Quality Manual. Equally, the same quality management elements would also be applied to governance and administration of any on-farm biosecurity system or scheme.

5.2.2 Risk identification, assessment and control

There are a number of methods used to identify, control and manage risk. Within Australia, risk management principles and guidance is provided through AS/NZS ISO 31000:2009 Risk Management Principles and Guidelines (Standards Australia, 2009). This standard is identical to the international standard ISO 31000:2009. However, Codex HACCP (Codex Committee on Food Hygiene, 1997) forms the basis for risk control within most food safety programs applied on-farm in Australia. Codex HACCP is also specifically directed towards good agricultural practice. Guidelines for its use are included as an Annex to the Codex.

There are 7 defining principles of HACCP, those being:

- Conduct a hazard analysis;
- Determine the Critical Control Points (CCPs);
- Establish critical limit(s);
- Establish a system to monitor control of the CCP;
- Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control;
- Establish procedures for verification to confirm that the HACCP system is working effectively; and
- Establish documentation concerning all procedures and records appropriate to these principles and their application.

The 12 principles for application are also well established.

There appears to be a number of reasons to support a HACCP based approach for on-farm biosecurity risk identification and control, particularly in regard to market assurance. This is the risk based approach taken nationally to develop interstate market access operational procedures for approval as part of the ICA scheme, and the approach taken for the industry based BioSecure HACCP (Nursery & Garden Industry Australia, 2008) market access assurance scheme.

Further, Codex HACCP is used within food safety assurance systems domestically and internationally. It is also of note that the international standard, ISPM 14 (International Plant Protection Convention, 2016) for the use of integrated measures in a systems approach for pest risk management also supports this approach as a risk management procedure whose contribution to the efficacy of the system can be measured and controlled.

To identify general areas where risk control steps are currently established through biosecurity best practice advice, three documents were examined. These were the Farm Biosecurity Manual template used by Plant Health Australia (PHA) for individual industry groups and available through Farm Biosecurity, the Farm Biosecurity Action Planner produced by PHA in association with Animal Health Australia, and the BioSecure HACCP Guidelines for Managing Biosecurity in Nursery Production produced by the Nursery & Garden Industry Australia (NGIA).

We identified and grouped recommended control activities into six identifiable areas, those being process management, identification of pest threats, inspection and monitoring, supply of low risk source materials and services, decontamination and hygiene, access and movement control, and pest control. We also included a number of possible control activities that were not specifically mentioned for biosecurity but are acknowledged as control activities across other areas. A fully HACCP analysis would no doubt identify more critical control points for consideration.

We specified whether a control activity was mentioned in a document, and if so, whether the document provided prescriptive advice, or general non-prescriptive advice in relation to that control activity. The findings are presented as Table 1 below. Opinion was sought from the project reference group on general areas of control on which procedures could be based and it was agreed that these areas could be considered as a basis for further analysis and application of control measures for development of an on-farm biosecurity system for the vegetable industry.

Table 1 – Presentation of findings on application of biosecurity control measures

Area / activity	Farm Biosecurity Manuals	Farm biosecurity Action Planner	BioSecure HACCP procedure
Control Area - Process management			
Quality Manual	x	x	x
Quality policy	x	x	x
Document control	x	x	x
Record control	x	x	✓ Prescriptive
Corrective action/Preventative action	x	x	✓ Prescriptive
Internal audit and review	x	x	x
External audit	x	x	✓ Prescriptive
Control of non-conforming product	x	x	✓ Prescriptive
Training	x	✓ Non-Prescriptive	✓ Prescriptive
Control Area - Identification of pest threats			
Identification of key pests	✓ Prescriptive	x	✓ Prescriptive
Pest Fact sheets	✓ Prescriptive	x	x
Control Area - Inspection and monitoring			
Pest Surveillance	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
Pest Reporting	✓ Prescriptive	x	✓ Prescriptive

Area / activity	Farm Biosecurity Manuals	Farm biosecurity Action Planner	BioSecure HACCP procedure
Control Area - Low risk source materials and services			
Planting materials and farm inputs	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
Services	x	x	x
Control Area - Decontamination and hygiene			
Waste products	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
General sanitation	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
General hygiene	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
Wash down facilities	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
Control Area - Access and movement control			
Biosecurity signs	✓ Prescriptive	✓ Prescriptive	✓ Prescriptive
Managing people movement	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
Visitors	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
Movement of vehicles and machinery	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
Parking areas	✓ Non-Prescriptive	✓ Non-Prescriptive	✓ Prescriptive
Greenhouse facilities	✓ Non-Prescriptive	x	✓ Prescriptive
Control Area - Pest control			
Pest control	x	x	✓ Prescriptive

5.2.3 Government process and legislation

5.2.3.1 Generally

Traditionally, biosecurity related legislation has focussed on making prescriptive requirements on persons that are directed at controlling specific pests in specific circumstances however modern legislation is now also focussing on any action or inaction by a person that could create or exacerbate a biosecurity risk.

The Queensland *Biosecurity Act 2014* (Queensland Parliamentary Counsel, 2017) makes this quite clear through its 'general biosecurity obligation' provisions. The general biosecurity obligation, in essence, requires an informed person to take all practical and reasonable steps to not exacerbate and to minimise biosecurity risk that is under their control. The Act allow for a person to demonstrate they have met this obligation by a number of means, including through demonstration of due diligence.

Similarly, the New South Wales *Biosecurity Act 2015* (New South Wales Parliamentary Counsel, 2017) also imposes a 'general biosecurity duty' that requires that an informed person to take reasonable and practical steps to prevent, eliminate or minimise biosecurity risk under their control.

What the approach will be on enforcement of general biosecurity obligations, or duties, is unclear as these provisions are yet to be tested. What is clear is that taking steps to minimise and not exacerbate biosecurity risk extends further than the producer, possibly extending to suppliers of producers and to marketers of at risk items.

It could be argued that taking steps to address biosecurity risk through implementation of on-farm biosecurity practices could be seen as exercising due diligence.

5.2.3.2 Intra and interstate market access movement regulations

Each State and Territory government establishes and enforces its own biosecurity legislation. Biosecurity legislative requirements can be established within an Act, a regulation, and by other means including by orders, directions or notices. Biosecurity requirements, or ways to demonstrate compliance to biosecurity requirements, can also be included within subordinate or other authorised documents such as a plant quarantine / biosecurity manual.

Movement regulations can be applied to a place, an area or an entire jurisdiction. To comply with movement regulations, a person must comply with the stated movement requirements.

5.2.3.3 Authorisation for market access assurance schemes

5.2.3.3.1 Mechanism

Authorisation for the use of market access assurance systems for interstate trade is provided for through jurisdictional legislation. An overview that specifies the state or territory, its authorising legislation and the mechanism employed is provided as Table 2 .

Table 2 - Authorising legislation

State / Territory	Authorising legislation	Mechanism
Queensland	<i>Biosecurity Act 2014</i>	Approved biosecurity accreditation scheme
New South Wales	<i>Biosecurity Act 2015</i>	Accreditation authority.
Australian Capital Territory	<i>Plant Diseases Act 2002</i>	N/A
Victoria	<i>Plant Biosecurity Act 2010</i>	Accreditation of biosecurity certifier by government through application.
Tasmania	<i>Plant Quarantine Act 1997</i>	Amendment of Plant Biosecurity Manual, that being a public notice to prescribe conditions for entry.
South Australia	<i>Plant Health Act 2009</i>	Accreditation of biosecurity certifier by government through application.
Western Australia	<i>Biosecurity and Agriculture Management Act</i>	Provision for quality assurance arrangements to satisfy import requirements.
Northern Territory	<i>Plant Health Act 2008</i>	By Gazette notice, establishment of a plant health assurance scheme.

5.2.3.3.2 Consultation on acceptance of assurance schemes

In Australia, development of domestic market access conditions for plants and plant products is oversighted by the Subcommittee on Domestic Quarantine and Market Access (SDQMA). It is comprised of the senior plant health regulators from the state and territory governments, representatives from the Australian Government, and also includes an observer representative from Plant Health Australia.

Its role includes to ensure that market access requirements are technically justified to minimise regulatory burdens on industry; and coordinated and harmonised (aligned and compatible), where possible, across the country and regions, and consistent with Australia's international import and export market access conditions and policies (Subcommittee on Domestic Quarantine and Market Access, 2017).

Importantly, SDQMA also provides a forum for non-government market access schemes to be considered by members as ‘plant quarantine arrangements that facilitate interstate movement of plants and plant products’. SDQMA also has two sub-committees to support its role, those being the Domestic Certification Systems Working Group whose role includes developing protocols and procedures for Interstate Certification Assurance and other market access certification systems, and the Quarantine Domestic Working Group whose role is to coordinate public awareness material relating to the interstate movement of plants and plant products.

SDQMA works under the direction of the national Plant Health Committee (PHC) and SDQMA members report back to responsible persons in relevant biosecurity authorities within their own jurisdictions.

5.2.3.4 *Market access procedures and assurance certificates*

5.2.3.4.1 **Market access procedures**

Market access assurance schemes rely on compliance to market access compliance procedures as the basis on which assurance of pest risk mitigation may be provided. These procedures are not intended to assist in pest prevention or management. There are two types of biosecurity self-certification assurance based market access compliance procedures authorised for use for interstate market access for biosecurity purposes in Australia. The first type, an ICA operational procedure, is used by government for its Interstate Certification Assurance (ICA) scheme. The second type is an Entry Conditions Compliance Procedure (ECCP) used by the NGIA as part of the BioSecure HACCP market access assurance scheme for nursery production. Both ‘compliance procedures’ employ similar themes in their structure. A comparison of document structure is included below in Table 3.

Table 3 - Comparison of market access compliance procedure structure

Criteria	ICA operational procedure heading	BioSecure HACCP ECCP heading
Document revision details	Revision table / register	DOCUMENT MANAGEMENT AUTHORISED REVIEWERS
Purpose and application	REQUIREMENTS	SCOPE
Pest, produce, location etc.	SCOPE	SCOPE PEST INFORMATION
Definitions	DEFINITIONS	DEFINITIONS AND ACRONYMS
The procedure, process and process controls	ICA SYSTEM	BIOSECURE HACCP ENTRY CONDITIONS COMPLIANCE PROCEDURE (ECCP) INSTRUCTION FOR DETECTION OF PESTS AND NON-CONFORMING REQUIREMENTS
Details on completion and issue of certificates	CERTIFICATION	COMPLETING A BIOSECURE HACCP COMPLIANCE CERTIFICATE (BHBC) AND MARKING A CONSIGNMENT
Requirements for identification and traceability	IDENTIFICATION AND TRACEABILITY	COMPLETING A BIOSECURE HACCP COMPLIANCE CERTIFICATE (BHBC) AND MARKING A CONSIGNMENT
Records and documents that must be maintained.	ICA RECORDS AND DOCUMENTATION	This is included in the BioSecure HACCP guidelines.
Details of audits and auditor requirements	AUDITING	This is included in scheme Terms and Conditions documents.
Training	Not included	TRAINING REQUIREMENTS
Attachments supporting the procedure	ATTACHMENTS	These are included in the BioSecure HACCP guidelines.
Additional resources for users	Not included	AUDIT CHECKLIST

One significant difference in compliance procedure content and structure between ICA and BioSecure HACCP market access procedures is that with the ICA operational procedure, the procedure in itself specifies all compliance and scheme requirements. The BioSecure HACCP procedure is supported by implementation of specified procedures contained within the BioSecure HACCP best practice guidelines – which are also subject to audit. Further, the BioSecure HACCP procedure is also supported by program Terms and Conditions and their own related requirements. The said, the who, what, when, where and how component of both procedures is specified within the 'ICA SYSTEM' component of the ICA procedure, and in the 'BIOSECURE HACCP ENTRY CONDITIONS COMPLIANCE PROCEDURE (ECCP)' section of the BioSecure HACCP procedure.

This is important when considering how a procedural framework for a market access compliance procedure might work for market access assurance for the vegetable industry. There is no right or wrong way to specify requirements within the working part of the procedure – as long as what is provided satisfies the jurisdictional entry condition requirements.

Typically government based compliance procedures focus only on prescriptive treatment and/or inspection measures to deal with a specific pest in a specific circumstance. The BioSecure HACCP scheme has provided further avenues for dealing with more complicated requirements by establishing BioSecure HACCP best practice guidelines and related procedures as an underlying assurance based biosecurity risk mitigation framework. BioSecure HACCP allows for a system approach to dealing with specific biosecurity risk and biosecurity risk generally. For example, nursery stock produced in potato cyst nematode infested and linked areas benefit from preventative risk control procedures specified as best practice measures in the BioSecure HACCP guidelines. These can and do translate directly into evidence of compliance to jurisdictional movement restrictions criteria, those being requirements for nursery stock to be grown in media that is free of soil, and production of plants not directly in contact with soil surfaces.

5.2.3.4.2 Assurance certificates

Assurance certificates, generally referred to as Plant Health Assurance Certificates (PHACs) for interstate market access self-certification, are the mechanism through which a business confirms that a product has been dealt with in accordance with the requirements of an operational compliance procedure. The PHAC is also used as a mechanism to trace and track consignments, and provide assurance to a customer that a biosecurity risk has been dealt with in an approved way.

The format of approved PHACs is essentially the same. The PHACs provides details of the consignor, the consignee, details of the consignment and the compliance procedure which has been applied. The PHAC also provides for any relevant additional certification and a declaration by an authorised person from the business that the information contained within the PHAC is true and correct in every particular.

The ICA PHAC is completed in writing, however there are some applications that now allow its completion electronically. The BioSecure HACCP PHAC, a Biosecure HACCP Biosecurity Certificate (BHBC), may only be produced electronically by a certified business through its profile on the BioSecure HACCP market access certification application - the Audit Management System. Electronic completion of PHACs in this way provides a number of advantages, the BHBC is stored on the AMS as an electronic record for the business, and the BHBC is also available to the scheme administrator for desktop auditing and review. Where a business has had certification suspended or cancelled, the AMS prevents BHBCs from being completed. For PHACs completed in writing, access is only available through an on-farm auditing.

Feedback from one member of the project reference group has confirmed that electronic certificates may be a preferred method of certification for growers.

5.2.4 Governance and delivery

It is not possible within the scope of this project to make recommendations on specifically who should provide governance over an on-farm biosecurity system and who should not. The following sections provide considerations on minimum requirements that should be considered in regard to establishing governance arrangements for an on-farm biosecurity system.

5.2.4.1 *Governance bodies*

Governance bodies should be considered based on demonstrated competence, including but not limited to the following:

- experience in the delivery of quality assurance services;
- technical expertise in biosecurity considerations;
- experience in the application of market access systems;
- economy and efficiency in delivery of services;
- experience in consultation and negotiation, including with government agencies;
- experience in consultation with industry groups both state and national; and
- financial accountability.

Although not essential in an on-farm biosecurity system development phase, there could be advantages in the funding provider seeking proposals for the development and governance of the system as part of one proposal.

5.2.4.2 *Quality framework and scheme administration*

A governance body must adopt a quality management approach to provision of services, preferably consistent with the approach provided for in ISO 9001. Similar to that required of users, the approach should be documented within an administrative quality manual that includes a quality policy and quality objectives, and procedures for control of documents and records, internal audit and review, corrective and preventative action and training.

A governance body must also provide policy and procedures that demonstrate control over both governance and delivery of services. Documentation required would include, but not be limited to:

- governance and administration arrangements and supporting governance delivery documents; and
- scheme terms and conditions documents and supporting delivery documents.

Governance documents might include provision for:

- Roles and responsibilities of all parties and responsible persons involved in governing the system including their functions and reporting obligations.
- Policy for decision making incorporating natural justice, procedural fairness provisions and appeal rights.
- Policy on establishment and publishing of system fees and charges.
- Rules for application for accreditation and assessment of applications.
- Rules for granting, maintaining and renewing accreditation.
- Rules for suspension or cancellation of accreditation.
- Policy for verification and auditing of compliance to system requirements.
- Rules for the engagement and monitoring of system support providers.
- Matters of confidentiality and indemnity.

Administrative system support policies and procedures must also be developed. Some examples would include procedures for drafting and approval of documents, use of data systems, auditing and training.

For market access purposes, governance documents must also address requirements specified within legislation, including those required for the establishment of accreditation bodies, for example, requirements made within the Queensland *Biosecurity Act 2014* and the New South Wales *Biosecurity Act 2015*.

Scheme delivery documents will include:

- System documents including procedures and forms.
- Supporting documents on guidelines for use of the system and any supporting applications.
- Education and training materials.
- User Terms and Conditions.
- Applications forms.

The minimum requirements for documentation could be established in consideration of existing self-certification systems, those being the ICA scheme and the BioSecure HACCP scheme as it pertains to market access.

5.2.4.3 Technical and administrative input and oversight into a system

5.2.4.3.1 Best practice system considerations

Within the vegetable industry, and across the horticultural industry, there are a number of organisations who represent and support growers at either a local, state or national level. Each organisation plays a part in recommending biosecurity risk mitigation steps within their own jurisdiction that are specifically targeted at the specific needs of their members. What could be considered as best biosecurity practice for one crop in one area may not be best biosecurity practice for another crop in another area. This is because biosecurity risk assessment and control is based on biosecurity risk exposure and consequence. This is confirmed in jurisdictional market access requirements with controls directed at a specific crop within a specific area for a specific pest. Further, when a new pest is detected in an area the imperative is to assess existing best practice biosecurity advice and modify or add to what has been proposed previously to appropriately address the new risk.

Biosecurity best practice needs to account for varied and changing risk exposure and consequence. Most elements of biosecurity best practice and control requirements can be specified in a generic system for horticultural users, however some cannot. For example, in one area there may be a high risk of exposure from a pest that is known to produce catastrophic consequence if introduced onto a property. The pest may only be introduced through infested plant material or infested soil. To mitigate that specific risk a property owner may require additional assurance from a supplier that the pest is not present on or in source plant material, and may require decontamination of footwear with a specific chemical at an increased frequency or duration. This scenario is evidenced with Tropical race 4 panama disease in bananas in Queensland as an example. What a biosecurity best practice system can do is to provide flexibility for a user to control risk in those areas in a way that is most appropriate to their situation.

One way this could be achieved is by allowing procedures to authorise the use of risk specific 'methods' to appropriately address user specific risk at a critical risk control point. The methods would specify the why, what, where, when and how of the control step, similar to a simple work instruction. An industry body could propose a 'method' for a control step to address a specific risk which a user could choose to adopt as the best way to control a risk specific to their crop and/or their area. A system could also consider the issue of 'approved methods' that the administering body could authorise and provide to meet a market access requirement. For example, an approved method for pre-harvest treatment for fruit fly, which would mirror requirements specified within the legislation of an importing jurisdiction. This could also be supported by an approved method for post-harvest inspection.

To demonstrate how an approved or proposed method could be incorporated into a best practice procedure for decontamination and hygiene on a farm the following example is provided below. The example provides for the type of requirements that would typically be documented in a decontamination and hygiene procedure, and how a method to achieve best biosecurity practice based on pest risk and exposure could be authorised within that procedure.

'DECONTAMINATION OF EQUIPMENT

Decontamination site

Decontamination of equipment must occur at a site within the low-risk area of the property.

The decontamination site shall not be positioned on, or within the immediate vicinity of, an access route.

The decontamination site may be covered by a concrete pad, bitumen, or compacted gravel.

Waste, including run-off, from the site must not be allowed to enter the production area and shall be contained in a manner that allows periodic cleaning and sanitation of the site – for example into a collection sump.

A site positioned in full sun shall be preferred to aid in drying of the site and promote exposure of contaminants to heat and light.

Decontamination method

*Our decontamination **method** for equipment specifies our requirements on:*

- *when to decontaminate, including the decontamination frequency for equipment that stays on farm.*
- *decontamination products.*
- *decontamination equipment.*
- *decontamination resources.*

The decontamination frequency is determined based on a range of risk factors including the following:

- *the level of exposure of the equipment to host materials and/or pests.*
- *whether the equipment is used solely on farm or between farms.*
- *the scope of movement of the equipment within the farm.*
- *the potential of the equipment to hold contamination.*

*The decontamination **method** must include an:*

- *inspection of the equipment for contamination; and*
- *a process that involves the physical removal of obvious contamination this is present; and*
- *a treatment using a sanitiser; and*
- *a final inspection for contaminants and to determine requirements for lubrication, rust prevention or other maintenance as required prior to use.*

The method is informed by our procedure ID-P-001 (Identification of pest threats) which identifies:

- *pest threats associated with our industry and the products we produce; and*
- *the sources of information that provide the most up to date methods of decontamination associated with those pest threats.*

The Biosecurity Manager shall document the method for decontamination of equipment (using form DH-F-003).

The Training Manager must ensure that training in decontamination is provided to all staff responsible for the receipt and use of equipment in accordance with the requirements specified in our System Manual.'

Approved methods or methods proposed for adoption need not be overly complicated, and could be as simple as a one page document. The administering authority would need to provide a template for approved or adopted methods.

5.2.4.3.2 Market access considerations

It is common practice for accreditation bodies to establish an administrative and technical oversight committee to provide general oversight and technical input into the accreditation process. The role of an administrative and technical review board is to ensure that decisions made are in the best interest of all participating stakeholders.

Ideally the committee would be made up of representatives of the governing body and representatives of industry groups participating in the accreditation process.

5.2.5 Supporting tools

Supporting tools include tools to assist in system management and control across a number of areas including:

- data management;
- document management;
- record management;
- auditing;
- reporting;
- information distribution; and
- provision of education and training services.

For the national ICA scheme, database systems generally focus on the capture of information related to an accredited business. Implementation of the scheme is generally paper based.

Significant advances in the use of system supporting tools have been made through development of the BioSecure HACCP system and other NGIA farm management systems. These include the development and implementation of a National Audit Portal (NAP) for the delivery of its best practice systems, the Audit Management System for delivery of the BioSecure HACCP scheme for market access purposes, and provision of competency based training and assessment through an online eLearning portal. . Either system would lend itself for similar use for an on-farm biosecurity system for the vegetable industry.

In short, the NAP provides for a number of functions including:

- a business interface which provides a user secure access to all audits undertaken on their property including a recommended action plan to correct any deficiencies identified at the conclusion of each audit;
- an interface that allows system managers to develop and update audit templates for an arrangement and verify audit outcomes;
- an interface that allows auditors to check business records and previous audit results, and capture and download new audit records through the use of a tablet; and
- a system that generates an audit report (action plan) based on audit results.

The AMS used for BioSecure HACCP market access certification performs similar functions, but it also includes, but is not limited to:

- functions for scheme administrators that provide access and control of system documents, business and certification records, audit scheduling, messaging of businesses individually or in relevant groups, downloading and control of compliance procedures, review of non-conformances and generation of a number of reports that are important to verify the system is operating efficiently.
- functions for users that include the capture of business details, approved supplier lists, system records, creation of assurance certificates, non-conformance details and access to relevant system documents.
- functions for government including access to relevant business certification records.

- functions for auditors to confirm and schedule audit jobs, access relevant business details and history and capture audit results.

Another supporting tool, the NGIA eLearning training portal has been developed to provide on-line training and assessment of competency in the application of ECCPs. Results feed into the BioSecure HACCP system to provide evidence of competency in performing relevant tasks.

Another useful supporting tool is the Hort360 program's online best practice system application. Hort360 is an application that is developed and implemented through Growcom. The Hort360 application is considered in further detail in subsequent sections of this report.

5.2.6 Supporting services

5.2.6.1 Audits and auditing

Currently, there is no significant driver for a producer to seek accreditation for biosecurity best practice alone. This does not mean that drivers will not exist in the future. It is likely and logical that with the advent of legislative requirements for any person to mitigate biosecurity risks that are under their control that purchasers of risk products will seek to reduce their biosecurity liability.

For the meantime, auditing services clearly would be required for accreditation for market access purposes. Auditing service providers would have to demonstrate an ability to meet demand for auditing services, demonstrate competency in fulfilling their allocated task, as well as provide economy and efficiency in delivery of services.

Further requirements for consideration are included within the Australian Standard AS/NZS ISO/IEC 17021:2011 - Conformity assessment—Requirements for bodies providing audit and certification of management systems (Standards Australia, 2011).

5.2.6.2 Education and training

On-going education and training plays an important role in supporting a continual improvement process.

It is of particular importance to engage with industry groups in the provision of education and training in the implementation of best biosecurity practice. However, to control the delivery of education and training services education and training material to be provided should be subject to an approval process to ensure an accurate and consistent message.

Education and training could occur on a local, state or national level. Education and training could also be provided based on commodity produced.

Provision of education and training support services should be documented within an agreed system education and training plan. Training should also be regularly reviewed to ensure the currency of information provided.

5.3 Evaluation of existing on-farm risk mitigation and assurance systems

Existing on-farm risk mitigation and assurance systems that could be used to support development of an on-farm biosecurity system for the Australian vegetable growers were identified and reviewed.

The systems selected were systems currently applied on-farm either for best practice or market assurance purposes. For this reason we chosen to include the ICA scheme, BioSecure HACCP, Hort360 and food safety systems generally. For food safety we chose to assess only Australian systems currently applied on farm in a general way. We chose not to include internationally schemes such as GLOBALG.A.P. as essentially those systems mirror that of domestic customer focussed assurance systems.

Review was based on the requirements identified to achieve the project objective. Whether a system had met the specified requirements was not always absolute, so an assessment was made on whether the system clearly or generally did achieve the requirement, or whether the system generally did not meet the specified requirements or was not applicable. It should be noted that a requirement not being met does not suggest that the system is not fit for purpose in its own unique circumstances or could not be adapted to satisfy that requirement.

Where possible, costs of development, use and maintenance were identified.

For on-farm quality management requirements, system source documents or applications were assessed to identify whether high-level quality management requirements were present in the system - those being the implementation of quality policy and quality objectives, control of documents and control of records, internal audit/ review, corrective action and control of nonconforming product (and preventative action by default); and training. For risk associated with processes, assessment of the system was made against the requirement to identify and control risk based on a HACCP type process.

To provide clarity we confirmed whether a system was currently biosecurity focussed. It should be noted that because a system is not currently biosecurity focussed, a system or elements of a system should not be excluded as an option for consideration for future biosecurity application. It is more relevant to identify if a system is customer focussed which is an important consideration for future application.

To confirm application for project purposes we identified the intent of the system, that being whether the system was directed at best practice, market access or both, and the scope of the system for general biosecurity risk control purposes. Evidence of an accepted approach for market access assurance purposes was explored including whether the system was accepted as meeting biosecurity legislative requirements for related market access purposes.

Importantly, and where possible, we investigated anecdotal or demonstrated analysis of cost benefit to a user in applying the system and whether the system had been provided with an opportunity to demonstrate stability as a product over time.

We considered the format of the product delivered to users including whether the product was delivered as a complete product ready for use or whether additional efforts were required to translate the product into a workable system for its users in their own circumstances. We also considered whether the product was presented in a way that provided requirements in a manner that allowed for clear evidence based auditing for assurance purposes.

Strengths, weaknesses, opportunities and threats of each initiative were identified as they may relate to an on-farm system for the vegetable industry to support later options analysis.

5.3.1 Interstate Certification Assurance (ICA) Scheme

The ICA scheme is a national system that is accepted and administered by State and Territory governments in Australia. It allows accredited businesses to certify plants and plant products as meeting specific interstate biosecurity market access quarantine restrictions.

There are estimated to be between 1000 and 2000 users of the system. Fees vary between jurisdictions. Using Queensland as an example, audit fees including travel are approximately \$280 per hour with up to two audits required per annum. Application and annual renewal fees are approximately \$300. Findings of an analysis of ICA for assurance purposes against our identified requirements are included as Table 4.

Table 4 - ICA scheme analysis findings

System/scheme – Interstate Certification Assurance (ICA)			
Source documents include: Rules for the Operation of the Interstate Certification Assurance Scheme Version 4.3. ICA operation procedures.			
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <input checked="" type="checkbox"/> Requires on-farm Quality management framework <input checked="" type="checkbox"/> HACCP based approach <input checked="" type="checkbox"/> Biosecurity focused <input checked="" type="checkbox"/> Supports prevention, control, management and recovery <input checked="" type="checkbox"/> Authorised by legislation <input checked="" type="checkbox"/> Recognised for international export <input checked="" type="checkbox"/> Mature system <input checked="" type="checkbox"/> Prescriptive </td> <td style="width: 50%; border: none; vertical-align: top;"> <input checked="" type="checkbox"/> Administrative Quality management framework <input checked="" type="checkbox"/> Customer focused <input checked="" type="checkbox"/> Supports best practice <input checked="" type="checkbox"/> Provides evidence of due diligence for biosecurity <input checked="" type="checkbox"/> Provides domestic market access <input checked="" type="checkbox"/> Evidence of cost benefit <input checked="" type="checkbox"/> Product rather than standard <input checked="" type="checkbox"/> Auditable </td> </tr> </table>		<input checked="" type="checkbox"/> Requires on-farm Quality management framework <input checked="" type="checkbox"/> HACCP based approach <input checked="" type="checkbox"/> Biosecurity focused <input checked="" type="checkbox"/> Supports prevention, control, management and recovery <input checked="" type="checkbox"/> Authorised by legislation <input checked="" type="checkbox"/> Recognised for international export <input checked="" type="checkbox"/> Mature system <input checked="" type="checkbox"/> Prescriptive	<input checked="" type="checkbox"/> Administrative Quality management framework <input checked="" type="checkbox"/> Customer focused <input checked="" type="checkbox"/> Supports best practice <input checked="" type="checkbox"/> Provides evidence of due diligence for biosecurity <input checked="" type="checkbox"/> Provides domestic market access <input checked="" type="checkbox"/> Evidence of cost benefit <input checked="" type="checkbox"/> Product rather than standard <input checked="" type="checkbox"/> Auditable
<input checked="" type="checkbox"/> Requires on-farm Quality management framework <input checked="" type="checkbox"/> HACCP based approach <input checked="" type="checkbox"/> Biosecurity focused <input checked="" type="checkbox"/> Supports prevention, control, management and recovery <input checked="" type="checkbox"/> Authorised by legislation <input checked="" type="checkbox"/> Recognised for international export <input checked="" type="checkbox"/> Mature system <input checked="" type="checkbox"/> Prescriptive	<input checked="" type="checkbox"/> Administrative Quality management framework <input checked="" type="checkbox"/> Customer focused <input checked="" type="checkbox"/> Supports best practice <input checked="" type="checkbox"/> Provides evidence of due diligence for biosecurity <input checked="" type="checkbox"/> Provides domestic market access <input checked="" type="checkbox"/> Evidence of cost benefit <input checked="" type="checkbox"/> Product rather than standard <input checked="" type="checkbox"/> Auditable		
Strengths and Weaknesses	<p>S. ICA is an established and nationally recognised self-certification market access assurance scheme administered and accepted by State and Territory governments. ICA has been operating for over a decade and is well tested.</p> <p>S. As operational procedures are used to inform a user of the requirements of each arrangement the user is only required to demonstrate compliance to the procedure. Procedures are developed, approved and maintained by the scheme administrator.</p> <p>S. For auditing, an auditor is auditing against a prescriptive requirement so interpretation as to whether a business has complied with a requirement is a simple process and requires less technical knowledge. A generic checklist for each operational procedure for each arrangement can be used.</p> <p>W. ICA is not an on-farm biosecurity system to control biosecurity risk. It is a scheme which provides assurance that the risk posed by a specific pest in a specific circumstance has been controlled in accordance with an operational procedure drafted to demonstrate compliance to jurisdictional market access requirements.</p> <p>W. In the event of a pest outbreak it can take some time to develop and implement a new ICA operational procedure to facilitate market access for affected commodities.</p> <p>W. Audits can only be performed by government auditors.</p>		
Opportunities and Threats	<p>O. ICA provides a framework in its Rules for Operation document that identify scheme requirements that satisfy jurisdictional quality management and HACCP requirements for administration and delivery of the scheme. This could be relied upon as establishing a minimum standard for a non-government schemes for inter-state trade.</p> <p>T. ICA is not an internationally recognised scheme for overseas export of commodities. It should not be assumed that ICA quality management and HACCP requirements for administration and delivery will satisfy requirements for international trade.</p>		

5.3.2 BioSecure HACCP

BioSecure HACCP is the first industry developed best practice on-farm biosecurity program in Australia to also be used as a market access instrument to provide assurance that a nursery production business has addressed relevant biosecurity risk.

BioSecure HACCP was developed by the NGIA in two stages. The first stage of BioSecure HACCP development commenced in 2005 and produced a 'best biosecurity practice' certification system for growers, building on the nursery industry's best management practice Nursery Industry Accreditation Scheme Australia (Nursery & Garden Industry Australia, 2013). The second stage of BioSecure HACCP was the development of the best practice system into a market access assurance scheme requiring adherence to specific Entry Condition Compliance Procedure(s) meeting jurisdictional quarantine requirements.

In principal support was given by SDQMA working group in 2008 to pursue this objective. There is now national acceptance by all States and Territories of the scheme to be used as a domestic market access assurance scheme providing growers with a system that supports self-certification for interstate plant movement.

The NGIA reports that almost 100 producers have now expressed interest in using the BioSecure HACCP certification scheme for market access purposes. NGIA reports investment in the scheme is in the order of \$0.8 million, with approximately \$0.2 million of that used to develop online audit and scheme management systems. Funding has been confirmed for further development of the scheme until 2020.

As a resource for growers, cost of purchase of the BioSecure HACCP Guidelines is \$150. Application for certification and annual renewal fees is \$1000 for members and \$2000 for non-members. Audit fees are \$150 per hour with one audit required per annum for best practice certification and two audits required per annum for market access certification purposes. An audit is also required to authorise and verify competency and compliance for each Entry Conditions Compliance Procedure a user might decide to use for market access purposes.

For best practice use only, an analysis of implementation of the scheme at two businesses identified a 3% productivity gain through a reduction in stock loss due to earlier pest management decision making and reduced pesticide use for one user, and a cost saving of \$450,000 for the other user based on similar outcomes. Findings of an analysis of BioSecure HACCP for assurance purposes against our identified requirements are included as Table 5.

Table 5 – BioSecure HACCP scheme analysis findings

System/scheme – BioSecure HACCP (Nursery & Garden Industry Australia)	
Source documents include: BioSecure HACCP Guidelines for Managing Biosecurity in Nursery Production, Terms and conditions, Governance and administration documents.	
<input checked="" type="checkbox"/> Requires on-farm Quality management framework	<input checked="" type="checkbox"/> Administrative Quality management framework
<input checked="" type="checkbox"/> HACCP based approach	<input checked="" type="checkbox"/> Customer focused
<input checked="" type="checkbox"/> Biosecurity focused	<input checked="" type="checkbox"/> Supports best practice
<input checked="" type="checkbox"/> Supports biosecurity prevention, control, management and recovery	<input checked="" type="checkbox"/> Provides evidence of due diligence in controlling biosecurity risks
<input checked="" type="checkbox"/> Authorised by legislation	<input checked="" type="checkbox"/> Provides domestic market access
<input checked="" type="checkbox"/> Recognised for international export	<input checked="" type="checkbox"/> Evidence of cost benefit
<input checked="" type="checkbox"/> Mature system	<input checked="" type="checkbox"/> Product rather than standard
<input checked="" type="checkbox"/> Prescriptive	<input checked="" type="checkbox"/> Auditable

System/scheme – BioSecure HACCP (Nursery & Garden Industry Australia)	
Strengths and Weaknesses	<p>S. BioSecure HACCP is an established and nationally recognised non-government on-farm biosecurity focussed market access assurance scheme administered by the NGIA.</p> <p>S. It is a best biosecurity management system that is designed to control biosecurity risk in general across a number of key areas.</p> <p>S. For auditing, an auditor is auditing against a prescriptive requirement so interpretation as to whether a business has complied with a requirement is a simple process and requires less technical knowledge. A generic checklist for each operational procedure for each arrangement can be used.</p> <p>S. As system documents are generic they are easier for an administrator to maintain and support.</p> <hr/> <p>W. BioSecure HACCP is not yet a fully commercialised product.</p>
Opportunities and Threats	<p>O. Market access requirements for nursery stock and associated items are subject to the same jurisdictional based legislation and sub-ordinate documents including biosecurity/quarantine manuals as for horticultural field produced crops.</p> <p>O. BioSecure HACCP provides a framework in its governance documents and terms and conditions that could be considered that identify requirements that satisfy jurisdictional quality management and HACCP requirements for administration and delivery of the scheme for interstate market access purposes.</p> <p>O. BioSecure HACCP has an approved market access document, an Entry Conditions Compliance Procedure template, which would also cater to specification of requirements for movement of vegetable produce.</p> <p>O. BioSecure HACCP is supported by web based audit capture and reporting applications, desktop system management applications and web based compliance procedure training applications that could apply as a model for on-farm horticultural market assurance systems.</p> <hr/> <p>T. BioSecure HACCP as a scheme for best practice market access assurance purposes is still in its infancy.</p>

5.3.3 Hort360

Hort360 is a best practice initiative provided by Growcom that is designed to identify best practice requirements across a number of areas that apply to horticultural producers that could impact on business operation. The initiative promotes opportunities for improvement in these areas. Key areas, represented as modules, include Air & Noise, Biodiversity, Energy, Industrial Relations, Irrigation, Nutrient, Run-off, Soil, Pesticide, Waste, Workplace Health & Safety and Better Business. Biosecurity is not currently included as a grower module.

The product is delivered on-line (facilitated and soon to be self-assessable). A user selects a relevant module to complete, provides management practice response in regard to a specific requirement and the user is advised, where relevant, on risks / opportunities to their business and actions that can be taken to improve performance in that area. Advice also includes whether the practices reported are below, at, or above industry standard.

The first module, Irrigation, was developed in 2006 under the Growcom Farm Management System and was delivered as part of the Rural Water Use Efficiency program across Queensland. Other modules have been developed over time. Hort360 as a brand was developed late 2015. Growcom reports that just over 800 companies have completed some aspect of Hort360, and those companies as a group have completed over 1400 modules in total.

Delivery of Hort360 is provided to all growers regardless of their membership to Growcom. Hort360 is currently delivered within funded projects for specific purposes/outcomes, however the intent is to transition the initiative into a commercially viable product.

To establish the Hort360 framework and database system Growcom has invested approximately \$180,000 - this excludes development of modules and delivery costs. Additional funds have been received over time for on-going expansion of scope and related development.

Growcom recently signed a five year contract to restructure EnviroVeg into the Hort360 framework and deliver a national project to assist vegetable growers achieve accreditation. Through this initiative and the work being conducted with Freshcare, Hort360 will become the training component for growers looking to secure accreditation against Freshcare Environmental.

Findings of an analysis of Hort360 against our identified requirements are included as Table 6.

Table 6 – Hort360 initiative analysis findings

System/scheme – Hort360 (Growcom)	
Source documents include: On-line Hort360 application.	
<input checked="" type="checkbox"/> Requires on-farm Quality management framework <input checked="" type="checkbox"/> HACCP based approach <input checked="" type="checkbox"/> Biosecurity focused <input checked="" type="checkbox"/> Supports biosecurity prevention, control, management and recovery <input checked="" type="checkbox"/> Authorised by legislation <input checked="" type="checkbox"/> Recognised for international export <input checked="" type="checkbox"/> Mature system <input checked="" type="checkbox"/> Prescriptive	<input checked="" type="checkbox"/> Administrative Quality management framework <input checked="" type="checkbox"/> Customer focused <input checked="" type="checkbox"/> Supports best practice <input checked="" type="checkbox"/> Provides evidence of due diligence in controlling biosecurity risks <input checked="" type="checkbox"/> Provides domestic market access <input checked="" type="checkbox"/> Evidence of cost benefit <input checked="" type="checkbox"/> Product rather than standard <input checked="" type="checkbox"/> Auditable
Strengths and Weaknesses	<p>S. The Hort360 platform appears to be used and useful with in the order of 800 users and growers testimonials provided on the Growcom website.</p> <p>S. The application appears simple to use.</p> <p>S. The application appears to lend itself for use for biosecurity purposes to support entry level education, training and self-assessment.</p> <p>S. Although Queensland focussed, Growcom represents growers over a wide range of horticultural commodities and has not identified any limitations for the use of Hort360 by growers outside the scope of their membership.</p> <p>W. Hort360 is not yet a fully commercialised product.</p> <p>W. The Hort360 product is a supporting tool and in itself would not suit application for biosecurity accreditation.</p> <p>W. Does not cater to addressing risks associated with specific pests in specific circumstances.</p>
Opportunities and Threats	<p>O. A Hort360 type platform would support wide exposure to on-farm biosecurity systems to a level where a business could make an assessment and a commercial decision on adopting an on-farm biosecurity system for assurance purposes based on trial and use and observed outcomes.</p> <p>T. Future costs associated with use are uncertain at this stage.</p>

5.3.4 Food safety / quality schemes generally

Although not biosecurity focussed it is important to make some assessment on the merits of food safety systems in regard to on-farm biosecurity assurance system development and application.

Findings of an analysis of food safety schemes against our identified requirements are included as Table 7.

Table 7 – Food safety scheme analysis findings

System/scheme – Food safety / food quality systems generally (Various)	
Source documents include: Retail standards, provider service documents.	
<input checked="" type="checkbox"/> Requires on-farm Quality management framework <input checked="" type="checkbox"/> HACCP based approach <input checked="" type="checkbox"/> Biosecurity focused <input checked="" type="checkbox"/> Supports biosecurity prevention, control, management and recovery <input checked="" type="checkbox"/> Authorised by legislation <input checked="" type="checkbox"/> Recognised for international export <input checked="" type="checkbox"/> Mature system <input checked="" type="checkbox"/> Prescriptive	<input checked="" type="checkbox"/> Administrative Quality management framework <input checked="" type="checkbox"/> Customer focused <input checked="" type="checkbox"/> Supports best practice <input checked="" type="checkbox"/> Provides evidence of due diligence in controlling biosecurity risks <input checked="" type="checkbox"/> Provides domestic market access <input checked="" type="checkbox"/> Evidence of cost benefit <input checked="" type="checkbox"/> Product rather than standard <input checked="" type="checkbox"/> Auditable
Strengths and Weaknesses	<p>S. Food safety schemes essentially employ similar requirements for process management and process control as are recommended for on-farm biosecurity schemes.</p> <p>S. Food safety schemes are directed at the same user groups.</p> <p>S. Food safety schemes have established on-farm auditing systems.</p> <p>S. Food safety assurance providers demonstrate evidence of competency in the implementation and maintenance of on-farm risk management schemes.</p> <p>W. Food safety initiatives are not an-farm biosecurity system to control biosecurity risk.</p> <p>W. Food safety schemes are directed towards meeting different customer expectations.</p>
Opportunities and Threats	<p>O. Food quality/safety accreditation schemes are essentially implemented by on-farm users that could benefit from biosecurity focussed assurance services.</p> <p>O. High level quality management and risk analysis/control elements are essentially complementary to what would be recommended for a biosecurity focussed on-farm biosecurity system and there could be an opportunity for assurance auditing to be performed for both food quality/safety and biosecurity at the same audit and also reduce cost associated with travel.</p> <p>O. There are a number of auditing service providers that provide auditing services for food safety that could provide auditing service for biosecurity assurance initiatives. This provides for competition in provision of auditing services and would also provide confidence to audit providers to consider provision for auditing services in more remote areas.</p> <p>T. Food safety systems are based on the specific accreditation scheme chosen. There is not a consistent approach applied across food safety accreditation users.</p> <p>T. There is not a consistent approach to provision of food safety accreditation services.</p> <p>T. As there are a number of food safety accreditation service providers, incorporation of on-farm biosecurity assurance services into one scheme or another could result in inappropriate and uncompetitive advantage to that service provider.</p>

5.4 Options and recommended option

Options were identified and strengths, weakness opportunities and threats were considered to promote economy and efficiency primarily for the direct user but also for customers and for industry/stakeholders.

5.4.1 Option 1 – do nothing

This option is not an option for the purposes of this project.

In 2010 it was estimated that introduced invertebrates alone resulted in \$4.7 billion in agricultural production losses annually and a further \$750 million in costs for pest control (Plant Health Australia, 2010). This is compounded by new detections of emergency plant pests - for the vegetable industry the latest being the detection of tomato-potato psyllid in Western Australia in 2017 which poses significant challenges to production and ongoing market access.

National biosecurity strategies now identify the concept of shared responsibility as a key requirement of maintaining profitable primary industries in the face of ever expanding biosecurity threats. Key to this is the implementation of steps on-farm to control pest risks and support early detection, containment, eradication and industry recovery.

5.4.2 Option 2 – develop and deliver an on-farm biosecurity standard

This is not a desirable option.

A standard, in effect, sets specifications and requirements designed to achieve an established objective. This is most likely the least costly option for a funding body to deliver, unless a decision is made to produce the standard as a recognised Australian standard.

A person must interpret how a standard applies in their own specific circumstances. This can create inconsistency in approach and does not favour provision for ongoing support and management. This is most costly option for industry users and does not provide for simplicity of industry adoption. Ultimately the standard must be translated into a usable and useful on-farm system.

Delivery of a standard would not provide a realistic mechanism for market access. Currently market access initiatives require demonstrated compliance to an agreed and prescriptive procedure to address a specific pest risk. It is possible that production of a standard could lead to multiple service providers developing individual systems based on their interpretation of the standard requirements. This has been demonstrated throughout the history of food safety systems in Australia and has caused significant issues for producers.

There is no realistic impediment to any entity as an administering authority approaching state and territory governments seeking approval of their own individual schemes based on a standard. It is not precluded through legislation. However it is unlikely that government would support or be willing to adopt a multifaceted approach for the provision of market access assurance.

5.4.3 Option 3 - incorporation into food safety systems

This could be an option, but is not a recommended option.

Food safety systems are directed at controlling food safety risk. Food safety systems can be directed at addressing multiple customer requirements. Biosecurity systems for market assurance purposes must be directed at satisfying the requirements of State and Territory governments.

The history of food safety accreditation systems demonstrate the impact of varying customer requirements and multiple accreditation bodies on horticultural producers. Impact has been clarified and addressed to some extent through the Harmonised Australian Retailer Produce Scheme (HARPS) project. Prior to this initiative, a grower that produced for retail sale and a business that packed produce for retail sale were potentially subject to multiple audits for multiple customers to achieve a relevant food safety standard. HARPS reports that in audits alone, harmonisation of customer food safety standards is estimated to save growers, producers and the extended supply chain around \$40 million per year combined. This was also reflected in comments from the reference group, with feedback indicating that the most harmonised HARPS approach is 'making a difference' to growers. It is important that new biosecurity risk related assurance systems are proactive and guard against steps that may be taken that lead to similar outcomes.

However, it is also important to note that with the introduction of modern biosecurity legislation, that imposes an obligation on all persons to take all reasonable and practical steps to minimise all biosecurity risk that is in their control, that retail buyers and other entities may take steps in the future to limit their own biosecurity liability.

5.4.4 Option 4 – deliver a generic on-farm system and provide ongoing user support

This is the recommended option and further advice on this option is provided in the recommendations section of this report.

In summary, a system would be developed based on quality management principles and informed through a HACCP analysis of risk at critical control points. This approach is consistent with existing domestic access self-certification systems used in Australia for biosecurity and provides a sound framework for establishment of international market access opportunities. The system would be produced to run independently or in association with other complementary assurance systems implemented on farm.

The system delivered would include an on-farm quality manual which authorises the use of procedures to deal with risk present at critical control points identified as part of the HACCP analysis. The quality manual would allow for acknowledgment of complementary high level quality management procedures already implemented on the farm with assurance provided on implementation of quality management requirements through audits of that complementary system. This would reduce audit cost and duplication of effort in this area.

Where variation in risk exists as a result of pest, host and location specific circumstances, approved methods authorised by a procedure which specify requirements based on circumstances would be used. Approved methods could form the basis for satisfying a market access requirement that could not be specifically addressed in a procedure, for example an authorised method linked to a pest control procedure could authorise a specific chemical to be used at specific intervals for a specific pest on a specific crop. A market access procedure could specify compliance to one of more procedural elements and/or approved methods as part of its requirements. All of these documents would be developed, supplied and maintained by the system administrator. The role of the user would be to implement the system and maintain appropriate records. This would be the best method to minimise cost to a user and ensure simplicity of industry adoption.

Governance and administration of the scheme would also follow a quality management systems approach documented as a scheme quality manual. Key governance documents would include a policy for governance and administration of the scheme, user terms and conditions and supporting policies and procedures. Industry representative bodies should be provided an opportunity to establish and inform decision making for the scheme through the establishment of industry specific accreditation committees, or representation on a joint governance committee.

Where possible, negotiation with NGIA should occur on possible use or integration into existing biosecurity market access management software including audit management systems and audit portals which among other things, allow for web based audit recording and reporting, electronic certification and record keeping. Platforms such as Growcom's Hort360 package could be considered for best practice management education and training, and entry level introduction into market access assurance preparation.

For provision of auditing services, consideration should be given to negotiation with on-farm food safety auditing services. This is important for two reasons. Food safety schemes already have a network of audit service providers, and there could be an added benefit to growers in cost and convenience by addressing food safety and biosecurity assurance requirements in the one audit.

It is difficult to estimate indicative costs associated with the development and implementation of this system, however costs in establishing BioSecure HACCP over the past 12 years are in the order of \$0.8 million with continued funding support provided to 2020 to fully commercialise the system. The Hort360 program secured initial investment of \$1.5 million to commence development in 2006. Further funding support has been provided since that time. Consideration, collaboration or integration of key elements of existing systems, or system support tools, provides some opportunity to reduce costs and implementation timeframes for on-farm biosecurity systems for the vegetable industry.

6 Outcomes

It is clear that industry adoption of an on-farm biosecurity system will be driven through the development of a system that meets business and customer requirements in a cost effective and value adding way, and:

- lends itself to support through existing industry funded research and development initiatives and national schemes;
- works in-line with other assurance harmonisation projects to eliminate duplication of effort;
- is flexible to allow rapid response to new biosecurity risks;
- benefits from other Australian horticultural industry investment as part of a shared capability network; and
- facilitates expansion, market protection, market opportunity and business profitability.

Analysis of standards, guidelines, legislative provisions and on-farm risk management initiatives has identified:

- a suitable process control quality management framework that is harmonised with and complementary to existing frameworks used on-farm for food safety purposes, the quality framework applied by government for administration of the ICA scheme for domestic market access, and that applied internationally for phytosanitary purposes;
- a process to identify risk, and take steps to control that risk at critical control points;
- key areas associated with an activity or process on which to form the basis of system risk control procedures;
- a method to deal with crop and location specific risk for risk prevention and market access purposes;
- governance considerations;
- confirmation that a well drafted on-farm biosecurity system can support market access;
- mechanisms for consultation and negotiation for market access purposes; and
- opportunities to learn from, benefit from and harmonise with other on-farm biosecurity initiatives.

The research outcomes provide for future consideration of a staged approach to the development and implementation of an on-farm biosecurity system that could be used as a biosecurity best practice resource for users, and support market access initiatives should a user identify a benefit for its use for that purpose.

7 Evaluation and Discussion

The focus of this project has not been on the benefits of adopting an on-farm biosecurity system. The consequences of not protecting against biosecurity risk is quite clear – otherwise profitable horticultural producers can and do lose their businesses after exposure to biosecurity threats. Whole industries can be made less profitable. The focus of this project has been on identifying requirements for an on-farm biosecurity system and strengths, weakness, opportunities and threats related to options for development and implementation.

The main challenges posed by this project were not those posed in identifying requirements and options for the development of an on-farm biosecurity system for best practice or to also cater for future market access purposes. What did pose a challenge was providing authoritative advice on indicative costings for system development and future governance arrangements. Consideration on cost could only be provided indicatively looking back at the history of relevant on-farm initiatives. Ultimately the cost of developing and maintaining a system will be reflective of the quality and reliability of the system developed and the competency of the system developer in translating requirements into a usable product.

Biosecurity poses an ever increasing risk, and the type of risk and the level of exposure to risk is not static. The needs and requirements of customers is not static. The system must cater for that. Interest from parties in governing a system will rely on bodies who identify a cost benefit in managing the system, in consideration of the system developed, and user interest.

What is clear on reflection of both the BioSecure HACCP scheme and the Hort360 initiatives as important on-farm best practice system examples is that the development of on-farm good agricultural practice systems/initiatives rely on sufficient time and investment to develop and refine a product. Both initiatives have allowed time to provide user exposure at a subsidised costs to seek feedback and correct deficiencies. User exposure allows a potential future user to assess benefit in their own particular circumstances.

User exposure will first come from providing a system, whether it be labelled as an on-farm biosecurity best practice system or not, that can be used all or in part to help a user take steps that they feel will best serve their biosecurity and business interests. Added benefits follow. Acceptance and use creates a critical mass to provide for ongoing scheme development and system maintenance.

8 Recommendations

The following recommendations are made based on project findings including findings on key requirements, analysis of strengths, weaknesses, opportunities and threats of existing on-farm systems and reference group consultation.

8.1 General

1. That there is acknowledgment that what is considered as 'biosecurity best practice' is continually subject to change based on informed knowledge gathering, research and development advances and changing pest and disease circumstances. The development of an on-farm biosecurity system must provide for sufficient flexibility to accommodate that change.
2. A generic ready to use system managed and maintained by a system administrator should be provided to users as opposed to a standard that requires the user to independently interpret and develop a system based on requirements specified within a standard.
3. System governance including document control for the system should primarily be the responsibility of the system administrator.
4. Implementation and record control be the responsibility of the user.

8.2 Quality management and continual improvement framework

5. The on-farm biosecurity system should include a quality management framework consistent with that provided for under the ISO 9001: Quality Management System – Requirements, published by Standards Australia/Standards New Zealand.
6. A generic on-farm quality manual should be produced for users of the system based on that framework that documents quality management processes and allows for any individual variance between businesses to be captured on form templates authorised by the manual.
7. Where recognised quality management processes are established for other purposes, including but not limited to food safety or quality processes consistent with an on-farm ISO 22000 based system, the quality manual must provide for acknowledgement of demonstrated compliance to those processes should the on-farm biosecurity system be used for market access purposes.
8. The quality manual must authorise procedures to deal with activity related risk.

8.3 Risk management framework - procedures

9. Risk analysis and control determinations should be undertaken and documented in a manner consistent with a HACCP type process.
10. Risk management requirements/recommendations based on risk analysis and control determinations should be documented within procedures that address control of risk against one or more critical control points.
11. Requirements directed at controlling risk at or across critical control points should be documented in procedures that are determined based on risk areas, or activities undertaken across risk areas. Procedures should be produced as separate documents to minimise disruption to responsible persons should amendment be required.
12. Procedures that should be considered as a starting point, based on current advice provided through on-farm best biosecurity practice organisations, include identification of pest threats, controlling access and movement, decontamination and hygiene and inspection and monitoring. For best practice and market access purposes, pest control must also be considered.

8.4 Forms and records

13. Where a procedure requires specific records to be maintained, the system developed should include form templates to be provided to users that comply with the requirements made within the relevant procedure consistent with the approach taken in the implementation of the ICA scheme and BioSecure HACCP.
14. The system should allow a user to develop or use an alternative form that best meets their own individual circumstances should that form meet requirements specified within a procedure.

8.5 Methods to deal with user specific risk

15. Procedures should specify requirements for dealing with a risk at a specific control point, however in relevant circumstances they should allow for a user to determine how that risk is addressed on their property.
16. Approved methods to deal with a risk in a general way should be provided by the system administrator, however for biosecurity best practice purposes, industry groups or other interested parties should be able to propose methods to their members for dealing with a specific risk based on member circumstances.
17. Where a method is to be relied upon to support market access purposes, that method should be developed by the system administrator to comply with interstate plant quarantine requirements and issued as an approved method for particular pest/disease circumstances.

8.6 Market access tools

18. The market access tool, documented as a specific procedure to address movement requirements set by one or more jurisdictions for a biosecurity pest or associated item, need only demonstrate to a jurisdiction that it satisfies their requirements.
19. BioSecure HACCP is currently the only non-government assurance program that has been acknowledged as an approved third party market access assurance scheme. As a result, the BioSecure HACCP Entry Condition Compliance Procedure does provide a structure for consideration on which a compliance procedure could be modelled with one or more approved methods being used to specify requirements.
20. The governance body would be responsible for developing and negotiating acceptance of a control procedure with relevant jurisdictions.

8.7 Governance and administration

21. An entity chosen to govern the system/scheme must demonstrate competency across relevant biosecurity areas, including experience in delivering assurance schemes and negotiation with relevant stakeholders including industry and government stakeholders.
22. Entities with relevant demonstrated knowledge and experience should be assessed based on economy and efficiency.
23. Governance systems must be supported by a robust quality management system and supporting documentation including both governance and delivery policies and procedures.
24. Ideally, the entity chosen to govern the system should also be responsible for development of the system.
25. Oversight of the system should be provided through the establishment of an administrative and technical review committee which includes representation by relevant stakeholders.

8.8 Audits and auditing for assurance purposes

26. The body governing and administering the scheme should not be obligated to provide auditor and auditing services however must be responsible for establishing, controlling, managing and overseeing auditing services.
27. Selection of auditing services should consider options for use of established food safety auditor networks with a view to minimise cost where possible for auditing of users seeking market access assurance accreditation.
28. Suppliers of auditing services should be sought based on compliance to auditing standards and cost efficiency.

8.9 System supply and distribution

29. In the first instance, a best practice on-farm biosecurity system that is supportable should be considered for development to allow interested businesses to improve biosecurity practice and process control.
30. Consideration should be given to supply of the product to users at minimum cost to increase exposure and understanding, similar to the process adopted in implementation of the BioSecure HACCP where the guideline was made available for purchase at minimum cost without the need for purchase of further support services.
31. Should support and updates be considered as a desirable option by system users, that support could be provided and funded through an annual subscription or other similar mechanism.
32. The same system must be capable of supporting market access assurance requirements should a user identify a commercial advantage in using and demonstrating compliance to requirements made within the system.
33. Based on interest and opportunity provided by the system, that an expression of interest be sought in governance and administration of the system for market access and other purposes and subsequent development and implementation of the system to achieve those aims.

8.10 Supporting tools

34. BioSecure HACCP is supported by web based audit capture and reporting applications, desktop system management applications and web based compliance procedure training applications that could apply as a model for on-farm horticultural market assurance systems.
35. A Hort360 type platform would support wide exposure to on-farm biosecurity systems to a level where a business could make an assessment and a commercial decision on adopting an on-farm biosecurity system for assurance purposes based on trial and use and observed outcomes.

8.11 Education and training

36. Industry groups should be considered for provision of education and training in the implementation of best biosecurity practice.

9 Scientific Refereed Publications

None to report.

10 IP/Commercialisation

No commercial IP generated.

11 References

Codex Committee on Food Hygiene, 1997. HACCP System and Guidelines for its Application, Annexe to CAC/RCP 1-1969, Rev 3 in Codex Alimentarius Commission Food Hygiene Basic Texts, Food and Agriculture Organisation of the United Nations, World Health Organisation, Rome.

International Plant Protection Convention, 2016. ISPM 14 - The use of integrated measures in a systems approach for pest risk management. Food and Agriculture Organisation (FAO), Rome.

Freshcare Ltd, 2009. Freshcare Code of Practice Food Safety and Quality, The National On-Farm Assurance Program For Australian Growers 3rd Edition. Freshcare Ltd, Sydney.

GLOBALG.A.P., 2014. GLOBALG.A.P. History. Available at: http://www.globalgap.org/uk_en/who-we-are/about-us/history/ (accessed 2 August 2016).

New South Wales Parliamentary Counsel, 2017. *Biosecurity Act 2015* (NSW). Available at: <http://www.legislation.nsw.gov.au/#/view/act/2015/24>.

Nursery & Garden Industry Australia, 2008. BioSecure HACCP - Guidelines for Managing Biosecurity in Nursery Production. Nursery & Garden Industry Australia, Sydney.

Nursery & Garden Industry Australia, 2013. Nursery Industry Accreditation Scheme Australia (NIASA) – Best Management Practice Guidelines. Nursery & Garden Industry Australia, Sydney.

Plant Health Australia, 2010. National Plant Biosecurity Strategy. Plant Health Australia, Australian Capital Territory.

Safe Quality Food Institute, 2014. A HACCP-Based Supplier Assurance Code for the Food Industry, Edition 7.2. Safe Quality Food Institute, Arlington Virginia.

Standards Australia, 2004. AS/NZS ISO 14001:2004 Environmental management systems— Requirements with guidance for use. Standards Australia/Standards New Zealand, Sydney and Wellington.

Standards Australia, 2005. AS ISO 22000:2005 Food safety management systems— Requirements for any organization in the food chain. Standards Australia, Sydney.

Standards Australia, 2009. AS/NZS ISO 31000:2009, Risk Management Principles and Guidelines. Standards Australia/Standards New Zealand, Sydney and Wellington.

Standards Australia, 2011. AS/NZS ISO/IEC 17021:2001, Conformity assessment—Requirements for bodies providing audit and certification of management systems. Standards Australia/Standards New Zealand, Sydney and Wellington.

Standards Australia, 2016. AS/NZS ISO9001:2016, Quality Management Systems - Requirements. Standards Australia/Standards New Zealand, Sydney and Wellington.

Subcommittee on Domestic Quarantine and Market Access, 2016. Rules for the Operation of the Interstate Certification Assurance Scheme Version 4.3. Subcommittee on Domestic Quarantine and Market Access, Australia.

Subcommittee on Domestic Quarantine and Market Access, 2017. Committees - Subcommittee on Domestic Quarantine and Market Access webpage. Available at:
<http://www.interstatequarantine.org.au/producers/committees/>.

Queensland Parliamentary Counsel, 2017. *Biosecurity Act 2014* (QLD). Available at:
<https://www.legislation.qld.gov.au/LEGISLTN/CURRENT/B/BiosecurityA14.pdf>.

Woolworths Ltd, 2013. WQA Quality Assurance Standard, Primary Production - Produce Version 8. Woolworths Ltd, Australia.

12 Acknowledgements

The project research team would like to thank all members of the project reference team and other stakeholders for providing advice and feedback on the project and clarifying key issues, and in particular:

- Anthony Kachenko and Peter Whittle (Horticulture Innovation Australia)
- Jessica Lye and Kevin Clayton-Green (AUSVEG)
- Greg Owens (NT Farmers)
- John McDonald (Nursery & Garden Industry Australia)
- Rachel Mackenzie and Scott Wallace (GROWCOM)
- Mike Ashton and Matt Rogers (Biosecurity Queensland).

13 Appendices

Appendix 1 – Feedback survey summary table

Appendix 2 – Reference group feedback survey

Appendix 3 – Survey responses

Appendix 4 – High level quality management element system comparison