Fostering and enhancing food safety in the vegetable industry

Dr Doris Blaesing
RMCG

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Level 7
179 Elizabeth Street
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Telephone: (02) 8295 2300
Fax: (02) 8295 2399

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Authors: Dr Doris Blaesing et al

Research Provider: RMCG

ABN: 35 154 629 943

RMCG
Consultants for Business, Communities & Environment

Tasmanian Office:
1/9 Arnold Street, Penguin, Tasmania 7316
PO Box 396, Penguin, Tasmania 7316
T (03) 6437 2264 F (03) 6437 2271

E rm@rmcg.com.au W www.rmcg.com.au

Contact Details:
Name: Doris Blaesing
Title: Senior Consultant
Address: PO Box 396, Penguin, Tasmania 7316
P: (03) 6437 2264
F: (03) 6437 2271
M: 0438 546 487
E: dorib@rmcg.cm.cu

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Purpose of the report:

This study provides reference information for the vegetable industry. It seeks to quantify the extent of food safety certification in the Australian vegetable industry as a primary measure of food safety commitment. It discusses issues around food safety hazards and opportunities for effective food safety management to maintain the industry's good food safety record.

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Media Summary

In 2010 OzFoodNet, a health network to enhance the surveillance of foodborne diseases in Australia, reported 30,035 notifications of nine diseases or conditions commonly transmitted by food in Australia. Between 2006 and 2010, a total of 29 cases involved vegetables, with 510 people affected, 23 of which were admitted to hospital, and there were no fatalities.

Food safety issues affect people's perception of safety as much as their actual health or life. They have an impact on all businesses dealing with the production, distribution and preparation of food and for these businesses, food safety issues can have financial and legal repercussions and they can influences trade relations.

Any business, including a vegetable farm, that supplies food directly to the public is classified a 'Food Business' under the Food Standards Code and must have a food safety program in place. Many vegetable growers and others who sell at farmers markets or use other direct marketing channels are not aware that they fall under this regulation. It is also not helpful that state based rules and regulations derived from the Code are inconsistent.

Major retailers and processors require food safety certification from their suppliers. As a result, a majority of Australian vegetable growers have a food safety program in place. A less desirable aspect of this is that several food safety systems/schemes exist side by side and many growers must abide by up to six of them. Still, food safety awareness and systems uptake amongst small vegetable farming operations and some small operators in supply chains is suspected to be low. This can put the entire industry at risk.

Data shows that vegetables eaten raw are the most frequent cause of individual foodborne illness outbreaks traced back to vegetables.

Lifestyles and with that buying and eating habits are changing, and with it the use of uncooked vegetables. Also, consumers' average food safety awareness is relatively low and responses to 'food scares' are often emotional and uninformed. This may increase the risk of foodborne illness outbreaks occurring in the future, and the impact an incident may have on individuals and businesses in the vegetable supply chain.

Recommendations

1. Realise mutual recognition, harmonising and streamlining of record keeping and auditing by multiple third party certification schemes applicable to vegetable growers. Use the FAO/WHO hazard categorisation for fresh produce to characterise risks and align food safety requirements to risks.
2. Determine which critical limits used in food safety schemes need to be reconsidered or newly established for Australian conditions.
3. Foster awareness of food safety risks and legal requirements. Implement extension to assist growers and supply chain members from different backgrounds, growing and handling different produce that currently do not have suitable food safety measures in place.
4. Educate the public about food safety using appealing methods and understandable content.
5. Investigate options to gather representative information and data from vegetable producers without placing a burden on them.
6. Get useful information and feedback to growers about food safety and compliance performance; it has to help to improve practices and streamline systems.

Technical Summary

In 2010 OzFoodNet, a health network to enhance the surveillance of foodborne diseases in Australia, reported 30,035 notifications of nine diseases or conditions commonly transmitted by food in Australia. Between 2006 and 2010, a total of 29 cases involved vegetables, with 510 people affected, 23 of which were admitted to hospital, and there were no fatalities.

Safe food is fundamental to protect public health; this condition appears straightforward. However, food safety management is a multifaceted, politically sensitive issue.

Food safety issues affect people's perception of safety as much as their actual health or life. They have an impact on all businesses dealing with the production, distribution and preparation of food and for these businesses food safety issues can have financial and legal repercussions and they can influences trade relations.

Media reports about foodborne illnesses can be sensationalist and misleading; agencies may be rash in reporting to the public.

The way a foodborne illness outbreak is communicated could amplify or moderate the damage to the industry, business and individuals. This needs to be carefully managed by a suitable organisation e.g. AUSVEG in the case of vegetables.

All food businesses must by law have a food safety program in place.

Any business including a farm business that supplies food directly to the public is classified a 'Food Business' under the Australian Food Standards Code. Many vegetable growers and others who sell at farmers markets or use other direct marketing channels are not aware that they fall under this regulation.

State based rules and regulations derived from the Food Standards Code are inconsistent.

Vegetable growers who operate across state borders must comply with different interpretations of the same Code.

Major retailers and processors require food safety certification from their suppliers; several food safety systems / schemes exist side by side.

Major vegetable buyers require growers to be certified under their own food safety systems. As a result many growers have to comply with up six systems. This puts a high demand on their time and finances; it does not necessarily improve food safety outcomes.

A majority of Australian vegetable growers have a food safety program in place.

On vegetable farms, participation rates vary between states and farm sizes. Smaller operations are less likely to have food safety measures in place than larger farms. NSW has the lowest level of participation. The types of food safety related activities undertaken, such as water testing or chemical residue testing, vary between farms and states. The attitudes towards the need for, or the effectiveness of, food safety systems vary between vegetable businesses. Still, most vegetable growers believe that a food safety related incident would affect their business and a straightforward system would be suitable to prevent such an incident from happening.

Food safety awareness and systems uptake amongst small vegetable farming operations and LOTE[1] producers is suspected to be low.

One reason for this would be that requirements and potential consequences are not well understood. Another would be that 3rd party certified systems may be too complex and costly to implement. Supply chains used by smaller operators also do not require certification or any other evidence of food safety implementation from them.

Food safety is a whole of supply chain issue.

Vegetables may become contaminated at any stage during the supply chain. Poor food safety management in any part of the chain may have repercussions for growers if vegetables are blamed for a foodborne illness outbreak. Still, many businesses in vegetable supply chains do not appear to have documented, audited food safety measures or a clear, consistent approach to food safety in place.

Australian vegetable growers are looking towards the Asian region to increase exports.

Food safety risk management should be considered when establishing supply chain arrangements to avoid any incidents that could damage Australia's reputation as a supplier of safe fresh produce and food.

Data shows that vegetables eaten raw are the most frequent cause of individual foodborne illness outbreaks traced back to vegetables.

Wash water used as a 'last rinse' and cross contamination from meat or seafood during food preparation are the most frequent sources of microbial contamination. Most foodborne illnesses are readily transferred from person to person.

Lifestyles and with that buying and eating habits are changing.

Consumers buy more pre-cut and prepacked fresh produce; salads, 'dipping' and other uses of uncooked vegetables are increasing both, at home and in food service. Many people eat more often away from home, using quick-serve or sit down restaurants and salad bars for main meals and snacks. Direct marketing by growers to consumers is becoming more popular. People travel more often, faster and over longer distances. These trends may increase the likelihood, severity and consequences of foodborne illness outbreaks.

Analytical methods have improved.

Modern analytical technology now allows for the detection of traces of chemical contamination and identification of low levels of pathogens. For many of the contaminants or potential human pathogens we do not understand risks well enough to set thresholds. Cumulative effects of contaminants have not been well researched.

Consumers' average food safety awareness is relatively low and responses to 'food scares' are often emotional.

While consumers do not understand aspects of food safety, they are easily scared by media reports and announcements about foodborne illnesses. Examples show that an issue with fruit or vegetables

[1] LOTE: language other than english

can lead to a reduction in all fresh produce purchases. Therefore, food safety management for fresh horticultural produce should be addressed jointly.

The tendency to litigate is increasing.

Individuals and organisations increasingly look for somebody to take the blame, and to receive compensation, if they believe they have been exposed to physical or financial harm. A food safety related incident could easily lead to a litigation case against businesses in the supply chain as examples from the US have shown.

Several 'food safety incident response plans' exist.

Response plans to food safety emergencies have been prepared by health and industry organisations on a national and state basis, and international guidelines exist. The plans are usually based on a risk analysis conducted individually for each plan (which may or may not be based on the FSANZ analysis of food related risks[2]). It is often not clear how the plans relate to each other, whether there is a hierarchy, and how they might be implemented efficiently without causing confusion and miscommunication.

Food safety surveillance, incident recording and reporting has improved for microbial hazards

The Australian Government Department of Health and Ageing established OzFoodNet in 2000 as a collaborative initiative with Australia's State and Territory health authorities to provide better understanding of the causes and incident of foodborne illness in the community and to provide an evidence base for policy formulation. Surveillance of non-microbial hazards is still sketchy. State authorities and FSANZ mainly monitor chemical hazards and other national organisations have conducted surveys. The economic impact of food safety related incidents is usually not investigated or reported.

Recommendations

Our recommendations focus on practical, ultimately achievable suggestions for the vegetable industry.

1. Realise mutual recognition, harmonising and streamlining of record keeping and auditing by multiple third party certification schemes applicable to vegetable growers.

Use the FAO/WHO hazard categorisation for fresh produce to characterise risks and align food safety requirements to risks. Investigate how a 3rd party certified system could be operated by small businesses considering cost, time available and management capacity i.e. what is the minimum requirement for public health?

2. Determine which critical limits used in food safety schemes need to be reconsidered or newly established for Australian conditions via:

- A review of published scientific research that has been completed under Australian conditions
- Communication with researchers in Australia to determine whether unpublished local data exists suitable for the review and to establish suitable limits, and
- Develop and implement research protocols to establish appropriate limits if there is no sound data.

[2] Food Standards Australia New Zealand, 2008: The Analysis of Food-Related Health Risks http://www.foodstandards.gov.au/publications

3. Foster awareness of food safety risks and legal requirements. Implement extension to assist growers and supply chain members from different backgrounds, growing and handling different produce who currently do not have suitable food safety measures in place to:

- Understand food safety risks and how to manage them using good practices. (One option or first step could be a food safety self-assessment tool. This would help identifying risks in their business, and implement an actions plan to control them)
- Be able to supervise and train their staff
- Understand legal obligations
- Understand why and how to use thresholds to guide decisions
- Encourage participation in a 3rd-party audited food safety systems (if they can meet the required costs, time requirement and management capacity).

Update the 'Guidelines for On-Farm Food Safety for Fresh Produce', second edition published in 2004 as part of the extension approach. Review the self assessments in the “Approved Supplier Program for Fresh Produce”, National Quality Management Working Group (Australia) 1999 with the view to implement a self assessment approach for supply chain members who are not certified under a 3rd party scheme.

4. Educate the public using appealing methods and understandable content.

5. Investigate options to gather representative information and data from and for vegetable producers that do not place a burden on them and that use harmonised survey methods.

6. Get useful information and feedback to growers about food safety and compliance performance; it has to help them to improve practices and streamline systems.

Definitions of terms

For the purposes of this document, the following definitions of terms are used:

Term	Definition
Acceptable	Means the food is safe or suitable.
Accreditation	Certification of competence in a specified subject or area of expertise, and of the integrity of an agency, firm, group, or person, awarded by a duly recognized and respected accrediting organisation. Organisations that issue credentials or certify third parties against official standards such as food safety standards are themselves formally accredited by accreditation bodies; hence they are called "accredited certification bodies". The accreditation process ensures that their certification practices are acceptable, typically meaning that they are competent to test and certify third parties, behave ethically and employ suitable quality assurance themselves.
Audit	A systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled. Three audit categories are as follows; 1. A First Party Audit or Internal Audit is a company's assessment of its own systems and performance 2. A Second Party Audit is conducted organisation to organisation e.g. company auditing a contractor or supplier 3. A Third Party Audit is conducted by an external, independent, trained, commercially employed auditor
Certification	Confirmation of certain characteristics or competencies. It is a formal procedure by which an accredited or authorized person or agency assesses and verifies (and attests in writing by issuing a certificate) the attributes, characteristics, quality, qualification, or status of individuals or organisations, goods or services, procedures or processes, or events or situations, in accordance with established requirements or standards.
Compliance	Refers to a state when persons, food businesses or primary producers are operating within the regulatory requirements that apply to that person, food and associated inputs, food business or primary producer.
Corrective action	Actions implemented in response to customer complaints, undesired levels of internal nonconformity, nonconformities identified during an internal or external audit or adverse or unstable trends in product and process monitoring. The identification of root causes and implementation of preventative measures to avoid recurrence are vital.
Critical non-conformance	A non-conformance of a business's approved food safety program that has substantial or immediate significance and is likely to result in, or has resulted in, unacceptable food.

Term	Definition
Danger zone	The temperature range in which food borne bacteria can grow. Foods that are potentially hazardous inside of the danger zone[3]: ▪ Meat, Fish, poultry ▪ Eggs, protein rich foods ▪ Dairy products ▪ Cut or peeled fresh produce ▪ Cooked vegetables, beans, rice, pasta ▪ Shellfish ▪ Sauces such as gravy ▪ Sprouts ▪ Any foods containing the above, ex. Casseroles, salads, quiches.
Foodborne illness	A condition caused by the consumption of a contaminated food, water or beverage. Foodborne illnesses are typically infections caused by bacteria, viruses, parasites, or conditions caused by toxins leading to vomiting, diarrhea, nausea, abdominal pain or fever.
Foodborne illness outbreak	An incident in which two or more persons experience a similar illness resulting from the ingestion of a common food
Foodborne injury	A condition caused by the handling or consumption of a contaminated food or beverage. Foodborne injuries are typically caused by physical contamination.
Food business	A *"business, enterprise or activity* that involves: a) The handling of food intended for sale b) The sale of food regardless of whether the business, enterprise or activity concerned is of a commercial nature or whether it involves the handling or sale of food on one occasion only. For the purposes of this definition, a business, enterprise or activity includes a factory, manufacturer, production, entity processing, transporter, store, producer, farm and those businesses that are licensed, accredited or registered or under suspension by a food regulator.
Food poisoning	Ingesting food or water containing bacteria, viruses, parasites or toxins created by those microbes cause what is called 'food poisoning'.
Food regulator	Bodies of the Commonwealth of Australia, the Government of New Zealand, or states and territories within Australia responsible for food safety legislation. These organisations may be part of government departments or be semi-independent of government and, while many are enforcement agencies, some may delegate enforcement responsibility to other bodies such as local governments.
Food safety	The conditions and practices from paddock to plate, and from prevention and surveillance to detection and control that preserve the quality and safety of food to prevent contamination and foodborne illnesses. A scientific discipline describing handling, preparation and storage of food in ways that prevent foodborne illness.

[3] http://www.gov.ns.ca/agri/foodsafety/pdfs/dangzone.pdf

Term	Definition
Food safety hazards	Microbiological, physical or chemical agents in food that are reasonably likely to cause illness or injury if not controlled. Biological hazards receive the most attention in HACCP systems due to presenting the greatest risk of widespread serious harm, and the highest frequency of recorded occurrence. Microorganisms of concern include: Salmonella species, Escherichia coli, Staphylococcus aureus, Shigella, Clostridium perfringens, Clostridium botulinum, Listeria monocytogenes, Campylobacter, Hepatitis A and Rotovirus. Physical hazards are most recognised by consumers as they usually can see the hazard (e.g. metal, glass, wood, insects, stones, soil, dirt, jewelry, hair, fingernails, plasters, personal items, bone, nuts / bolts, wire, plastic, paper and cardboard). Chemical hazards can include: agricultural residues (pesticides, fertilisers, fungicides, antibiotics and growth regulators) cleaning chemical residues, factory contaminants (pest control chemicals, lubricants, coatings, paints, refrigerants and water treatment chemicals), food allergens (eggs, fish, milk, peanuts, sesame seeds, soy, sulphites, tree nuts and wheat), naturally occurring harmful chemicals (mycotoxins, scombrotoxin (histamine), mushroom toxins and shellfish toxins), industrial heavy metals (e.g. lead, zinc, cadmium, arsenic and mercury).
Food safety incident	Any situation within the food supply chain where there is a risk, potential risk, perceived risk or confirmed occurrence of a food safety hazard, illness or injury associated with the consumption of a food or foods. This can be related to any stage of the food supply chain; it requires some form of effective, scientifically based, balanced response that is legally sound and well communicated
Food safety management system	A holistic system of controls that manage food safety in a food business. Generally includes Good Agricultural Practices (GAPs), Good Manufacturing Practices (GMPs) a HACCP (Hazard Audit Critical Control Point) Plan, management policies and traceability/recall systems.
Food safety program	A general term referring to any risk-based food safety management system, including legislated food safety programs and HACCP plans.
Food Standards Code	Food Standards Code means the Australia New Zealand Food Standards Code as defined in the *Australia New Zealand Food Authority Act 1991*.
GFSI benchmarked system	Food safety systems that have been compared with the Global Food Safety Initiative GFSI Guidance Document. Benchmarked schemes have a common foundation of requirements, which provide consistent results. Still, benchmarked schemes cannot be considered as equal.
HACCP-based system	A system that is consistent with the seven principles of HACCP: 1) conduct a hazard analysis; 2) determine the critical control points (CCPs); 3) establish critical limits; 4) establish monitoring procedures; 5) establish corrective actions; 6) establish verification procedures; 7) establish record-keeping and documentation procedures
Monitoring	Includes activity undertaken either by audit, inspection, surveillance or alternative methods to ensure compliance with the Food Standards Code.
Preventive action	Preventive actions are implemented to improve processes and eliminate causes of potential non-conformities or other undesirable situations. A focus is on the systematic investigation of risks and their 'root causes' to prevent occurrence (or to prevent their recurrence for corrective action).
Regulation	A rule or order about conduct, prescribed by a food regulator; a governing direction or law.

Term	Definition
Risk	Risk is the potential of loss (an undesirable outcome, however not necessarily so) resulting from a given action, activity and/or inaction, foreseen or unforeseen. The notion implies that a choice having an influence on the outcome sometimes exists (or existed). Potential losses themselves may also be called "risks" without any indication of cause. Any human endeavour carries some risk, but some are much riskier than others.
Unsafe or unsuitable	Food is unsafe or unsuitable if it: a) Is damaged, deteriorated or perished to an extent that affects its reasonable intended use b) Contains any damaged, deteriorated or perished substance that affects its reasonable intended use c) Is the product of a diseased animal, or an animal that has died otherwise than by slaughter, and has not been declared by an Government Regulation or Act to be safe for human consumption d) Contains a biological or chemical agent, or other matter or substance that is foreign to the nature of the food.
Verification	The application of methods, procedures, tests and other tools for evaluation, in addition to monitoring, to determine compliance of the food business's food safety program with the Food Standards Code or appropriate regulation. Verification may be done via audits.

1 Introduction

1.1 Background

Food safety is a concern

According to the World Health Organisation (WHO) and Centers for Disease Control and Prevention (CDC)[4], in the USA alone, annually, there are 76 million cases of foodborne illness leading to 325,000 hospitalizations and 5,000 deaths[5]. In 2010 OzFoodNet[6] reported 30,035 notifications of nine diseases or conditions commonly transmitted by food in Australia.

Fresh and processed horticultural produce, including vegetables, have been implemented in food safety related incidents worldwide.

In 2003 the Codex Alimentarius commission, an intergovernmental body, published guidelines to food safety[7] that is providing direction for the Australian and New Zealand Food Standards Code to enhance participation in food safety.

The Food Standards Code and horticulture supply chains

It is a legal requirement under the Food Standards Code ("the Code") for certain businesses, termed Food Businesses in the Code, to have a food safety system, and have effective approved supplier programs to manage the possible introduction of food safety hazards from suppliers such as vegetable growing businesses.

Horticultural producers if considered a 'primary producer' in the Code have no legal requirement to have a food safety system in place. However, as soon as they retail directly to consumers e.g. through roadside sales or farmer's markets or conduct some form of processing including prepacking on-farm, they are classed as a Food Business. They then need to comply with the requirements of Chapter 3 of the Code.

It appears that most businesses in the horticultural industry that have implemented a food safety system have done so in response to requests from their customers such as processors, packers, wholesalers, food service operators and retailers. Some vegetable producers who sell directly to the public may not have a food safety system in place.

There is provision in the Food Standards Code to implement regulation that applies to all primary producers so that they will be legally required to implement a food safety system. This has been implemented for a number of primary industry sectors, for example dairy, seafood, seed sprouts, and eggs.

After considerable consultation and research, Food Standards Australia New Zealand (FSANZ) decided in November 2012 not to pursue this course of action for the horticulture industry. Their reasoning was that a majority of horticultural producers representing a high

[4] http://www.cdc.gov/foodborneburden/
[5] "Several foodborne diseases are increasing in Europe". World Health Organisation. 2003-12-16. Archived from the original on 2005-04-16. "Food safety and foodborne illness". World Health Organisation. Retrieved 2010-12-10
[6] http://www.ozfoodnet.gov.au/ - A health network to enhance the surveillance of foodborne diseases in Australia
[7] "Codex Alimentarius and Food Hygiene" Food and Agriculture Organisation of the United Nations. ftp://ftp.fao.org/codex/Publications/Booklets/Hygiene/FoodHygiene_2003e.pdf

percentage of the production area, possibly 65% to 80%, were already 3rd party certified according to research undertaken for FSANZ by TQA Australia in 2011. The high participation in food safety systems by area was explained using the assumption that larger scale producers were most likely dealing directly with major retailers, who require suppliers to have food safety certification.

FSANZ's further reason for not regulating horticultural 'primary producers' was that the resources required in the State and Territory health jurisdictions (which are responsible for actual implementation and compliance), and local council Environmental Health Officers were not resourced sufficiently to reach the many smaller businesses currently not certified. FSANZ also undertook a cost: benefit assessment of a proposed regulation, which did not support additional regulation of growers.

Food safety for vegetable supply chains

Apart from the moral obligation to produce safe food, there is a powerful industry argument to ensure that members of the vegetable industry adopt effective food safety systems. The primary reason is to avoid a food safety incident that could result in significant economic and reputational damage to the industry as a whole. There are numerous examples of this occurring overseas. In response to this concern, the industry is currently developing a Crisis Management Plan (CMP) and associated training and resources in VG12091. While the CMP focuses on damage control, the adoption of adequate preventative measures via practical food safety management should be a focus for the vegetable industry.

A further argument supporting widespread implementation of food safety systems is for the industry to be able to promote food safety compliance to supply chain members and consumers in Australia and overseas to gain or maintain a competitive advantage. Confidence in food safety is both an expectation and a value attribute that consumers recognise and support. Conversely, a reputation for poor food safety is a marketplace liability.

Food safety certification under a recognised 3rd party audited system is an important step in minimising the risk of foodborne illness and other food safety hazards. A food safety program should be adopted by owners and staff of each business in the supply chain and be part of the business culture. A food safety system implemented with poor attitude and culture would be worse than having no system at all.

The Australian vegetable industry has long promoted its reputation for being 'clean and green' with minimal evidence to support this. Australian growers are fortunate that the Australian environment is iconic in the minds of many consumers and that we have not experienced the environmental and food safety issues that have damaged the reputation of some of our competitors overseas. However, it seems risky to rely on reputation alone, without having the evidence that markets may look for in the future.

1.2 This study

This study provides reference information for the vegetable industry. It seeks to quantify the extent of food safety certification in the Australian vegetable industry as a primary measure of food safety commitment. It discusses issues around food safety hazards and opportunities for effective food safety management to maintain the industry's good food safety record.

1.2.1 Study scope

Not all businesses in the vegetable supply chain from growing through to retailing are classified as 'Food Businesses' under the Code; i.e. those classed as 'primary producers'. However, all supply chain links are concerned with food safety and can be implicated and damaged in a food safety incident, emergency or crisis. This study is aimed around vegetable growing, packing, processing and those supplying retail, export markets, quick serve restaurants and food service businesses.

1.2.2 Study objectives and required outcomes

Objectives

The overall objectives are to describe:

1. The food safety environment of the Australian vegetable industry by describing the level and features of vegetable industry food safety certification and other measures taken to manage food safety in the supply chain
2. How to avoid a food safety incident that could result in significant economic and reputational damage to the affected vegetable business and the industry as a whole.

Detailed aims are to understand the vegetable industry's:

- Food safety awareness including awareness of risks and legal requirements
- Preparedness to deal with food safety issues on a business by business basis and as an industry
- Proportion that is part of a 3rd party certified system, and which system(s) are implemented
- Businesses reasons for being part of a certification system or for non-participation (ceasing certification or never being certified)
- View of the importance, advantages and disadvantages of food safety certification and what may prevent good food safety management
- Knowledge of food safety related risks (posed by vegetables) to human health or industry economics
- Needs and options to improve food safety management, if required e.g. awareness and training needs[8].

[8] Referring to: Macquarie Franklin, December 2012, Review of skills and training in the vegetable industry, Prospect TAS

Outcomes

The required outcome from the study is an informed AUSVEG and Vegetable IAC capable of making recommendations for further activities in the area of food safety based on the results of this study.

2 Methodology

2.1 Desktop study

The aim of the desktop study is to provide information on potential food safety hazards and related risks for consumers and the vegetable industry. Risks for consumers include health related consequences from eating 'unsafe' vegetables. Risks for vegetable growers include loss of reputation, market share and profits.

The desktop study provides a context for food safety certification needs by reviewing contemporary records and reports (since 2000) about food safety incidents applicable to the vegetable sector. This includes trying to identify the vegetable products, geographic locations, primary causes, severity, market and economic outcomes and other consequences, including responses (crisis management) to such incidents.

2.2 Review of food safety systems in horticulture

An analysis of the FSANZ review of food safety systems in horticulture was conducted via communication with system owners and examination of their databases to get an understanding of system uptake in vegetable supply chains as compared to all of horticulture.

Contact was also made with the major Certification Bodies (CB's) in Australia. The CB's were requested to provide details on certifications held by vegetable producers in Australia. Despite repeated attempts to obtain this information, the response rate from CB's was poor, with only two CB's providing data. Due to this, it was not possible to use the information from CB's. A list of all CB's contacted, and links to relevant databases are included with survey contact lists in Appendix 1.

2.3 Vegetable industry survey

A survey of vegetable producers and others in the supply chain was developed and distributed to gather additional information.

The main aim of the survey was to gather information about:

- Certification – reasons for certification and reasons why certification is not maintained
- Food safety awareness and attitudes – knowledge of food safety outbreaks and opinions on potential impacts of a foodborne illness outbreak
- Food safety activities – practices being implemented by the supply chain.

The survey was publicised using a number of methods including email to organisations (e.g. farmers market association, wholesale markets, state peak industry bodies), food businesses and primary producers, social media (Facebook and Twitter) and twice through the AUSVEG weekly newsletter. Organisations and individuals who were contacted to complete the survey and/or distribute to their networks are included in Appendix 2.

Due to the lack of a representative contact lists for growers, packers, processors, and others (e.g. food businesses serving meals) in the vegetable supply chain, the survey was not sufficient to estimate number of businesses certified to specific food safety systems.

In addition, discussions with 'primary producers' and 'food businesses' were conducted to better explore attitudes in relation to food safety management, certification and non-certification.

2.4 Synthesis of findings

The findings from the desktop study and surveys were analysed and synthesised to identify needs and options for improved food safety risk management as well as the need for further work to improve food safety performance, if participation in certified schemes was found to be low and/or awareness of and attitudes towards food safety were poor.

3 Desktop study findings

The following sections describe the food safety environment for vegetable industry supply chains including food safety hazards, and foodborne illness outbreaks involving vegetables.

3.1 Food safety aspects

Food safety systems commonly implemented by Australian vegetable producers generally focus on the following hazards:

1. Chemical contamination
2. Physical contamination
3. Allergen cross-contamination, and
4. Microbiological contamination

3.1.1 Chemical contamination

In contrast to microbiologically caused foodborne illness, the link between exposure and effect of chemical hazards in foods is usually complicated by cumulative low doses and the delay between exposure and the onset of symptoms. Chemical hazards include environmental contaminants, food ingredients (such as iodine), heavy metals, mycotoxins, natural toxins, improper storage, processing contaminants, cleaning products and veterinary medicines.

Australia has run an extensive residue testing system over the past 30 years involving local, state and Commonwealth regulators (the Australian Pesticides and Veterinary Medicines Authority - APVMA). This system is supplemented by wide ranging quality assurance testing undertaken by commodity groups and supermarket chains. Of the tens of thousands of tests done annually, the APVMA reports very few detections. The organisation reports a greater than 99% compliance with standards relating to chemical safety.

The Office of Chemical Safety (OCS) establishes public health standards for pesticides, including how much of a chemical a human can safely consume over a lifetime. The APVMA sets maximum residue limits (MRLs), the legal limit on the amount of pesticide residue that can remain on food offered for sale. MRLs are set well below the public health standard.

FSANZ is responsible for dietary exposure assessments of residues in the diet as part of the MRL setting process. FSANZ works closely with the APVMA on these assessments.

FSANZ considers requests to harmonise MRLs with international MRLs established by Codex or MRLs established in another country. Stakeholders can apply to have these requests considered. Requests are also made without an application. FSANZ may prepare an MRL proposal once a year to consider these requests and also MRL variations requested by the APVMA. The APVMA may request MRL variations in the Code to reflect regulatory decisions it has made as part of APVMA chemical reviews and to seek other variations that are outside the scope of changes it may make in the Code.

The APVMA only registers agricultural chemicals if the residue levels remaining on fruit and vegetables lead to dietary intakes below the public health standards.

The states and territories enforce food standards, including MRLs. Imported food is also inspected by the Department of Agriculture to ensure it complies with these standards.

Random, targeted and compliance monitoring of fresh produce is undertaken to ensure the MRLs set by the APVMA are not exceeded. This includes:

- The National Residues Survey undertaken by the Department of Agriculture, Fisheries and Forestry (http://www.daff.gov.au/agriculture-food/nrs)
- The Australian Total Diet Study undertaken by Food Standards Australia New Zealand (http://foodsafety.govt.nz/policy-law/food-monitoring-programmes/total-diet-study/)
- On-farm testing programs, undertaken by growers, packers and commodity groups
- State and territory government residue testing
- Supermarket testing

Produce found to exceed MRLs must not be sold to the Australian public.

The focus on testing for chemical hazards, especially agricultural chemical residues, has increased in the US and Europe in the past years. All fresh produce entering the EU has to be tested. A recent report, cited below, shows that chemical safety issues seem to be a greater problem in Europe than in Australia.

Fruit and vegetable import system protecting EU consumers

A report published by the EU Commission shows that the system of controls at EU borders on fruit and vegetable imports from non-EU countries is protecting consumers from potential food safety risks. In addition to the 'routine' controls carried out on these imports, some commodities are subject to an increased level of controls due to the risks associated with them. Today's report presents the results of controls carried out by EU countries in 2012.

Over 71,000 consignments subject to reinforced controls reached EU borders in 2012. Of those, 10,610 were sampled for laboratory analysis and 751 (i.e., 7.1%) were found in breach of EU legislation and were prevented from entering the EU market. Some products achieved satisfactory levels of compliance and were therefore removed from the list of imports targeted for controls. These are: feed additives and pre-mixtures from India (tested for lead and cadmium), chilli peppers from Peru (aflatoxins), chilli and chilli products from all non-EU countries (Sudan dyes).

However, Chinese broccoli and nutmeg and mace from Indonesia were added to the list for the possible presence of pesticides and aflatoxins. Due to the very high non-compliance levels reported in 2012, more stringent conditions were adopted for the import of groundnuts from Ghana and India, okra and curry leaves from India and watermelon seeds from Nigeria: these must now be accompanied by results of sampling and analysis and by a health certificate verified by authorised representatives of the country of origin.

The report is published in the framework of Regulation (EC) No 669/2009 on an increased level of official controls on certain imports of food and feed of non-animal origin, contains the list (reviewed on a quarterly basis) of imports subject to increased border controls.

Source: agri.eu

3.1.2 Physical contamination

Produce can become contaminated at any point in the supply chain by introduction of physical contaminants. A physical hazard is any foreign matter or object in a food item that may cause illness or injury to a person consuming the product.

Foreign objects are the most obvious evidence of a contaminated product and are therefore most likely to be found during harvest, packing or processing and also reported via consumer complaints. Therefore processors and major retailers carefully check deliveries for physical contamination. Their QA records could provide valuable information to the industry about the type of issues found during inspections of different vegetables by region.

Physical contamination is less likely than chemical, allergen or biological contamination to affect large numbers of people.

In vegetable products, foreign objects may include metal flakes, fragments or parts i.e. nuts and bolts, tools, injection needles, shotgun pellets, pieces of product packaging or staples, stones, glass or wood fragments, insects or other filth and dirt, personal items i.e. jewellery or wound coverings, or any other foreign material not normally found in food products. Sources for such contaminants include paddocks and packing/processing facilities, other materials or ingredients used with vegetables, badly maintained facilities and equipment, improper production procedures and poor employee practices.

Rejections due to physical contamination of food are not unusual, and can often lead to a product recall if the contaminant could cause injury to a consumer.

3.1.3 Allergen cross-contamination

Allergic reactions to food differ greatly from person to person, but can range from discomfort to life-threatening anaphylaxis. According to a press release from the World Allergy Organisation April 2013[9], globally, an estimated 220-250 million people may suffer from food allergy. Despite a lack of reliable data, many scientists think that the number of people with food allergies is rising, as is the number of foods to which they are allergic to[10] in both developed and developing countries, and especially in children.

Without comprehensive data on the prevalence of food allergies in the general population, scientists often resort to counting cases of anaphylaxis, the severe systemic reaction that follows exposure to a specific antigen (allergen).

Some reports mention that Australia has higher levels of food allergy than other countries. In the absence of repeated population estimates using objective measures of assessment, evidence that food allergy might be more common in Australia is indirect, derived from surrogate markers such as changing health service demand (i.e. longer waiting lists, increasing proportion of patients seen by a health professional, being assessed for food allergy as opposed to other conditions), and increased hospital admission rates for anaphylaxis, observed in Australia, the UK and USA.

[9] WAO: www.worldallergy.org/UserFiles/file/PressReleaseWorldAllergyWeek2013Embargoedto8April.pdf
[10] www.foodallergy.org

In response to the possible increase in allergies to food, the Australian Allergen Bureau was established in 2005 to provide information to industry about allergen management. According to the Allergen Bureau approximately 4-8% of children and 1-2% of adults now have a true food allergy. The Australian Society of Clinical Immunology and Allergy[11] reports in 2013 that food-induced anaphylaxis has doubled in the last 10 years and 10% of infants now have an immediate food allergy. The difference in estimates between agencies would be due to the differences in surrogate data collection and data interpretation.

The increasing number of reports about allergies, including those posed by food, has led to a focus on allergens in the food industry. Cross-contamination of produce with allergenic agents is the main issue for vegetable growers. The most frequently mentioned agents causing allergic reactions include peanuts, shrimp, raw or cooked egg, sesame seed and cow's milk. All these foods could be consumed together with vegetables or be a potential source of cross contamination.

The Allergen Bureau has developed many tools for growers such as Food Allergen management training packages and VITAL. The VITAL (Voluntary Incidental Trace Allergen Labelling) system can be used by food producers to assess the potential in their business for allergen cross-contamination and provides labelling instructions if necessary.

3.1.4 Microbiological contamination

Microbial contamination poses the greatest risk to people because of the large number of organisms that may cause a foodborne illness outbreak, the number of ways fresh or processed vegetables may become contaminated and the potential to spread fast and widely via multiple pathways.

According to the "Foodborne illness in Australia" publication[12], contaminated food (not specifically vegetables) was estimated to cause about 6,000 cases of illnesses other than gastroenteritis in Australia each year. Toxoplasmosis was estimated to be the most common non-gastroenteritis illness, causing 5,900 new symptomatic illnesses each year. Some serious illnesses, such as invasive listeriosis, where 20% of infections are fatal were also attributed to contaminated food in general.

The Food Safety Information Council (www.foodsafety.asn.au) reports during Food Safety Week (11-17 November 2013) that there are an estimated 5.4 million cases of food borne illness in Australia each year. Food poisoning results, on average, in 120 deaths, 1.2 million visits to doctors, 300,000 prescriptions for antibiotics, and 2.1 million days of lost work each year. The estimated annual cost of food poisoning in Australia is $1.25 billion. A Newspoll survey conducted on behalf of the organisation by telephone in October 2013 among a sample of 1201 people (aged 18 and over) nationally showed that food safety awareness and practices in Australian households were poor. This included awareness of risks of cross contamination from meat or fish to vegetables during storage and preparation of food. This is especially concerning for industry sectors that produce vegetables that will/can be eaten uncooked and particularly those that may be eaten without washing prior to use in the home.

[11] www.allergy.org.au : Allergy and Immune Diseases in Australia (AIDA) Report 2013
[12] Australian Government Department of Health and Ageing, 2005; Foodborne illness in Australia, annual incidence circa 2000. ISBN 0 642 82576 9

Food Standards Australia and New Zealand (2009), reports the number of all cases of food poisoning in Australia is 5.4 million yearly. The number of new daily cases of food poisoning in Australia is 11,500 and 120 people die due to food poisoning each year in Australia.

Improved instructions on packaging may not be the answer for prepacked fresh vegetables as the survey found that:

- Only just over half (55%) always read and complied with 'use by' dates
- Less than half (45%) said they always read and complied with 'best before' dates
- A third (33%) of people surveyed always read and comply with storage instructions and
- Only 14% of people surveyed read and comply with cooking instructions.

Types of microbial hazards

Microbiological hazards can be classified into spore-forming bacteria, non-spore-forming bacteria, viruses, and parasites. Certain bacteria form spores to withstand environmental stress conditions such as high heat, freezing or lack of oxygen.

Spore-forming organisms can attach to vegetables grown near the soil. Examples of these organisms include *Bacillus cereus*, *Clostridium perfringens*, and *Clostridium botulinum*. Rapid cooling and maintaining refrigeration temperatures at less than 5^{o}C at all times, and allowing sufficient oxygen influx into fresh vegetable packaging would reduce the risk of vegetative cell formation and the production of dangerous toxins that cause illness (Linton, 2003).

Non-spore-forming bacteria such as enterotoxigenic and enterohemorrhagic *Escherichia coli*, *Campylobacter jejuni, Listeria monocytogenes, Salmonella, Shigella* spp., *Staphylococcus aureus,* and *Vibrio* spp. could contaminate fresh produce by cross contact with humans or animals carrying these organisms. All of these bacteria have been associated with publicised fresh produce foodborne illness outbreaks of public health significance. The faecal to oral route is possibly the main mechanism of transfer for these pathogens. It could be controlled by simply practising good personal hygiene, cleaning food contact surfaces, and always using potable water when water is required.

Foodborne viruses require a living host in which to grow and reproduce. Viruses tend to move from one food to another, from water supply to food, or from food handler to food. Hepatitis A, Norovirus (Norwalk virus), and rotavirus are viruses of public health significance. Hepatitis A has been isolated in vegetables washed with non-potable water. A person can carry the virus for up to six weeks and contaminate food and other workers without any knowledge of signs and symptoms. The Norwalk virus and rotavirus have been associated with many foodborne infections. Raw fruits and vegetables washed with contaminated water were implicated in some outbreaks. These viruses are transmitted by person-to-person contact and by faecal contamination. Again, practising good personal hygiene and controlling staff carrying the virus are measures that could possibly eliminate food-borne illness caused by these pathogens.

Parasitic protozoa include *Cyclospora cayetanensis, Giardia lamblia*, and *Cryptosporidium parvum*. They are single-cell microorganisms that must live on or inside a host to survive.

These parasites may be transmitted via contaminated water, by person-to-person contact, and by faecal contamination. Use of potable water for operations is critical.

Appendix 3 provides a more extensive overview of microbial organisms that can cause foodborne illness. Infection pathways that need to be controlled are shown in Appendix 4.

Microbial hazard categorisation for fresh commodities

Not all vegetables present identical microbial risks; categorisation assists in setting priorities for preventative measures.

Food safety systems could use risk categorisation based on good data to streamline systems, monitoring and auditing requirements.

The following section describes an approach to categorising microbiological hazards of fresh produce that could be used to streamline food safety requirements according to risk. Microbial contamination poses the highest risk for the vegetable industry due to the potential for rapid spread of illness (via produce or person to person), cross contamination (from meat or fish) and serious illness or even death, especially in vulnerable groups of the population (elderly or infirm people, infants and pregnant women).

FAO and WHO convened an Expert Meeting on 19–21 October 2007 to consider how to adequately address the extensive request for scientific advice received from the 38th Session of the Codex Committee on Food Hygiene (CCFH) on the microbiological hazards associated with fresh produce. The meeting established the priority commodities of concern and provided some guidance to FAO and WHO as to how these could be addressed.

The meeting agreed to a set of **six criteria**, which it used to rank the commodities of concern as identified by the previous session of the CCFH and by member countries. The same criteria can be applied to Australian vegetables.

The hazard criteria were:

1. Frequency and severity of illness recorded
2. Size and scope of production
3. Diversity and complexity of the production chain and industry
4. Potential for amplification of foodborne pathogens through the food chain
5. Potential for control
6. Extent of economic and trade impact.

Points 1-3 relate to the likelihood of risks, points 4-6 to potential consequences.

The information that had been made available by member countries was reviewed in the light of these six criteria. This enabled the ranking of identified commodities into the following three priority groupings. The same groupings appear to be relevant for Australian vegetables.

Level 1 Priorities – leafy green vegetables

Leafy greens are a level 1 priority because they are usually eaten raw; washing may not remove all pathogens and cross contamination may occur during food preparation and after washing. Leafy greens are grown and traded in large volumes, have been associated with multiple outbreaks with high numbers of illnesses in at least three regions of the world, and are grown and processed in diverse and complex ways, ranging from in-field packing to pre-cut and bagged product. Such post-harvest activities contribute to the possibility of amplification of foodborne pathogens. The risk of carrying over cross contaminations received from meat or fish during food preparations in restaurants or homes is high.

Level 2 Priorities – berries, **green onions,** melons**, sprouted seeds,** tomatoes

These commodities were identified as being the second highest concern. It was not possible to rank them from a global perspective. It was clear that regional differences exist and therefore it would be easier to rank these commodities in order of priority from a regional perspective. Sprouted seeds were considered somewhat separately from the other four in this group as a Codex guideline for the hygienic production and packaging of sprouted seeds already exists. However, sprouted seeds continue to be implicated in outbreaks and therefore the meeting considered that the existing code should be reviewed in the light of the available information to determine if any revisions were necessary.

Level 3 Priorities - carrots, **cucumbers,** almonds**, baby corn,** sesame seeds, onions and garlic, mango, paw paw, and **celery**

While all these commodities have been implicated in cases or outbreaks of foodborne illness, the public health impact was considered to be low, based on information available. Also, there is limited data available for most of these commodities, and in several cases the associated problems have been recognized only recently. *However, these may be emerging problems and therefore it was recommended that problems linked to these commodities be noted and the commodities be monitored for further problems*. As more information becomes available, the ranking of these commodities would need to be re-evaluated.

Food safety risks, physical, chemical or microbiological hazards, can occur at any stage of the vegetable supply chain.

3.2 Food safety in Australian vegetable supply chains

3.2.1 Supply chains

The supply chain for fresh vegetables is described in Figure 3-1. It highlights that food safety is a consideration for most production steps (blue boxes). Figure 3-2 describes the 'Market' component (brown box) to illustrate the complexity of supply chains post the farm gate.

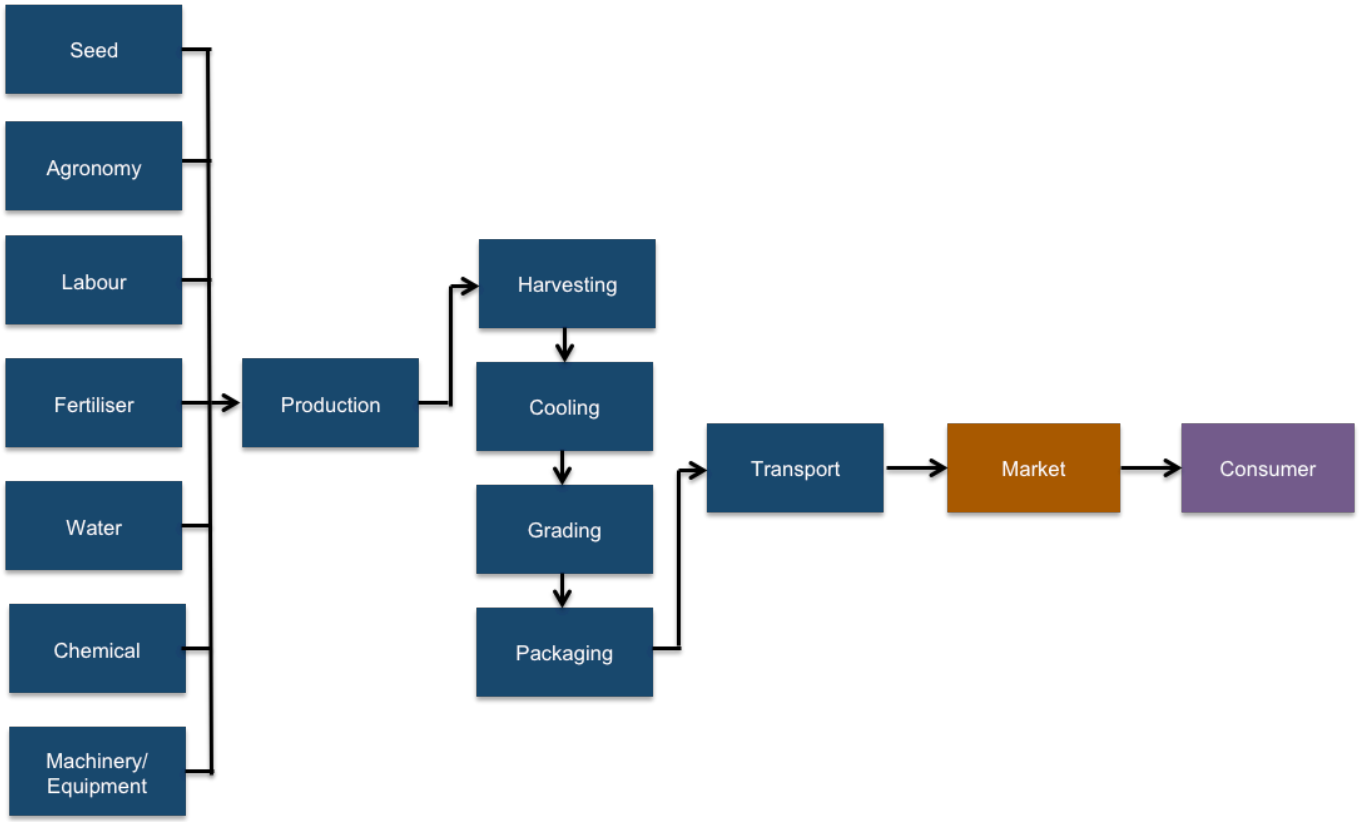


Figure 3-1 Businesses involved in planting, harvesting and transporting a vegetable crop to market.

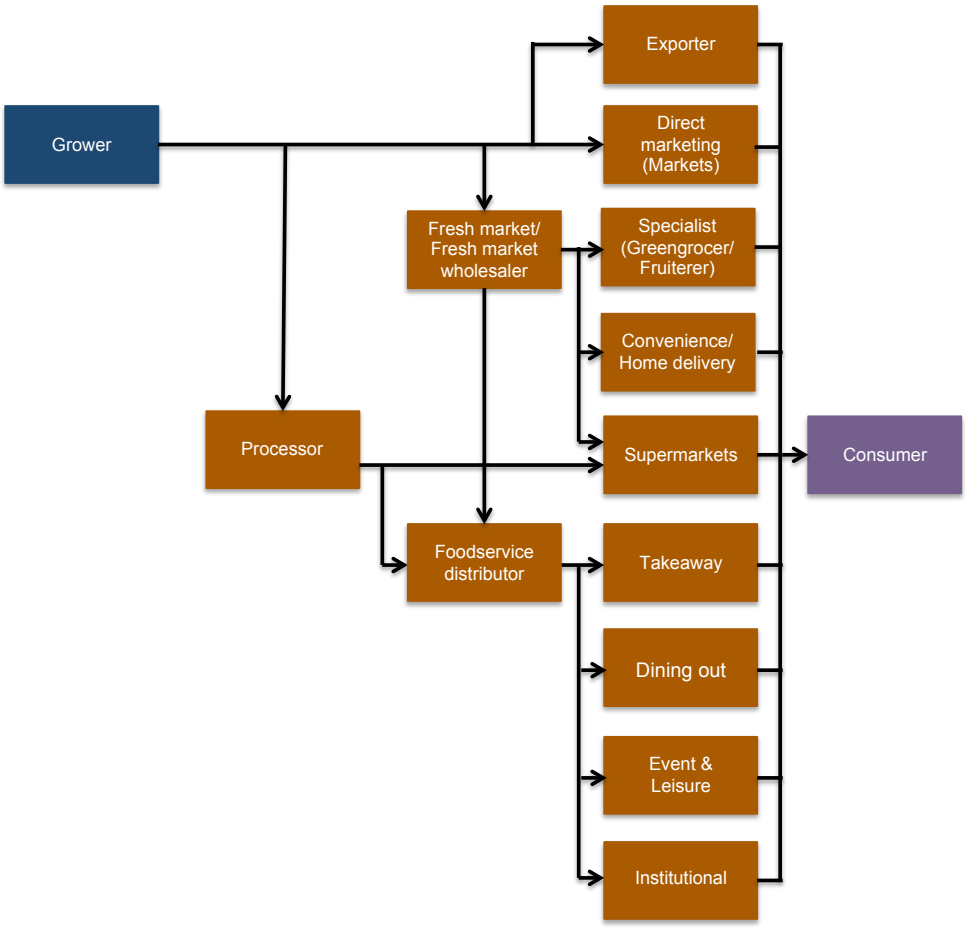


Figure 3-2 Businesses involved in moving a vegetable product through the market to the consumer

There are a large and diverse number of food retail outlets outside the concentrated sales channels of grocery stores as illustrated in Figure 3-3. According to Freshlogic's latest available information in 2011[13], about 62 per cent of spending occurs in 4,500 outlets with the remaining 38 per cent is spread across approximately 77,000 food outlets, which are used for various meal occasions.

The intricacies of supply chains with a high number and diversity of food retail and foodservice outlets, highlights the widespread effect a food safety breach may have and how difficult it may be to trace it. This is particularly the case if the breach is caused by a microbiological hazard that originated on-farm. Good traceability is the key for containing a food safety incident to prevent emergency or crisis situations.

[13] Spencer, S & Kneebone, M 2007, FoodMap: A comparative analysis of Australian food distribution channels, Australian Government Department of Agriculture, Fisheries and Forestry, Canberra. http://www.daff.gov.au/__data/assets/pdf_file/0003/298002/foodmap-full.pdf

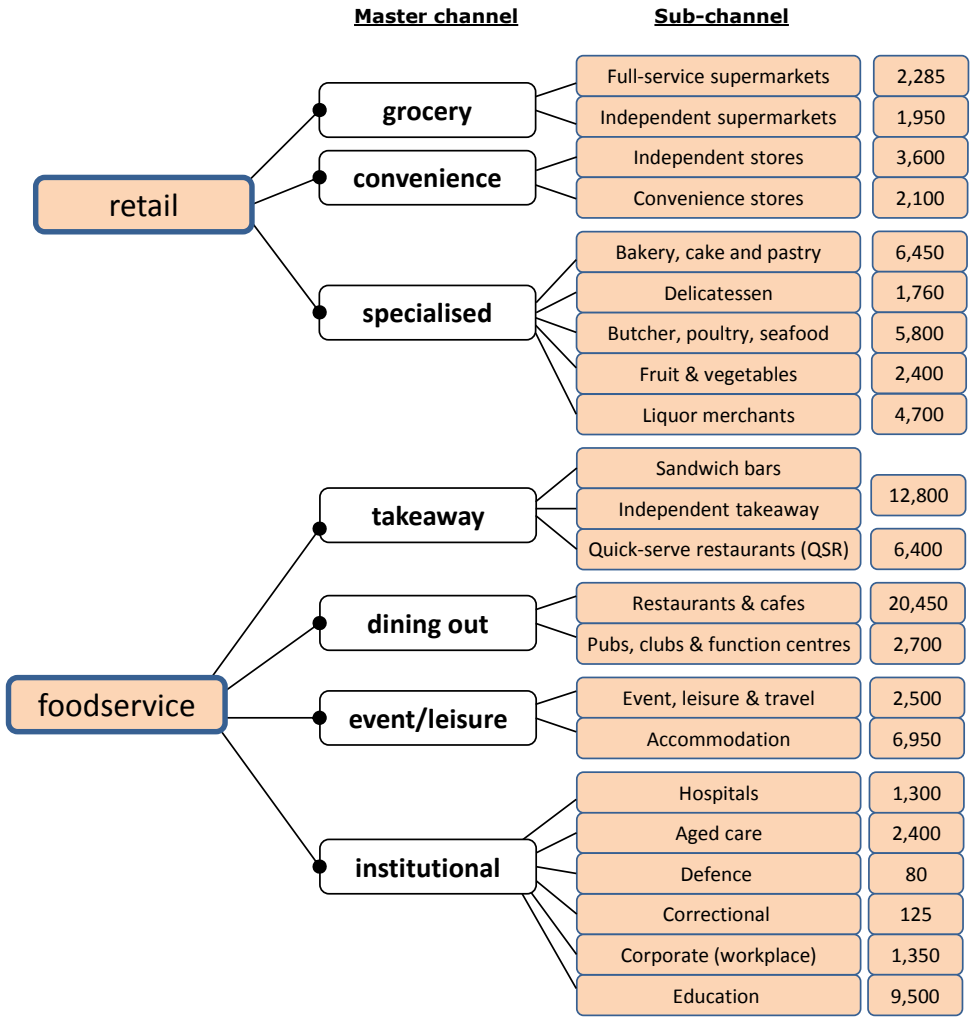


Figure 3-3 Supply chain distinction between foodservice and retail channels, showing master and sub-channels including numbers[14]

Table 3-1 provides data on Volumes of vegetables sold in major outlets. This information indicates that supermarkets could be a major focus, should food related illnesses occur, due to the volume of fresh vegetables they handle. Traceability from paddock to supermarkets and even to processors, the next largest category is expected to be much better than traceability to the many speciality and food service outlets. Supermarkets and processors would have greater requirements and control of food safety in their supply chain.

A food safety breach in any part of the supply chain can affect the entire vegetable or fresh produce industry. Therefore it is important that all participants understand and use good practices, no matter how much of the total volume they supply to consumers.

The supply chain information indicates that smaller scale operations and/or those with multiple and complex supply chain arrangements may be a higher food safety risk than

[14] Spencer, S & Kneebone, M (Freshlogic) (2012), FOODmap: An analysis of the Australian food supply chain, Department of Agriculture, Fisheries and Forestry, Canberra. ISBN 978-1-921575-45-7 (printed), ISBN 978-1-921575-46-4 (online)

larger operations that operate in more streamlined supply chains. Reasons for this are that councils and others in charge of ensuring food safety cannot efficiently support the high number of small businesses and product traceability may be poor. It is therefore important to work on fostering good practices based on awareness and understanding of risks rather than relying on regulation to 'do the job'.

Farmers markets and other ways of selling directly to customers are not included in Figure 3-3 and Table 3-1. Direct sales may be a critical avenue for food hazards to reach customers as, based on desktop research and our survey (refer to section 6), many growers who sell directly to the public are not aware of the fact that they are classified as a food business under the Code.

Table 3-1 Australian fresh vegetable sales volumes and proportions by major category (food map 2012 data)

#	Category	Tonnes	% of total production
1	Fresh Supermarket	1,252,000	36.40
2	Processing use	1,048,000	30.47
3	Speciality greengrocers & markets	487,200	14.16
4	Foodservice	356,200	10.36
5	Other	197,600	5.74
6	Fresh exports	98,600	2.87
	Total production	**3,439,600**	**100.00**
7	Fresh imports	42,800	1.24

3.2.2 Food safety pre- farm gate

Australian vegetable farms

The following section provides information based on ABARES data[15] about participation in food safety systems based on farm size.

Food safety participation differs between states and farm business sizes.

An estimated 65 per cent of Australian vegetable farms had a food safety program in place in 2010–11 (Table 3-2). The proportion of vegetable farms with a food safety program varied between states with South Australia having the highest proportion (87%) and New South Wales the lowest (31%).

Use of poor quality water for pre-harvest and post-harvest activities was identified as the most common cause of microbial produce contamination in the supply chain before produce is used in a restaurant or home (FSANZ 2012). In 2010–11, an estimated 44 per cent of Australian vegetable farms undertook a food safety assessment of their water source (Table 3-2). A lower proportion of vegetable growers in New South Wales and Victoria conducted a risk assessment of their farm's water source than the national average. Vegetable farms in

[15] ABARES, 2012; Australian vegetable growing farms: An economic survey 2010–11 and 2011–12

South Australia again had the highest level of participation with 60 per cent conducting a food safety assessment of their water source.

More than half vegetable growers tested their produce for chemical residues. However, the proportion of growers that tested vegetables for chemical residue again varied between states, with an estimated 23 per cent of vegetable growers in New South Wales conducting such a test, compared with 74 per cent in Western Australia.

Table 3-2 Food safety precautions undertaken, by state, 2010–11

percentage of farms

	NSW		Vic.		Qld		SA		WA		Tas.		Aust.	
	%		%		%		%		%		%		%	
Have participated in or are considering an environmental management program	42	(24)	42	(26)	17	(41)	26	(22)	48	(28)	45	(21)	34	(12)
Conducted a food safety assessment of the farms water source	31	(30)	31	(14)	51	(26)	60	(27)	53	(24)	46	(22)	44	(11)
Test produce for chemical residues	23	(34)	72	(15)	63	(17)	70	(25)	74	(15)	71	(15)	59	(8)
Have a food safety program in place	31	(28)	70	(15)	65	(22)	87	(10)	80	(13)	78	(13)	65	(8)

Note: Figures in parentheses are standard errors expressed as a percentage of the estimate.

Source: ABARES Australian vegetable growing farms survey.

A greater proportion of large vegetable farms (those with more than 70 hectares) undertook food safety measures, compared with other growers (Table 3-3). An estimated 93 per cent of large vegetable farms reported testing produce for chemical residues, compared with 37 per cent for the smallest vegetable farms (those with less than 5 hectares of vegetables).

Table 3-3 Food safety precautions, by area of vegetables planted, 2010–11

percentage of farms

	<5 hectares		5–20 hectares		20–70 hectares		>70 hectares	
	%		%		%		%	
Have participated in or are considering an environmental management program	17	(41)	42	(18)	34	(17)	50	(15)
Conducted a food safety assessment of the farms water source	38	(36)	33	(17)	51	(11)	69	(11)
Test produce for chemical residues	37	(37)	61	(11)	65	(12)	93	(5)
Have a food safety program in place	48	(21)	60	(13)	76	(9)	90	(1)

Note: Figures in parentheses are standard errors expressed as a percentage of the estimate.

Source: ABARES Australian vegetable growing farms survey.

Food safety on organic farms

Specific information relating to organic production is included as several reported foodborne illness outbreaks appeared to have originated on organic farms. The risk of contamination may be higher than on conventional farms as organic production relies on organic fertiliser sources, including manures, for crop nutrient supply.

Average organic farms in Australia are growing in size, but are still smaller than conventional farms[13]. According to the above-mentioned ABARES report they would therefore have a relatively low participation in food safety schemes based on farm size.

Supply chains for organic produce are likely to involve direct sales to the public including farmers markets (refer to section 3.2.3). These generally do not require proof of food safety certification from their clients (even though, based on them selling to the public, they are 'food businesses' and must comply with section 3 of the Code).

In 2012 Australia had over 12 million hectares of certified land for organic production, the majority in rangelands[16]. There are just over 3,000 certified operations, 2,200 of these are in primary production. Organic farmers are on average younger than the average Australian farmer.

The Australian organic market is estimated to be over A$1B. It is a niche market with circa 1% retail value and relative to EU and US this is a small percentage. Major supermarkets now take positions in the organic marketplace. In 2009 and 2010 consumer surveys reported by Biological Farmers Australia (BFA) showed that 57% of households claim to have purchased organic fruit and vegetables in the past 12 months and 42% purchased organic processed goods including vegetables. This means that about every 2nd household buys fresh organic horticultural produce or processed vegetables.

The survey revealed that the main buying reasons were that the produce is chemical free (82%), additive free (77%) and environmentally friendly (70%). Interestingly for this study, 26% of respondents assumed that organic food provides better traceability (and thus safety). The figures reveal that while microbiological contamination poses the greatest risk of harm to people (and damage to supply chains), many consumers appear to be more concerned about chemical contamination and environmental stewardship. Consumer perceptions about organic produce could mean they may be more inclined to eat fresh organic vegetables raw and unwashed based on their perceived 'healthiness'. Thus, risks may be higher than with conventional produce eaten raw or unwashed.

Attempts to get HACCP food safety integrated into existing organic standards (even though as "additional to") are ongoing. Resistance is still strong in the 'informal' organic sector with a view and perception around additional costs, additional (superfluous) paperwork and testing.

Since 1998 BFA has encouraged organic farmers to adopt HACCP and has developed an alliance with Freshcare and retailer partnerships. However, according to BFA some organic growers do not see benefits in food safety certification.

Market relevant organic standards that should encompass food safety (and environmental stewardship) as an integral part of organic production are: ACOS = BFA/Bud logo Australian Certified Organic Standard (2010 + amendments), NS = DAFF (AQIS) National Standard for Organic and Bio-dynamic Produce (2009), AS6000=Australian Standard for Organic and Bio-dynamic Produce (2009 + amendments), NOP = National Organic Program of USDA (US Department of Agriculture) and EU = European Union 834/2007 +.

[16] Monk, A. 2013: Organic Foods: Food safety incl. Market Overview 2012, Biological Farmers Australia (BFA) Ltd

3.2.3 Food safety post farm gate

Supermarkets

All major supermarket retailers require 3rd party food safety certification of their suppliers. The systems are not identical despite having the same aim.

Woolworths, Coles and Supa-IGA dominate the supermarket category, operating over 1,900 full-service supermarkets. These outlets offer 25,000 products, including a complete range of fresh, frozen, and processed vegetables. They have state-based distribution facilities that enable them to buy product centrally and then breakup and distribute product to their store networks.

The discount operator Aldi entered the Australian market in 2002 and since then, expanded its network to 230 stores. Aldi also operates central buying and state-based distribution facilities. Costco Wholesale also entered the Australian market. In 2009 it opened its first store in Melbourne, with another two stores in Sydney and Canberra opening since. There are two more stores due to open in late 2013. In addition, a second tier of retail supermarket operators, such as FoodWorks, Foodland and Harris Farm Markets, provide fresh vegetable offers.

Woolworths have developed their own food safety system for direct suppliers and indirect suppliers of Woolworths branded produce. Certification to Woolworths Quality Assurance (WQA) is by invitation only. Woolworths outlines category criteria for suppliers of produce to their vendors. At a minimum, produce suppliers to vendors must have a 3rd-party audited HACCP-based system from a registered Certification Body (i.e. Freshcare, HACCP, GlobalG.A.P). This is outlined in Appendix 4 of the WQA standard.

Coles have produced a set of requirements that overarch a number of approved food safety systems. For produce growers, GlobalG.A.P (Option 1), Freshcare, and SQF are acceptable standards. A grower with a packing facility can also choose from these systems, and can choose to be certified to BRC for their packing facility only. For those suppliers who only pack produce, the same standards (except Freshcare) can be chosen.

Aldi and Costco have a number of requirements for their suppliers, and also request that they be certified to a GFSI-benchmarked system. IGA simply require their suppliers to be certified to any 3rd-party audited food safety system.

Processing

Processors predominantly contract growers directly. Generally, processors require some form of on-farm food safety practices to be in place, but not all require their suppliers to be certified to a food safety system. Food safety practices required by processors often focus on physical and chemical hazards.

The processing industry consists of companies that bottle, can, preserve, quick-freeze and quick-dry vegetables. Products include dehydrated vegetable products, soups, sauces, pickles and concentrates. In Australia major fruit and vegetable processors

include SPC-Ardmona, Goulburn Valley, Simplot, Unilever, Heinz, Golden Circle and McCains. These companies sell vegetable products under many well-known brands.

Fresh markets and greengrocers

Wholesale

There are six central markets in Australia, each of which perform a vital role in the sale and distribution of fresh fruit, vegetables and flowers. Central markets provide a structured trading environment where all industry sectors (growers, wholesalers, retailers) are able to meet and collectively trade. Central markets provide a distribution mechanism for the many thousands of businesses that retail or process fresh produce. A large proportion of Australia's fresh produce is either traded or transhipped through Australia's central markets.

There is no consistent approach to food safety certification for supplies of wholesalers. Some will only buy certified produce; some have approved supplier programs, while others do not have any specific food safety requirements.

Growers can directly sell at most wholesale markets or supply to merchants who are located at the market. Transport occurs via freight forwarders or own trucks. Wholesale markets mainly deal in bulk cartons and bins rather than prepacked product; however, some pre-pack bagged and punnet lines are traded through wholesale markets.

Freight forwarders may or may not be covered by approved supplier programs or other food safety schemes.

Retail

a. Greengrocers

These outlets are typically independently owned and may utilise group buying and distribution arrangements. Specialist fresh product wholesalers and distributors service them.

There are no consistent food safety certification requirements for greengrocers. The Greengrocers Australia Association does not deal with this aspect of their retail business members.

Consumers buy vegetables at a greengrocer for better quality, better range and expected lower more consistent prices. Greengrocers can offer a range of quality and product prices i.e. they can provide two grades of a like product and accurately identify these two grades at the point of sale. Specialised greengrocer businesses are now also taking orders for home deliveries online.

b. Convenience stores

Independent grocery and convenience store channels have a minority share of retail sales of fresh and processed vegetables and offer a limited range of

Food safety certification requirements for convenience stores (e.g. Milkbars, 7-Eleven) selling fresh produce do not appear to exist.

products. A significant percentage of convenience stores are located within petrol stations or suburban strips of village shopping centres. Regional distribution centres service chains or banner groups of independent and convenience stores (e.g. 7-Eleven).

Direct marketing

Growers selling directly to the public are classified as Food Businesses under the Code and relevant Food Acts and must have appropriate food safety management systems in place to comply with these requirements.

Direct farmer to consumer marketing includes any method by which growers sell their products directly to consumers. The commonly used methods are sales direct from the farm, pick-your-own operations, roadside stands and markets, public farmers markets and house-to-house delivery. The primary attraction of direct marketing outlets to consumers is the opportunity to purchase fresh products from their source. Recent consumer interest in purchasing produce directly from farmers also seems to be coupled with increasing concerns regarding food freshness, healthiness and safety. The safety aspect appears to have a focus on potential chemical contamination for customers of farmers markets or other direct marketing outlets.

Below are examples of the types of rules and regulations for stallholders at farmers markets.

Many organised direct markets have rules relating to food safety; however these appear to be focussing on the safety of food products being made at the market, and on personal hygiene for food handlers. There does not seem to be a consistent approach to food safety for stallholders supplying vegetables directly to the public whether it is their own or brought in.

The Victorian Farmers Market Accreditation Program is an initiative of the Victorian Farmers' Markets Association supported by the Victorian government. The aim is to "provide a solid basis of quality, integrity and fairness to all consumers. The program advocates best practice and celebrates the work of genuine farmers, specialty makers and farmers' markets. The program ensures the credibility of participants in a proudly transparent process." This program is voluntary and focuses on regionality and knowing the grower of the produce as opposed to food safety.

The Adelaide Showground Farmers Market has a document that outlines rules and responsibilities for all stallholders. Stallholders must comply with all relevant legislation, including the Food Standards Code and the local Food Act. There is also a Health and Hygiene Policy which can be found on their website at http://www.adelaidefarmersmarket.com.au/files/rwnbbqxvct/2012-Rules-and-responsibilities---B&W.pdf. The policy states "Food safety is the biggest threat our market faces" and provides detailed requirements for safe food handling, transport and storage, personal hygiene and waste, however no mention is made in the document about the safety of fresh produce.

The Moruya Farmers Markets also has documented rules and regulations for stallholders. One of the rules is that primary producers using chemicals in their production methods must "ensure they observe the appropriate withholding periods as indicated by the manufacturer of the chemical and using the guidelines provided by the Australian Pesticides and Veterinary Medicines Authority".

Food service

Foodservice businesses buy vegetables for use in meals or snacks. They buy and use more frozen than fresh vegetables, since a product in its frozen form can be stored and used as required, minimising waste and maintaining acceptable quality. The foodservice buyers seek competitive prices. Since they are not trading the product in its purchased form, they are influenced by the product's suitability for their food production or assembly process.

Foodservice outlets are classified as Food Businesses under the Code and relevant Food Acts and must have appropriate food safety management systems in place to comply with these requirements.

Takeaway / Quick-serve

Takeaway constitutes over 16,000 takeaway outlets ranging from major franchises like McDonalds and Subway to family run fish and chip shops. Major franchises have processed and fresh vegetables purchased and supplied centrally, according to tight specifications. The supply arrangements generally involve either outsourced or in-house component processing or preparation. This will include pre-cooking, shredding and cutting, and pre-packaging of some fast-moving meal items. Larger independent takeaway food outlets utilise group buying and distribution arrangements. Specialist fresh product wholesalers and distributors who have developed business models based on the frequency, cold-chain and specification requirements of these retailers service them.

There does not appear to be any information available for small takeaway outlets, on individual food safety requirements for their suppliers, however takeaway and quick serve restaurants are classified as Food Businesses under the Code and relevant Food Acts and must have appropriate food safety management systems in place to comply with these requirements.

Major franchises such as McDonalds, Subway and Yum! Brands such as KFC and Pizza Hut define quality and food safety standards for their suppliers. On the global Yum! Brands website, there is information provided on supplier and restaurant food safety. They state that they "actively work with our suppliers to raise industry standards because we insist that our products are safe and of superior quality". In the McDonald's Corporation Worldwide Corporate Social Responsibility 2010 Report, a section is devoted to the farm and suppliers of produce, stating "multiple varieties of lettuce and tomatoes are grown on farms around the world in keeping with good agricultural practices (GAP) developed by McDonald's employees, suppliers and outside consultants."

Dining out / restaurants

Dining out includes more than 25,000 cafes and restaurants, pubs, clubs and function centres that provide meals, snacks, and a venue for dining out. These buyers are seeking a continuity of supply so they can set menus and rely on product quality. They typically purchase through fresh market providers.

There does not appear to be any information on "sit down restaurants'" individual food safety requirements for suppliers, however these businesses are classified as Food Businesses under the Code and relevant Food Acts and must have appropriate food safety management systems in place to comply with these requirements.

Event and Leisure

Events and leisure include more than 14,000 venues, caterers, and travel providers that provide food for specific events and venues. These buyers are often seeking large quantities of product over short periods, as they usually service large gatherings of people. **The need for or use of food safety systems is not clear for events and leisure.**

Some councils now require a food-handling certificate for 'food safety supervisors' at community events. The driver for the regulation and whether it has significance for the vegetable industry is not clear. Increases in regulation do not necessarily improve the understanding of food safety issues and result in a change in behaviour of all involved. Awareness programs may be more useful.

Institutional

Institution has over 12,000 locations that cater for facilities such as hospitals, aged care, schools, and correction facilities. Operators typically have in-house equipment and tools to prepare meals from scratch. Some operators, for example schools and aged care, expect suppliers to meet certain nutritional standards. The buyers in the channel often use a tender process and contract arrangements to secure fresh vegetable supply and expect a lower price as they are often using product that may not be suitable for retail presentation.

It is not clear and reliable information could not be found about whether institutions ask suppliers for evidence of food safety management.

Export

According to ABS data, the value of Australian vegetable exports is forecast to increase by 3% in 2013–14 to $570 million before rising marginally to $577 million (in 2012–13 dollars) by 2017–18.

The main fresh vegetable exports from Australia traditionally include carrots, onions and shallots, asparagus, brassica crops and potatoes (Figure 3-4). Australia is considered a niche, high quality

Given that Australian vegetable growers are looking towards the Asian region with a view to increase exports, food safety risk management should be considered when setting up supply chain arrangements to avoid any incidents that could damage Australia's reputation as a supplier of safe fresh produce and food.

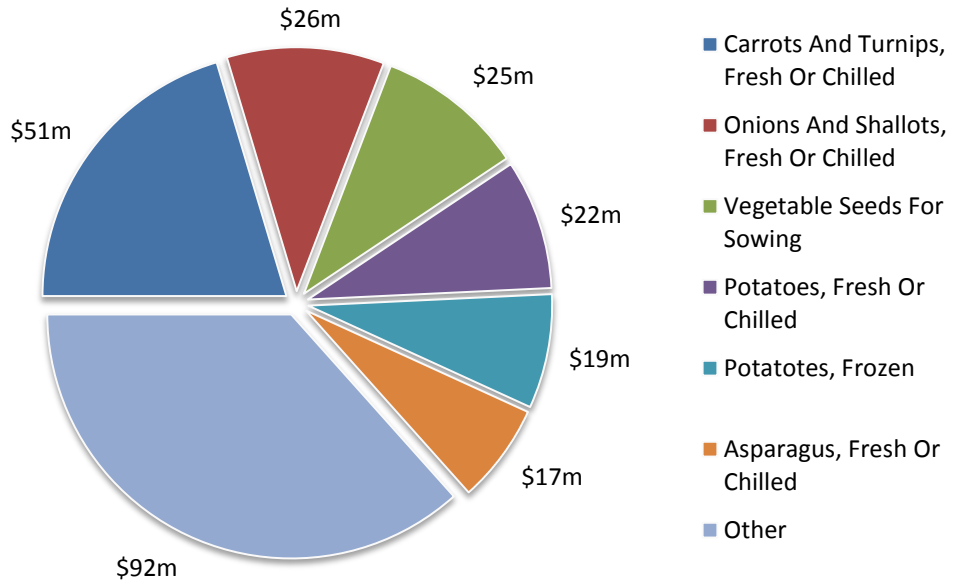
exporter of vegetables with a good food safety record. It has some supply advantages in the world market due to its ability to supply in the counter seasons to the northern hemisphere. The biggest market for Australian vegetable exports is Asia with the key markets being Japan, Hong Kong, Singapore and Malaysia. The UAE, NZ, the USA and the EU follow Asia in importance.

Exported produce may be sold through wholesale markets or supermarket chains. It is important to understand and manage the freight logistics and cold chain maintenance by freight forwarders to ensure quality and food safety are sustained.

Food safety requirements vary greatly depending on the market and the customer. For example if supplying directly into major supermarkets in the EU, there are strict food safety guidelines in place. Many markets require certification to a GFSI-benchmarked system such as BRC or SQF. In addition these supermarkets may have their own set of requirements or systems that need to be adopted by suppliers. Examples of these include Tesco's Nature, Marks and Spencers Field to Fork and Albert Heijn's protocol for residue control.

Similarly structured food safety requirements do not appear to exist in Asian supply chains.

Japan and China are very food safety conscious due to scares related to beef and milk. Importers and supermarkets in this region, such as AEON, have adopted internationally recognised food safety systems such as GlobalG.A.P. to ensure the safety of produce they grow and purchase.



Source: Global Trade Information Service, sourced from ABS International Trade data, 2011-12

Figure 3-4 Vegetable exports by vegetable commodity, 2011-12 ($m)

Given the importance of international trade rules for Australia's food and agriculture trade, Australia takes an active role in the WTO and related standard setting bodies in order to continually improve the conditions faced by Australian exporters in overseas markets.

Imports

Like food that is produced domestically, food that is imported into Australia must meet Australian food standards. The monitoring of imported food is a responsibility shared across many government agencies, including those at local, state, territory and federal levels.

The Imported Food Control Act 1992 addresses food safety requirements for imported food including vegetables.

FSANZ monitors food safety incidents worldwide and provides advice to the government on monitoring and testing of imported food. FSANZ advises the relevant department(s) when food poses a medium-high risk to human health and on appropriate testing. It also provides risk assessment advice to state and territory regulators, who are responsible for monitoring all food at point of sale, including imported food.

Table 3-4 provides context for potential food safety concerns in regards to import or export.

Table 3-4 Imports, exports and trade balance (volume) for fresh vegetables[17]

Code and commodity	2007	2008	2009	2010	2011	2012
Fresh IMPORTS (tonnes)						
070519, Lettuce (*Lactuca sativa*), except Head Lettuce, Fresh or Chilled	55	0	0	0	0	5
070610, Carrots and Turnips, Fresh or Chilled	219	26	0	50	78	0
070820, Beans (*Vigna* spp., *Phaseolus* spp.), Fresh or Chilled	632	873	729	555	796	750
070960, Fruits of the genus *Capsicum* (Peppers) or of the genus *Pimenta* (e.g. Allspice), Fresh or Chilled	2,618	1,685	1,603	1,959	1,728	1,757
070410, Cauliflower and Headed Broccoli (*Brassica Oleracea* var. *Botrytis*), Fresh or Chilled	13	0	2	34	2	0
070810, Peas (*Pisum sativum*), Fresh or Chilled	1,422	1,452	1,594	1,409	1,413	1,693
070993, Pumpkins, Squash and Gourds (*Cucurbita* spp.), Fresh or Chilled	0	0	0	0	0	0
Fresh EXPORTS (tonnes)						
070519, Lettuce (*Lactuca sativa*), except Head Lettuce, Fresh or Chilled	499	673	573	709	573	542
070610, Carrots and Turnips, Fresh or Chilled	55,223	56,603	67,566	73,551	67,054	68,976

[17] VG12083 Understanding the Nature, Origins, Volume and Values of Vegetable Imports Interim Report November 2013

Code and commodity	2007	2008	2009	2010	2011	2012
070820, Beans (Vigna spp., Phaseolus spp.), Fresh or Chilled	840	1,025	1,150	1,403	1,150	1,049
070960, Fruits of the genus *Capsicum* (Peppers) or of the genus *Pimenta* (e.g. Allspice), Fresh or Chilled	922	822	978	841	406	172
070410, Cauliflower and Headed Broccoli (*Brassica oleracea* var. botrytis), Fresh or Chilled	2,372	2,309	2,229	2,935	2,520	2,132
070810, Peas (*Pisum sativum*), Fresh or Chilled	189	58	118	61	9	945
070993, Pumpkins, Squash and Gourds (*Cucurbita* spp.), Fresh or Chilled	0	0	0	0	0	1,296
Fresh TRADE BALANCE (tonnes)						
070519, Lettuce (*Lactuca sativa*), except Head Lettuce, Fresh or Chilled	445	673	573	709	573	536
070610, Carrots and Turnips, Fresh or Chilled	55,004	56,577	67,566	73,501	66,975	68,976
070820, Beans (*Vigna* spp., *Phaseolus* spp.), Fresh or Chilled	208	152	422	849	354	299
070960, Fruits of the genus *Capsicum* (Peppers) or of the genus *Pimenta* (e.g. Allspice), Fresh or Chilled	-1,696	-863	-625	-1,118	-1,322	-1,585
070410, Cauliflower and Headed Broccoli (*Brassica oleracea* var. botrytis), Fresh or Chilled	2,359	2,309	2,227	2,901	2,518	2,132
070810, Peas (*Pisum sativum*), Fresh or Chilled	-1,233	-1,394	-1,475	-1,348	-1,403	-748
070993, Pumpkins, Squash and Gourds (*Cucurbita* spp.), Fresh or Chilled	0	0	0	0	0	1,296

3.3 Foodborne illness due to microbial contamination involving vegetables

Vegetables are recognised as a key component of a healthy, balanced diet (Figure 3-5) and are perceived as being low risk by many consumers when compared with other foods e.g. poultry and seafood. This image can be severely damaged if vegetables become associated with a potential or actual food safety incident as happened in June 2013 in the US (Figure 3-6). Following the publication trail for this incident highlighted that it took nearly one month for the source and causal organism of this vegetable related illness to be confirmed by authorities. Such a scare easily overrides the good health messages about vegetables in consumers' minds leading to a shift in buying behaviour with a possible move from fresh to processed product and a reduction in overall vegetable purchases.

Figure 3-5 Health benefits of vegetables

Even if consumers believe a certain type of food may be 'contaminated', they stop buying it. This was evident during the 'fireblight incident' when NZ was accused of spreading the plant disease, that affects plants only, and only those in the *Rosacea* family like apples and pears. As apples were mentioned in media reports in connection with the word 'disease', customers stopped buying apples and the unrelated custard apples (because of the name); they continued to buy pears. This is one example of non-rational behaviour that can be expected when food is considered risky. Attitudes towards GM food or even 'conventional' production further document this issue.

Unfortunately, useful data on economic consequences of different types of 'food scares' is usually not investigated and reported.

3.3.1 Sources of microbial contamination

Good hygiene, temperature and atmosphere control in the fresh vegetable supply chain can prevent foodborne illnesses.

Microbial contamination of vegetable products can occur in the field, during harvesting, post harvest handling, processing, storage, transport or during food preparation. Boecker Food Safety (www.eat-safe.com) lists the following common sources of contamination:

- Faecal contamination of soils due to grazing animals or human waste
- Contamination from un-composted manure or recycled sludge used as fertiliser
- Irrigation water contaminated with runoff from areas grazed by animals
- Handling by workers practicing poor personal hygiene or infected by others
- Contaminated wash water in the processing facility
- Drip or splash from contaminated floors, drains, overhead pipes or cooling systems
- Cross contamination during food preparation e.g. though raw meat or eggs
- People to people contamination
- Using unwashed vegetables for raw consumption.

Which of the abovementioned sources causes the most severe or most frequent food related illnesses and the types of pathogens involved could not be found. When primary causes of an illness are recorded the information relates to the type of pathogen and when or how a person came in contact with it.

3.3.2 Records of vegetable related incidents in Australia

Food safety incidents applicable to the vegetable sector and recorded via OzFoodNet (2006-2010) are listed in Appendix 5. They include information on:

- Vegetable products
- Geographic locations
- Primary causes and severity of illness.

The information in Appendix 5 is summarised in Table 3-5. It shows that more than half of the outbreaks and number of people affected were due to two pathogens, Salmonella and Norovirus. Both of these pathogens are easily transferred from person to person or animal to person. Poor knowledge and use of appropriate hygiene practices are the main risk.

The data shows that salad vegetables as part of a meal or sandwiches and fresh produce in general were the commodities mentioned most frequently as a root cause of individual outbreaks.

A total of 29 cases occurred with 510 people affected, 23 had to be admitted to hospital and there were no fatalities.

Table 3-5: Vegetable related foodborne illness outbreaks 2006-2010

Statistics	Affected # people	Hospitalised # people	Outbreaks total #
Total	**510**	**23**	**29**
Min per outbreak	2	0	
Max per outbreak	75	7	
Median per outbreak	9	0	
Average per outbreak	17.6	1	
Pathogen			
Norovirus	131	0	8
Salmonella	157	19	7
Total	288	19	**15**

Salmonellosis is an infection of the digestive system caused by the bacteria salmonella. There are thousands of salmonella types. They occur in the gut of humans and many domestic and wild animals. Salmonellosis occurs when people ingest the bacteria. This can occur in a number of different ways:

- Eating undercooked meat (especially chicken) and raw or undercooked eggs.
- Eating cooked or ready to eat food such as vegetables that have come into contact with Salmonella bacteria from raw food or contaminated surfaces such as chopping boards and cooking utensils that have been used for raw food (cross contamination).
- People with salmonellosis have the bacteria in their faeces. If they do not wash their hands properly after going to the toilet, changing the nappy of an infected infant or after handling animals with salmonellosis, they can spread the bacteria to surfaces, objects, food and drinks that other people come into contact with.

The illness may only last a few days, however occasionally the bacteria can remain in the faeces for months after symptoms have stopped. Although the risk of spreading salmonellosis is lower once the symptoms have stopped, it is possible to pass on the bacteria while it is still present in the faeces.

Norovirus is very infectious and can be spread easily from person to person. Both faeces and vomit are infectious. People with Norovirus are infectious for at least three days after the symptoms stop but on some occasions they can still be infectious up to two weeks after. They can survive on contaminated surfaces and are resistant to many common disinfectants. Norovirus can be spread in many different ways:

- Consuming contaminated food or drinks.
- Touching surfaces or objects contaminated with Norovirus and then putting hands or fingers into your mouth.
- Having direct contact with another person who is infected e.g. sharing food or eating from the same utensils as someone who is ill.
- Aerosol spread (when vomiting disperses virus particles into the air).

Pre-packed fresh vegetables can pose a higher risk for microbial contamination than loose, not packed produce. This is especially if it can be eaten raw – anaerobic conditions prevent spoilage organisms from growing while human pathogens can survive. This means the vegetables may look unspoiled but are contaminated.

Cross contamination of vegetables occurring in a home or at community events could lead to widespread illness. For example if contaminated salad is consumed during a summer gathering and people to people transfer occurs. ACT Health has prepared a factsheet for home BBQs www.health.act.gov.au/publications-reports/fact-sheets/food-bbq-with-friends. It does not address potential risks to or from vegetables; meat and fish are seen as the higher risk area.

A foodborne illness outbreak involving fresh produce can cause severe (economic and reputational) damage to the entire fresh produce industry, vegetable producers, food businesses or individuals.

I

Changes in the food safety environment

In the last 20 years, knowledge of foodborne disease epidemiology evolved while the fresh vegetable industry was undergoing notable changes in how vegetables were grown, handled and distributed. Factors now increasing the risk of foodborne illness associated with fresh produce include the following:

- Modifications in agronomic practices, processing and packaging technologies
- Marketing channels allowing fresh produce supply to consumers fast and over long distances
- Changes in population demographics, e.g. a proportional increase in older people and
- Changes in food consumption patterns e.g. move to pre washed, prepacked and minimum processed, ready to eat vegetables.

Increased awareness because of epidemiologic surveillance programs coupled with better detection technologies has contributed to better documentation of foodborne illness, causes and pathways (Appendices 3 and 4). Technology allowed for numerous pathogens to be isolated from a wide variety of fresh fruits and vegetables. It is important to note that the number of samples in each study would have varied substantially. Although not all of the pathogens found have actually been associated with produce-related foodborne disease outbreaks, they are all capable of causing illness.

The improved detection and recording has increased media attention to food safety, which can pose a risk of unjustified accusation of businesses in the supply chain, if background research about facts has not been done properly and or a sensationalist reporting style is used. Figure 3-6 shows an example of a measured media notice while Figure 3-7 provides an example of dubious reporting. It is noteworthy that the source of the illness in both examples is attributed to the vegetables themselves, not to unhygienic practices

Majority Of Foodborne Illness Caused By Green Vegetables

Here's some food for thought: According to a new study by the CDC, the greatest number of foodborne illnesses are not caused by raw cookie dough or undercooked meat or questionable shellfish, but by leafy green vegetables.

Of the 9.6 million cases of food-borne illness reported each year, contaminated plants cause 51 percent; leafy greens alone contribute 23 percent of the total, more than any other commodity. All the meat and poultry commodities combined - beef, game, pork, and poultry - were responsible for 22 percent of illness, and dairy carried 17 percent.

Many of the contaminants lurking on leafy greens are noroviruses - the bugs that cause what most of us call the "stomach flu" - deposited by food handlers, according to a story in the New York Times.

But before you throw caution to the wind and sit down with a big bowl of raw cookie dough and your favourite chicken tartare, beware: tainted greens may make you sick, but poultry is still more likely to kill you.

Source: Australian Popular Science http://www.popsci.com.au/science/majority-of-foodborne-illness-caused-by-green-vegetables 7/02/13

Figure 3-6 Publication about vegetable related illness in the US, 2013

US: Bagged salad mix implicated in Cyclospora outbreak

The Cyclospora outbreak that has sickened at least 373 people in 15 states in June is believed to have been caused by a now-expired, prepackaged salad mix, Iowa's top food inspector said on Tuesday.

"The evidence points to a salad mix containing iceberg and romaine lettuce, as well as carrots and red cabbage as the source of the outbreak reported in Iowa and Nebraska," said Steven Mandernach, Chief of the Food and Consumer Safety Bureau of the Iowa Department of Inspections and Appeals. "Iowans should continue eating salads as the implicated prepackaged mix is no longer in the State's food supply chain."

The investigation found a connection to the salad mix in 80 percent of case patients. Nebraska State epidemiologist Dr. Tom Safranek told Food Safety News that the US Centers for Disease Control and Prevention has hosted conference calls on the investigation three times a week that involve nearly 90 personnel from affected states. Safranek said the common source was "most certainly" pre-washed, bagged salad mix, and it's highly likely that there's a common distributor in Iowa and Nebraska. However, it's still "too early" to name the restaurants and grocery stores involved.

Federal investigators are hoping to obtain enough information from States to perform a complete traceback of the salad mix.

Source: www.foodsafetynews.com, Publication date: 7/31/2013

Figure 3-7 Sensationalist reporting on leafy vegetables as a main source of food related illness outbreaks

Similar media coverage can be found at: http://healthland.time.com/2013/01/30/veggies-to-blame-for-majority-of-foodborne-illnesses/#ixzz2ah1WB1PW.

Handling practices, especially after harvest, and vicinity to contamination sources such as manures, meat and fish, rather than the vegetables themselves pose a significant food safety risk. However, reports usually state that a vegetable (or fruit) caused a foodborne illness, giving the impression that the disease is inherent to the product. It is seldom mentioned that the vegetables themselves are not harmful, but they are contaminated mostly during incorrect or careless handling or preparation.

From the cited media outputs it appears that the same US study was picked up in many media reports around the world. This gives the impression that the problem of food safety in vegetables is much worse than it actually is.

Some commonly found microbes spread quickly from person to person often affecting more people than the original source e.g. fresh produce that has been contaminated (a fact that usually is neglected in media reports).

Boecker Food Safety (www.eat-safe.com) published examples of fresh produce and juice from which bacterial pathogens have been isolated providing the pathogen and product, again implying that the product is a typical carrier of the microorganism.

- *E.coli* 0157:H7 - Apple juice, Cabbage, Lettuce, Cress sprouts, Coriander
- *Salmonella* - Tomato, Alfalfa sprouts, cabbage, chilli, eggplant, spinach, fennel, parsley, strawberries, Watermelon, Cantaloupe etc.
- *Bacillus cereus* - Cucumbers, Mustard sprouts, Soybean sprouts, Cress sprouts
- *Clostridium botulinum* - Cabbage, Mushrooms, Pepper
- *Campylobacter jejuni* - Green onions, Lettuce, Mushroom, Potato, Parsley, Pepper
- *Listeria monocytogenes* - Bean sprouts, Cabbage, Chicory, Cucumber, Eggplant, salad vegetables, Radish, Mushrooms, Potatoes, Tomatoes
- *Staphylococcus* - Alfalfa sprouts, Carrot, Onion sprouts, Radish, Parsley.

The publication of the above product:pathogen combinations did not mention whether any of these were implicated in a foodborne illness outbreak.

Appendix 6 lists examples of incidents involving fresh produce with a focus on how these were reported. It highlights that popular incident reporting is often ‘tainted’ by media styles and does not provide objective information on actual consequences, responses to incidents and challenges of responses, or market and economic outcomes.

3.3.3 Consequences of vegetable based illness outbreaks

The following section provides examples of consequences of vegetable based illness outbreaks. Many more can be found through internet searches.

Recalls

One of the most recent 'food scares' in the US led to recalls of spinach in 39 States and was reported as follows through the 'Food Poisoning Health Center' website:

> Feb. 19, 2013 -- Spinach that might have E. coli bacteria contamination is being recalled in 39 states. Taylor Farms Retail Inc., says it is voluntarily withdrawing organic baby spinach sold in 5-ounce or 16-ounce salad trays under five brand names that have a "best by" date of Feb. 24, 2013:
>
> 1. Central Market Organics
> 2. Full Circle Organics
> 3. Marketside Organic
> 4. Simple Truth Organic
> 5. Taylor Farms Organic
>
> The spinach may be contaminated with E. coli, but the company says it knows of no one who has gotten sick. If you have this spinach, Taylor Farms says you shouldn't eat it -- throw it away. The company does not say how E. coli might have contaminated the spinach.
>
> The recalled organic baby spinach was sold in these states:
>
> Alabama, Alaska, Arizona, Arkansas, California, Colorado, Delaware, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York, North Carolina, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, Wisconsin, Wyoming.

The company was proactive in preventing harm to customers however, the business would have been seriously affected by the recalls which were due to E.coli contamination identified in wash water through routine monitoring.

The same company, Taylor Farms Inc., was affected again a few months later by a second recall as described below. The bacterium that was implicated in the recall, *Listeria monocytogenes,* survives well under anaerobic conditions which can easily develop in prepacked produce, especially if in a modified atmosphere pack and or kept above the recommended temperature.

The news item refers to the US FDA website for more detailed information. This may be an issue if the web is used as the main source of distributing that information, as some vulnerable groups of people may not have access to the Internet.

"Taylor Farms recalls Deli Salads that contain Reser's Products' published by news desk, October 30, 2013.

After Reser's Fine Foods expanded its recall of products potentially contaminated with *Listeria monocytogenes*, Taylor Farms Foodservice in Florida, Illinois, Maryland, Texas and Tennessee are issuing a secondary recall of deli products containing components of implicated in Reser's expanded recall. Grocers involved have been instructed to remove any remaining product from their deli case and to dispose of any of the remaining product in their inventory. Customers who have purchased these products are urged not to consume the products and should dispose of the recalled products immediately. Consumers with concerns about an illness from consumption of this product should contact a health care provider.

The full list of products recalled by Taylor Farms can be found on the U.S. Food and Drug Administration's website.

These recall incidents highlight the relatively high food safety risks that exist for vegetable producers/ packers selling product that is consumed without cooking, whether from their own farm or bought in from another supplier. Potentially products from organic farms relying on manures as a source of plant nutrients pose an even higher risk those from conventional farms.

Illness epidemic, misinformation and economic loss

A case study of the fenugreek sprout related illness outbreak in Germany in 2011 is presented in Appendix 7 highlighting the chain of events and widespread economic impact it had on the fresh produce industry.

In all, 3,950 people were affected and 53 died. A handful of cases were reported in several other countries including Switzerland, Poland, the Netherlands, Sweden, Denmark, the UK, Canada and the USA. Essentially all affected people had been in Germany or France shortly before becoming ill. Initially, German health authorities, without results of ongoing tests made incorrect statements on the likely origin and strain of *Escherichia coli*, which was especially damaging to cucumber growers in Spain.

Have there ever been problems with contaminated sprouts in Australia? A 2005 Salmonella outbreak in WA with 125 cases and a 2006 Salmonella outbreak with 15 cases in Victoria were linked to alfalfa sprouts.

This and many other stories about foodborne illness outbreaks show what went wrong. Most of the time the incidents originating on farms or due to handling in the supply chain were preventable through basic good practices and vigilance. The reports provide insights in how damage may have been prevented by better vigilance, common sense and crisis management, especially communication between agencies and to media. It appears that

human error, lack of awareness or carelessness can be major risk factors in food safety management.

The way a foodborne illness outbreak is communicated by authorities and media can amplify or could moderate the damage to the industry, business and individuals.

Criminal charges for individuals

The 1996 *E. coli* O157:H7 outbreak in the Eastern U.S., traced back to lettuce producer Fancy Cutt Farms in California, led to civil and criminal charges for violating food safety laws by processing lettuce in unsanitary conditions that could lead to bacterial contamination. According to health authorities, the company was rinsing lettuce in dirty, bacteria-laden water, in a shed 100 feet away from a cattle pen, right in the path of dust-borne manure. The story continues that increasingly, *E. coli* and other deadly bacteria are showing up in fresh fruits and vegetables, the kinds of food health-conscious Americans are eating more of, and more often.

A second, more recent example of litigation based on a foodborne illness incident was reported by News Desk, November 27, 2013:

Second Lawsuit Filed Against Salad Maker in Trader Joe's E. Coli Outbreak.

A San Francisco woman has filed a lawsuit against Artherstone Foods, an organic salad and sandwich producers operating as Glass Onion Catering, after the company's products allegedly sickened her with E. coli O157:H7.

According to the complaint, Jessie Withers ate a salad purchased from Trader Joe's on October 13 and began experiencing symptoms of E. coli infection on October 21. Withers was admitted to hospital emergency rooms for treatment on two separate occasions because of her illness.

Withers tested positive for the same strain of E. coli linked to other outbreak victims with a history of eating salads and wraps produced by Glass Onion Catering. According to court documents, Withers continues to suffer symptoms of E. coli infection more than a month after falling ill.

This is the second lawsuit filed against Glass Onion by food safety law firm Marler Clark, which underwrites Food Safety News. The first lawsuit was filed on behalf of a woman in Sonoma County, CA.

As of Nov. 21, the U.S. Centers for Disease Control and Prevention are reporting at least 32 illnesses in four states involved in the outbreak. This is not the only food safety incident that led to charges for individuals.

3.4 Food safety surveillance, incident recording and reporting

Surveillance for foodborne disease outbreaks in the US is well advanced. Information on outbreaks is analysed and reported at http://www.cdc.gov/mmwr. 'Centres for Disease Control and Prevention' (CDC) also publishes a Foodborne Outbreak Online Database (FOOD): http://wwwn.cdc.gov/foodborneoutbreaks/. It provides data by year, US state, location of consumption, pathogen and food type.

In Australia, OzFoodNet (www.ozfoodnet.gov.au/), a health network to enhance the surveillance of foodborne illness in Australia, records foodborne illness outbreaks. Information on outbreaks resulting from contaminated food can be accessed through the OzFoodNet Outbreak Register. Currently, it has data on the major causes of foodborne disease outbreaks for 2001 to 2008. Data can be extracted by implicated food, setting where the food was prepared, and causative agent. OzFoodNet (http://www.ozfoodnet.gov.au/), is part of a World Health Organization capacity building network Global Foodborne Infections Network (GFN http://www.who.int/gfn/en); formerly known as Global SalmSurv.

OzFoodNet aims to:

- Estimate the incident and cost of foodborne illness in Australia
- Investigate the epidemiology of foodborne illness, by enhancing surveillance and conducting special studies on foodborne pathogens
- Collaborate nationally to coordinate investigations into foodborne illness outbreaks, particularly those that cross State, Territory and country borders
- Identify foods and commodities that cause human illness and provide information to food safety agencies for risk assessment; and
- Train people to investigate foodborne illness.

Information on outbreaks resulting from contaminated food can be accessed through the OzFoodNet Outbreak Register. Data (2001-March 2009), can be extracted by implicated food, setting where the food was prepared, and causative agent. The purpose of the Outbreak Register is to provide a prospective on-going record of foodborne illness outbreaks.

Foodborne illness outbreak data can be useful to identify emerging illness. The data can also provide important information about patterns in outbreak occurrence, and identify risky food preparation and handling practices.

This scheme covers all of Australia and categorises outbreaks by mode of transmission into the following categories:

- Foodborne
- Suspected foodborne
- Waterborne (including recreational)
- Suspected Waterborne (including recreational)
- Animal-to-person
- Person-to-person
- Unknown.

OzFoodNet and partner agencies follow up and investigate the following pathogens:

- Campylobacter
- Salmonella
- Typhoid
- Shigella
- Shiga Toxin-producing Eschericia coli
- Haemolytic Uraemic Syndrome
- Listeria
- Hepatitis A
- Norovirus - most common cause of gastroenteritis – many ways of transmission including person to person, surfaces, food and water.

Quality of data capture and reporting

In spite of records kept by OzFoodNet on the major microbiological issues, the total number of food complaints from all contamination sources, food samples analysed and the number of marginal and non-compliant results is not recorded or reported nationally. Any trends in food safety from regulatory food sampling and complaint investigation are therefore unknown.

Many confirmed cases of food safety related incidents are most likely not reported nationally. There are no complete national registers of chemical, physical, suspected and confirmed microbiological and allergy incidents available.

A central, real time register using on-line networking technology would be important for incident, emergency and crisis management. Reporting outbreaks 6-12 months after they occur rather than as they occur, reduces the effectiveness of any intervention strategies.

The OzFoodNet records do not include valuable industry information such as:

- Consequences for the businesses involved
- Responses to incidents and challenges of responses, and
- Market and economic outcomes.

Retailers do not disclose statistics on rejections based on food safety concerns.

3.5 Response to outbreaks

OzFoodNet (www.ozfoodnet.gov.au/) is preparing guidelines for the detection, investigation and management of multi-jurisdictional outbreaks of foodborne illness. This is expected to sit under the Australian Government Department of Health 2009 'National Food Incident Response Protocol', which is a guide for the coordination of Australian government agencies responsible for food safety and food issues in the event of a national food incident (http://www.health.gov.au/, Appendix 8). This principal document describes roles, responsibilities and actions and communication pathways

Horticulture Industry Crisis Management Guidelines were developed for the horticultural industry to assist in responses to a crisis or uncontained situation. A recently prepared Crisis Management Plan (CMP) will soon supersede this document for the vegetable industry. The vegetable industry's CMP should follow the FAO/WHO framework for developing national

food safety emergency response plans (Rome 2010), and link to the National Food Incident Response Protocol as well as the FSANZ Analysis of Food-Related Health Risks[18]. It should describe response mechanisms according to the required level (Figure 3-8).

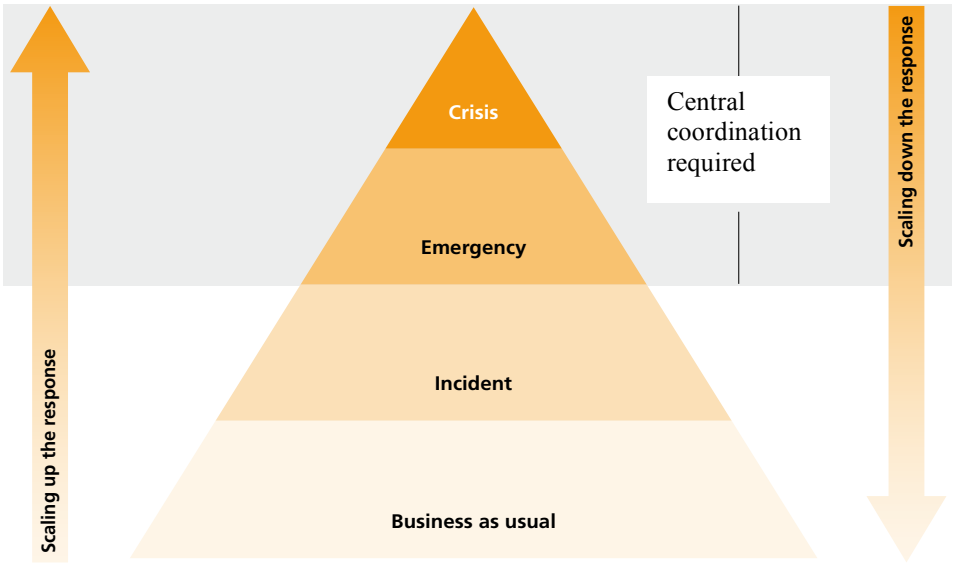


Figure 3-8: Food incident response scaling [19]

Section 3.2.1 highlighted the need for careful and controlled communication should an incident occur. Therefore appropriate procedures from the vegetable CMP and how they link to other relevant plans must be well communicated to all supply chain members dealing with vegetables and adopted.

[18] Food Standards Australia New Zealand, 2008: The Analysis of Food-Related Health Risks http://www.foodstandards.gov.au/publications
[19] FAO/WHO framework for developing national food safety emergency response plans, Rome 2010

4 Food safety legislation under the Food Standards Code and Food Acts

The Standards set out in the Food Standards Code are legislative instruments, developed and administered by Food Standards Australia New Zealand (FSANZ). The Code details requirements for food sold in Australia and New Zealand.

The Code is divided into four chapters:

1. General Food Standards (including labelling and substances added to food);
2. Food Product Standards (for products such as meat and eggs);
3. Food Safety Standards (including training staff, washing hands and cleaning equipment); and
4. Primary Production Standards (additional production standards for certain products such as seafood, poultry meat and seed sprouts).

4.1 Applicability of the Code to vegetables

Chapter One

Outlines requirements for readability of labels, what the label must include i.e. name and physical address of producer, date marking of foods, warning and advisory statements and country of origin claims. This chapter also outlines the Maximum Residue Limits (MRLs), Extraneous Residue Limits (ERLs) and Maximum Limits (MLs) for food. These are the allowable limits of agricultural chemicals and heavy metals in food. Although these limits are set by the APVMA, they do not become legislated until they are included in the Code. Chapter One also includes microbiological limits for food, but these limits are only set for foods such as cheese, butter, raw milk, meat and fish.

Chapter Two

Includes a Food Product Standard related to vegetables, but only provides specific information on pH levels for fruits and vegetables presented in brine, oil, vinegar or water. This chapter will not be applicable to the majority of vegetable producers.

Chapter Three

Outlines the food safety programs, practices and general requirements for any business classified as a "Food Business" under the Code. A Food Business is defined in the Code as "a business, enterprise or activity (other than primary food production) that involves the handling of food intended for sale; or the sale of food".

From this definition we can see that those businesses defined as "Primary Producers" are exempt. A Primary Producer is someone that participates in "Primary Food Production". In the Code, Primary Food Production means the growing, cultivation, picking, harvesting, collection or catching of food, and includes:

- The transportation or delivery of food on, from or between the premises on which it was grown, cultivated, picked, harvested, collected or caught;

- The packing, treating (for example, washing) or storing of food on the premises on which it was grown, cultivated, picked, harvested, collected or caught; and
- Any other food production activity that is regulated by or under an Act prescribed by the regulations for the purposes of this definition.

Primary food production does not include:

- Any process involving the substantial transformation of food (for example, manufacturing or canning), regardless of whether the process is carried out on the premises in which the food was grown, cultivated, picked, harvested, collected or caught; or
- The sale or service of food directly to the public; or
- Any other food production activity prescribed by the regulations under the Act for the purposes of this definition.

This chapter does not include those businesses that grow and/or pack vegetables that are not sold directly to the public. A producer that is growing vegetables for sale to a packhouse or processor, or on to a retailer, is considered to be engaged in “Primary Food Production”.

Businesses that do sell directly to the public (i.e. farmers markets, roadside stalls) are considered a Food Business under the Code. Also, a business that packs or handles products on premises other than where it was grown, cultivated, picked, harvested, collected or caught are considered Food Businesses. For example, a business that packs pumpkins grown by another business is considered a Food Business, even if they also grow their own pumpkins. The application of this Chapter of the Code is complex and can be confusing for those who do more than just grow or pack their own produce not for direct retail sale.

Further complicating the matter is the fact that **each State and Territory has its own Food Act.** Each of these Food Acts has another definition of Food Business and Primary Food Production. Some of these are identical to the Food Standards Code, but some have additional wording. This can mean that for businesses that have sites in different states, the legislation can be slightly different for each site. A summary of the definitions from the Code and each Food Act is attached in Appendix 9.

For businesses that are classified as a Food Business, there are additional requirements outlined in Chapter three. These relate to the development, implementation and auditing of a food safety program.

Chapter Four

Consist of Primary Production Standards. These standards provide additional requirements for a number of products such as seafood, poultry meat, dairy and seed sprouts. FSANZ have been considering the development of a Primary Production Standard for horticulture. While no official communication has been made on the development of this Standard, it appears that this will not occur.

5 Food safety systems relevant to vegetables

The following sections provide published data about food safety systems in horticulture and the vegetable industry.

5.1 Overview

Several industry or buyer-based standards are in operation to address food safety across Australia. Systems encompass fresh produce as a whole and do not separate vegetables from other horticultural or food products. [20]

Australia's vegetable growers have no nationally consistent food safety requirements or systems.

Food Standards Australia New Zealand (FSANZ) has been investigating the need to develop a Primary Production and Processing standard for horticulture, which would apply to vegetable growers, as part of a series of national food safety standards (FSANZ 2012). The decision was made not to proceed as FSANZ research highlighted the overall good food safety track record in the horticulture industry, and the difficulty in developing a straightforward standard due to the complexity and diversity of the industry.

This means that each horticultural industry sector must look after its own systems to prevent foodborne illnesses.

Generally, there are two 'types' of food safety systems, principle-based systems and prescriptive systems. Principle-based systems are used as a conceptual basis for food safety where objectives are described. Prescriptive systems provide detailed rules or elements that must be complied with. The main concern with principle-based systems is that an individual does not fully understand how to implement food safety or what the risks may be – they are 'unconsciously incompetent'. Prescriptive systems remove this concern, however compliance with these types of systems can result in producers having to implement practices that are not strictly necessary to control the actual food safety hazard present i.e. overregulation may occur.

One of the first approaches used to identify and control food safety hazards was HACCP (Hazard Analysis Critical Control Point). HACCP was originally developed by NASA in the 1960's as a means of ensuring the safety of the food sent into space. This approach to food safety is utilised and underpins many of the food safety systems being implemented today.

Since the development of HACCP, a multitude of food safety systems have been released and developed by Government departments, retailers, industry bodies and commodity groups.

Only a relatively small number of these systems are implemented by vegetable handling businesses in Australia. Other than HACCP, the most commonly implemented systems in Australia are BRC, SQF, GlobalG.A.P, Coles requirements, WQA and Freshcare.

[20] Gibbs, C, Harris-Adams, K & Davidson, A 2013, Review of Selected Regulatory Burdens on Agriculture and Forestry Businesses, ABARES (Report to client prepared for the Department of Agriculture's Agricultural Productivity Division), Canberra, November. ISBN: 978-1-74323-155-5 ABARES project: 43360. Internet: Review of Selected Regulatory Burdens on Agriculture and Forestry Businesses is available at: daff.gov.au/abares/publications.

5.2 Description of systems

There are a number of major systems utilised by the vegetable industry, which are described in more detail.

BRC Global Standard for Food Safety – Issue 6, July 2011

System owner:	British Retail Consortium (United Kingdom)
First developed:	1998
History:	In 1998 the British Retail Consortium (BRC) developed and introduced the BRC Food Technical Standard as a tool for evaluating the manufacturers of various retailers' own brand food products. BRC believe that their standard will assist retailers and brand owners to produce food products of consistent safety and quality and assist with their 'due diligence' defence, should they be subject to a prosecution by the enforcement authorities.
Applicability across the supply chain:	Designed for packers and processors only. Not an on-farm food safety system.
Update schedule:	Every three years
Critical areas covered in system:	HACCP Quality Management (including internal audit, corrective action) Site Standards Product Control (including traceability, allergen management) Process Control (including layout, product flow and segregation, housekeeping, control of operations) Personnel (including training and hygiene)
Who can be certified?	Open to all producing products under scope. Producers must purchase a copy of the standard (approx. $200).
Uptake in Australia:	170 businesses certified *(Data from BRC database)*
Uptake in vegetables in Australia:	7 certified businesses (*as the BRC Standard is not applicable on-farm, there are a limited number of businesses certified to it. BRC have a publicly available database that can be searched for certified businesses. A search of that database reveals 7 certified businesses involved with vegetable production in Australia. 3 of these are fresh cut salad producers).*

Coles Supplier Requirements – Food – CSR-FV3, May 2011

System owner:	Coles Supermarket (Australia)
First developed:	2006
History:	Originally released in 2006, Coles developed the "Coles Supplier Requirements" to address issues specifically relating to Coles that weren't included in external food safety systems. These requirements are audited at the same time as the external system that the supplier is certified to.
Applicability across the supply chain:	For all suppliers of produce to Coles. Coles Brands Suppliers will be audited against these additional elements as well as being certified against the relevant external standard (BRC-Food, SQF v7 L3, Freshcare or GlobalG.A.P IFA-V4 Option 1)

Update schedule:	Not defined in standard. Last updated in May 2011
Critical areas covered in system:	Use of subcontractors and indirect suppliers Product specifications and finished product assessment Retention samples and shelf-life validation HACCP training Metal detectors Soil additives
Who can be certified?	Only available to Coles suppliers. Copy of requirements available as free download on Coles website.
Uptake in Australia:	In excess 600 sites for fruit and vegetables (Data from pers. comm. Marion Bray, 2011)
Uptake in vegetables in Australia:	Unknown (*This system is only applicable to suppliers of fruit and vegetables to Coles Supermarkets).*

Freshcare Food Safety and Quality – 3rd Edition, July 2009

System owner:	Freshcare Limited (Australia)
First developed:	2000
History:	The Freshcare Code of Practice - Food Safety and Quality is an industry owned standard, originally launched in 2000, which describes the good agricultural practices required on-farm to provide assurance that fresh produce is safe to eat and meets customer requirements.
Applicability across the supply chain:	Freshcare Code of Practice - Food Safety and Quality is only applicable to producers growing and packing fresh produce and fresh produce for processing. It has been has been designed to cover all activities on-farm including growing and storage, and extending to packing and dispatch of produce. It is not applicable to transport companies or market agents.
Update schedule:	Approximately every 3-4 years. Last updated July 2009.
Critical areas covered in system:	Management Commitment Quality Management (including internal audit, corrective action) Site Standards Product Control (including traceability, allergen management) Process Control (including housekeeping, control of operations) Personnel (including training and hygiene)
Who can be certified?	Open to all producing products under scope. Copy of Code of Practice available as a free download on Freshcare website.
Uptake in Australia:	2556 certified (*Data sourced from Freshcare September 2013)*
Uptake in vegetables in Australia:	Approximately 1000

GlobalG.A.P. Integrated Farm Assurance – Version 4, March 2011

System owner:	GlobalG.A.P. (Germany)
First developed:	1997
History:	Originally called EurepGAP and established in 1997, GlobalG.A.P is an integrated farm assurance system that defines Good Agricultural Practices (GAP) as agreed by European Retailers and associated organisations. Within the Integrated Farm Assurance standard, there are a number of 'modules'. For horticultural producers, three of these modules apply – "All Farm Base", "Crops Base" and "Fruit and Vegetables".
Applicability across the supply chain:	GlobalG.A.P describes the Integrated Farm Assurance standard as a "pre-farm gate or on-farm standard that covers the certification of the whole agricultural production process of the product from before the plant is in the ground (origin and propagation material control points) … to non-processed product (no processing, manufacturing is covered)".
Update schedule:	Approximately every 4 years. Last updated July 2011.
Critical areas covered in system:	Site history and management Quality Management (including internal audit, corrective action) Subcontractors Product Control (including traceability) Process Control (including housekeeping, control of operations) Personnel (including training and hygiene)
Who can be certified?	Open to all producing products under scope. Copy of all documents available as a free download on GlobalG.A.P website.
Uptake in Australia:	153 certified across all scopes of livestock, aquaculture, crops (*Data sourced from GlobalG.A.P Annual Report 2013)*
Uptake in vegetables in Australia:	Approximately 75

SQF Code – Edition 7.1, May 2013

System owner:	Food Marketing Institute (United States of America)
First developed:	1995
History:	Originally developed in Western Australia, and purchased by the Food Marketing Institute in 2003, the SQF Code incorporates HACCP with a number of additional requirements. The SQF programme focuses on quality and safety.
Applicability across the supply chain:	SQF is applicable across the entire supply chain form primary production through to transport and distribution.
Update schedule:	Approximately every 3-4 years. Last updated May 2013.
Critical areas covered in system:	HACCP Quality Management (including internal audit, corrective action) Product Control (including traceability and allergens) Process Control (including housekeeping, control of operations)

	Personnel (including training and hygiene)
Who can be certified?	Open to all producing products under scope. Copy of standard available as a free download on SQFI website.
Uptake in Australia:	630 across all food scopes including meat, beverage (*Data sourced from JAZ-ANZ database).*
Uptake in vegetables in Australia:	Approximately 72 (for growing, packing, processing vegetables). Approximately 75 vegetable brokers.

WQA: Primary Production – Produce – Version 8, March 2013

System owner:	Woolworths Limited
First developed:	1996
History:	Originally launched as Woolworths Vendor Quality Management System (WVQMS), WQA is mandatory for all Woolworths' direct suppliers (and indirect suppliers packing Woolworths –branded produce). WQA is a HACCP-based system focusing on product safety and legality.
Applicability across the supply chain:	According to the WQA v8 – Produce, this system "…covers all Woolworths Branded Produce, pre packed produce (which includes bulk, proprietary and ingredients (where applicable))…" There is a separate module for service providers (i.e. distributors).
Update schedule:	Approximately every 1-2 years. Last updated 1 March 2013.
Critical areas covered in system:	HACCP Quality Management (including internal audit, corrective action) Product Control (including traceability and allergens) Process Control (including housekeeping, control of operations) Personnel (including training and hygiene)
Who can be certified?	Only available to suppliers to Woolworths (by invitation only). Copy of standard available on Woolworths' website as a free download.
Uptake in Australia:	Unknown
Uptake in vegetables in Australia:	In excess of 300 sites for vegetables (Data from pers. comm. Anthony Morgan, 2013)

In 2011, a report was prepared for FSANZ to assist in helping decision making related to the development of the Primary Production and Procession Standard for horticulture. This review, undertaken by TQA Australia, included an overview of the food safety system most commonly implemented by horticultural producers in Australia (Table 5-1). Figures are for all horticultural products, including vegetables, as system owners do not keep separate records for categories. This has made it impossible to update this table specifically for vegetable producers.

Table 5-1: Food safety certifications overview; adapted from FSANZ Supporting Document 3, PPP Proposal P1015[21]

Standard name	Numbers in Australia		Comments
	Standard owner	Certification Bodies	
BRC Global Standard	3	27	CBs cannot sort
Coles Requirements	>600	499	
Freshcare	2797	3157	Lead time on/off
GlobalG.A.P	112	97	
SGS HACCP	-	2934	Not just horticulture
SQF2000	40	493	CBs could not provide data on horticultural producers only
SQF1000	76		
Woolworths QA	Unavailable	838	
Totals	**3679**	**8045**	**Best guess = 6,200 certified horticultural growers**

Horticulture Australia Limited estimates, based on assumptions relating to multiple certifications by individual businesses, that the 8045 certifications would relate to approximately 6,200 businesses certified across all of horticulture.

5.2.1 Food safety and quality systems equivalence

The number of food safety/QA standards and audit checklists that growers of fresh produce are currently confronted with causes a considerable time and financial burden and also confusion. As a result uncertainty exists throughout the horticulture industry with regard to some of the technical aspects of on-farm food safety.

To address these issues a DAFF chaired Working Group on Food Safety and Quality System's Equivalence was established in 2000. This joint government-industry working group focused on ways to reduce the problems associated with multiple food safety and quality systems and audits. Some progress has been made in recent months and the industry may see progress in equivalence and systems harmonisation soon.

In 2001, the group published the 'Guidelines for On-Farm Food Safety for Fresh Produce'. A revised second edition was published in 2004. After nearly 10 years, a third edition that incorporates new science and aspects of food safety is now overdue. This document should be published in hard and electronic copy and as an APP.

[21] www.foodstandards.gov.au

6 Vegetable industry food safety survey findings

The following section describes the participation of vegetable businesses in food safety certification systems and other measures taken to manage food safety. Reasons for participation in or rejection of certification systems are stated as made.

A copy of the survey can be found in Appendix 10.

6.1.1 Account of survey responses

A total of 42 people began the survey, with only 20 respondents (47.6%) completing the survey in its entirety. This low response rate is disappointing, although not surprising. Surveys previously completed have highlighted the difficulty in spreading the message to the target market and encouraging representatives of the industry to participate. More consideration is needed to best identify accessing information from growers and other supply chain members. A selection of results is provided below.

6.1.2 Presentation of survey results

Based on postcodes, Tasmania was well represented in the survey, with 45% of survey respondents. No respondents were from the Northern Territory, South Australia, Western Australia or the ACT. However 12% did not provide their postcode. The predominant age bracket for respondents was 36-50, with this group making up 50% of total respondents. Respondents came from all age brackets, with the lowest response rate from those aged 65 and over.

40% of survey respondents indicated they grow for the fresh market and a further 40% grew and packed for the fresh market (Figure 6-1). Further review of the data supplied indicated that 60% of respondents supply only a single distribution stream. Only 6% of respondents supply into three or more distribution streams.

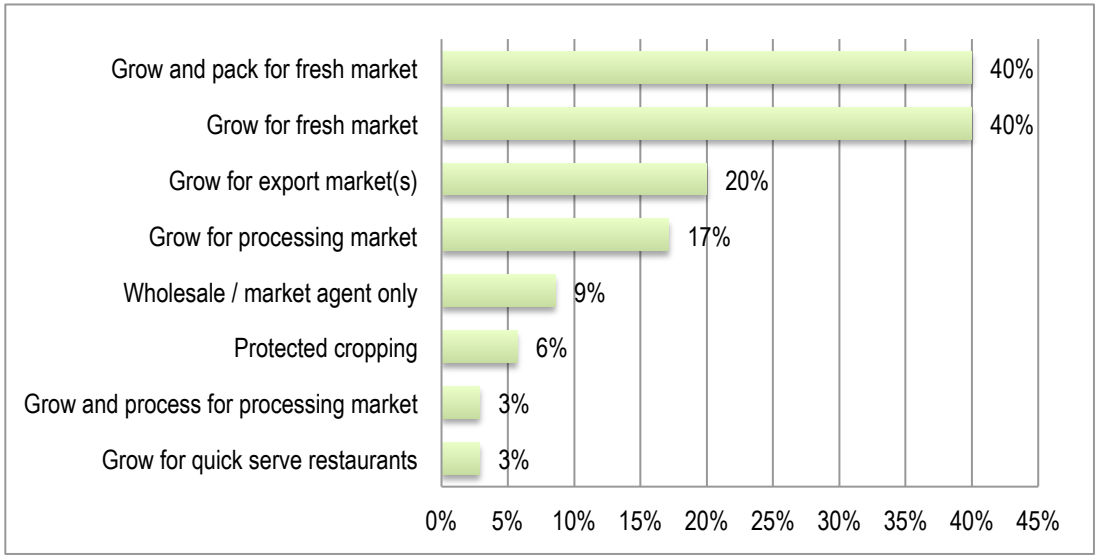


Figure 6-1: Market categories

Supermarkets (such as Coles, Woolworths and Aldi) and market agents / wholesalers were the most common market for respondents. This is not surprising given the high percentage of respondents that indicated they grow and/or pack for fresh market. The third most popular market for respondents was the farmers market (30%) (Figure 6-2). This popularity is reflected in data released by the Department of Agriculture, Forestry and Fisheries in Australian Food Statistics 2010-11. The report states that the total number of farmers markets has more than doubled between 2004 and 2011. It is not known how many producers who attend farmers markets are 3rd party certified, or have a food safety system in place.

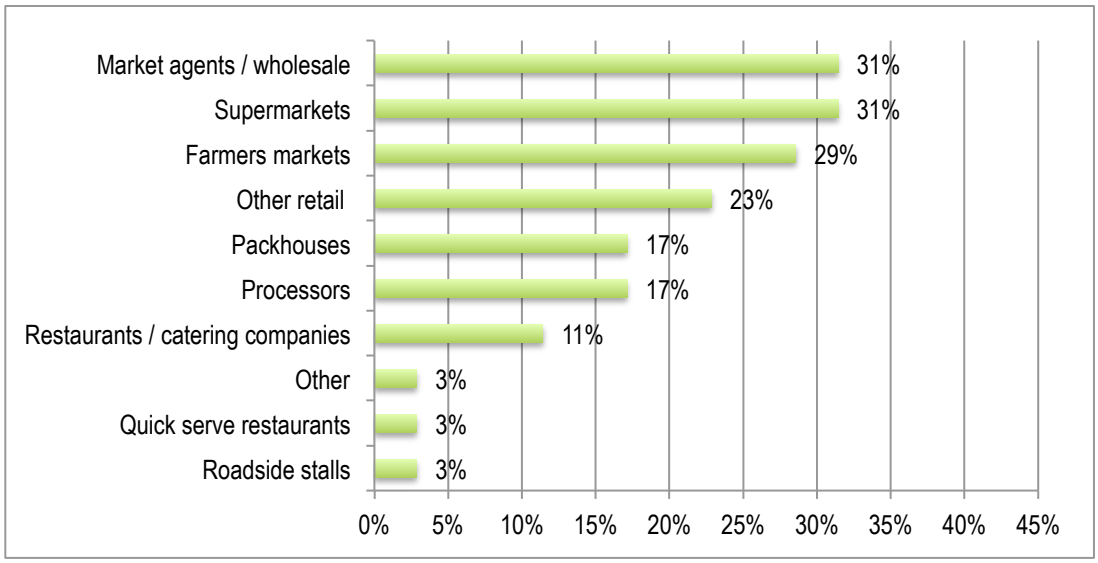


Figure 6-2 Distribution streams

Given the high number of Tasmanian respondents, it is not surprising that the top 4 commodities grown by respondents were carrots and broccoli (42%), and pumpkins and beans (35%) (Figure 6-3). Only 4% of respondents grew capsicums, celery and sweet potatoes, and no one that grew sweet corn or Chinese cabbage answered the survey. 15% of respondents indicated they grew vegetables other than the ones listed. These vegetables included garlic, tomatoes, leeks, herbs, radish and potatoes.

In terms of size of properties, 57% of respondents grew 50 hectares or less of vegetables, with only 4% growing more than 1000 hectares.

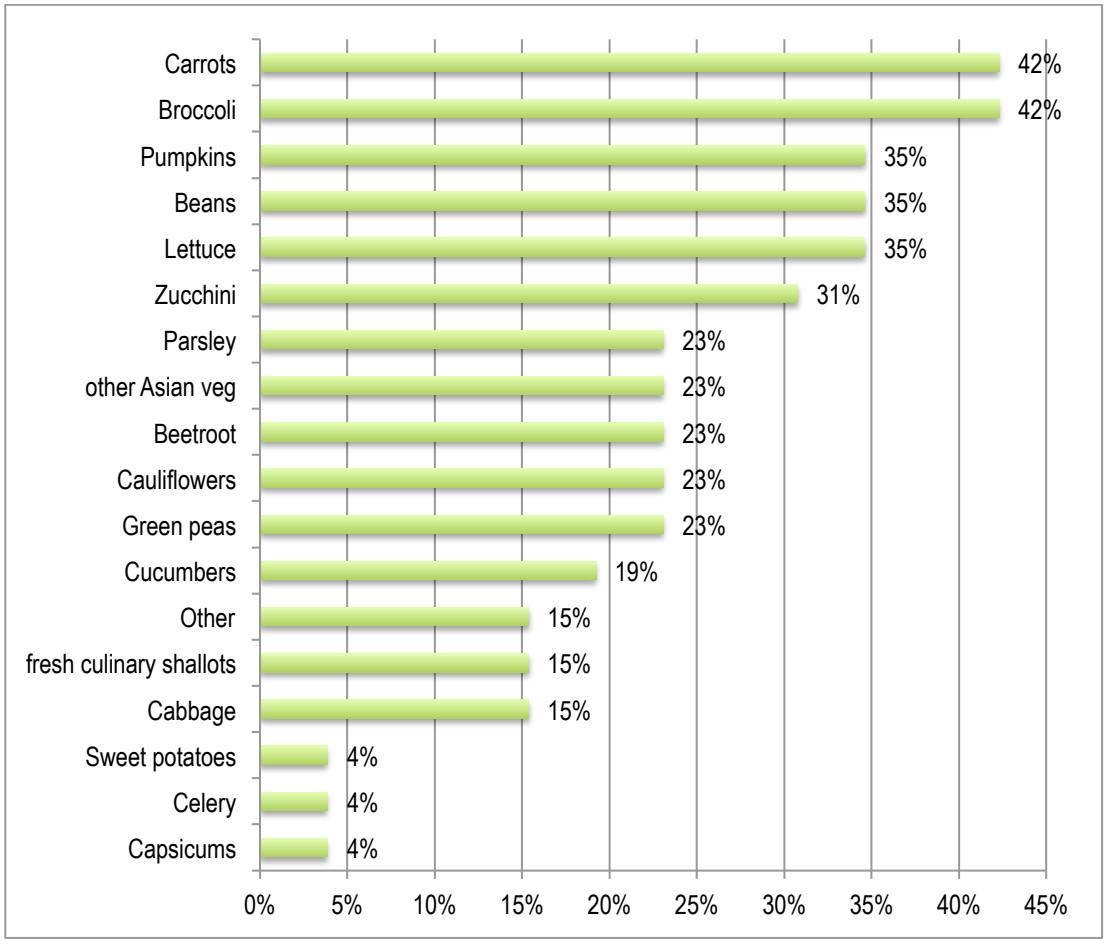


Figure 6-3 Commodities grown

20% of respondents indicated that they were aware of foodborne illness outbreaks in their commodity that have occurred in Australia, whereas 43% indicated that they were aware of foodborne illness outbreaks in their commodity from other countries. Respondents were then asked the likelihood of a foodborne illness outbreak occurring in a commodity they grow. Over three-quarters of respondents did not believe that this was likely to occur. Of those that did, some of the commodities they grow would be considered a higher risk of outbreaks, or have had outbreak in the past such as lettuce, parsley and other herbs and Asian vegetables.

Despite the fact that the high majority of respondents did not believe it was likely that an outbreak would occur in their commodity, they do believe that their business would be affected if an outbreak were to occur (Figure 6-4).

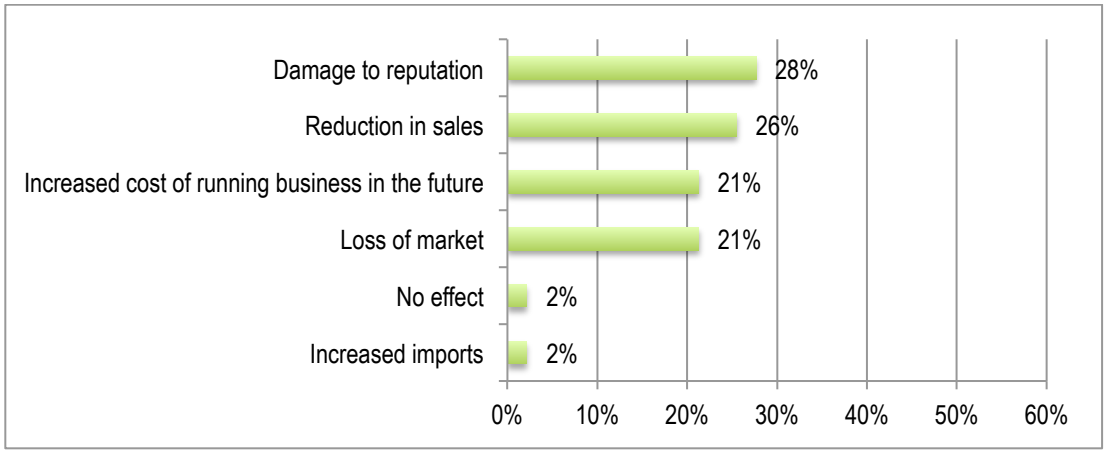


Figure 6-4 Impacts on business from a foodborne illness outbreak

Over half of respondents believed that it should be mandatory for vegetable growers to be certified to a 3rd-party audited food safety system. The response to this question was cross-referenced with respondents answer to the question "Are you currently certified to a 3rd-party audited food safety system". As expected, 95% of respondents that thought it should be mandatory were themselves currently certified. Of the 45% of respondents that do not believe certification should be mandatory, two-thirds were currently certified.

This question prompted comments from a number of respondents. One respondent believed that mandatory certification would mean all growers would "adhere to the same level of safety", while another stated that the current system of self-regulation did not provide "a high level of confidence that ALL growers grow and pack safely". One respondent did not support mandatory certification because of the "increased costs and corruption that would result if it was introduced". There were also some concerns that any "new mandatory requirements would be overkill".

The majority of respondents believed that levy money should be used for research into food safety information and improving food safety systems. Three-quarters of respondents were supportive of levy funds to be used in extension of food safety information. There is an opportunity for industry bodies to determine if this finding is shared by the wider industry and if so, investigate what information and research the industry wants.

While most respondents agreed that they would attend training in food safety if it were offered, there was no consistency with how much they would be prepared to pay for this training. Some wanted the training, but didn't want to pay for it, while others were prepared to pay between $100 and $1,000 per day.

A large number of respondents indicated they would like to be able to label their product as food safety certified (Figure 6-5). This is not common practice in Australia at present, but is in place in other countries. An example is the Assured Food Standard, a scheme that operates in the UK. It has a Red Tractor as its quality mark, and is used by many agricultural industries including meat, dairy, produce and poultry to provide assurance to the consumer. There are positives and negatives associated with this kind of branding or labelling, but may be something industry could consider in the future.

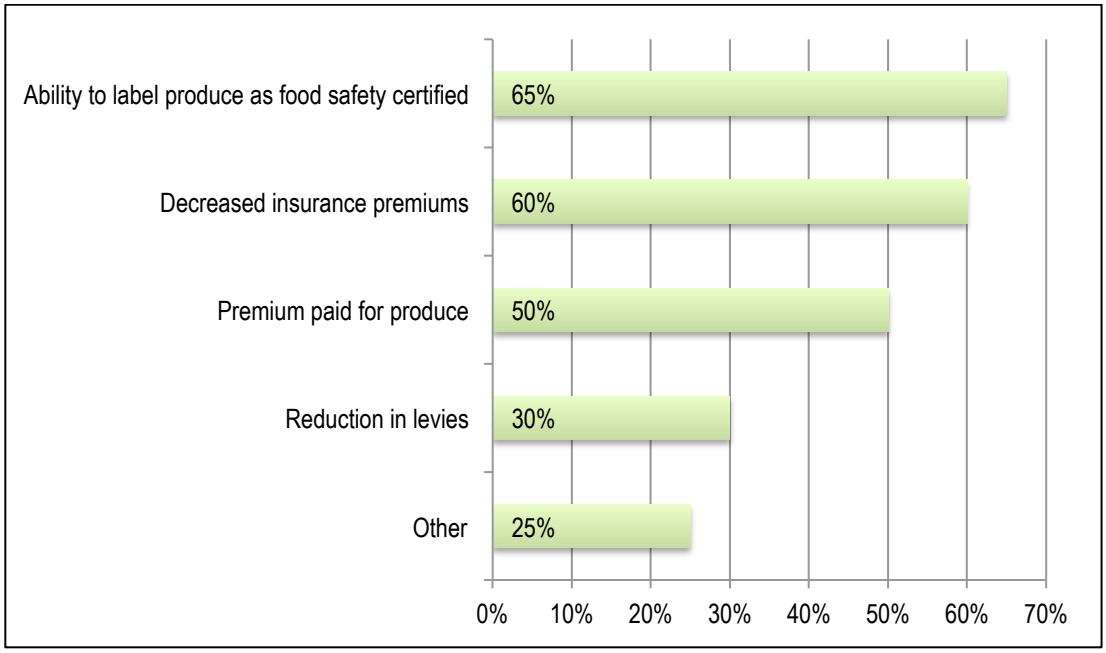


Figure 6-5 Benefits producers that are certified should receive

When asked to provide details on the specific benefits of these systems for their business, respondents were given a number of options. Increased markets (60%) was by far the most significant benefit selected by respondents to this question. Improved cleanliness of the facility (47%) and reduced number of recalls (27%) rounded out the top three benefits.

Respondents that were certified to a food safety system were asked a series of questions about the length of time they have been certified, what systems they are certified to and the primary reason for certification. When asked about the value of these systems for their business, all but one respondent believed that the food safety system they were certified to was very valuable or had some value to their business. Interestingly, 67% of respondents certified would remain certified even if their customer or market no longer required it.

Respondents were asked what the most difficult aspects of implementing and maintaining certification to the food safety system were. This was open-ended question, and a number of common themes were identified including:

- Cost - “Cost unrecoverable in our industry”
- Paperwork - “Maintaining the paperwork”
- Time - “It’s not difficult, it is just the time”
- System changes - “Keeping up with all the changes across so many systems”
- Auditors – “Availability of Auditors due to our varied scope of operations”.

Only three respondents answered questions for those that have never been certified to a food safety system. When asked why they had never been certified, one respondent stated that they “only grow fresh picked, packed and directly sold vegetables. Very low risk produce. Only small-scale farm”, while another simply replied that there was “no need”.

Respondents were asked what would entice them to become certified to a food safety system. Two out of the three respondents indicated that they would become certified if the systems were less expensive to implement and maintain and there was less paperwork to

complete. One of these respondents also indicated that they would consider implementing a system should a foodborne outbreak occur in a commodity they grow. The third respondent stated, “Nothing would entice us”.

The final section of the survey was open to all respondents focusing on common practices that can have an impact or can improve food safety of produce (Figure 6-6). The most common of the practices that were listed on the survey was to maintain records of irrigation. It is safe to say that most producers would be doing this not for food safety, but to improve or assess water usage on the property.

Displaying personal hygiene signage was the next most popular practice for respondents, and indicates that most producers are aware of the high impact that workers can have on the safety of their produce. Only 37% of respondents keep records of application of organic fertilisers and manures. This could indicate a lack of control of these products, but may also be that the majority of respondents don’t actually apply these products.

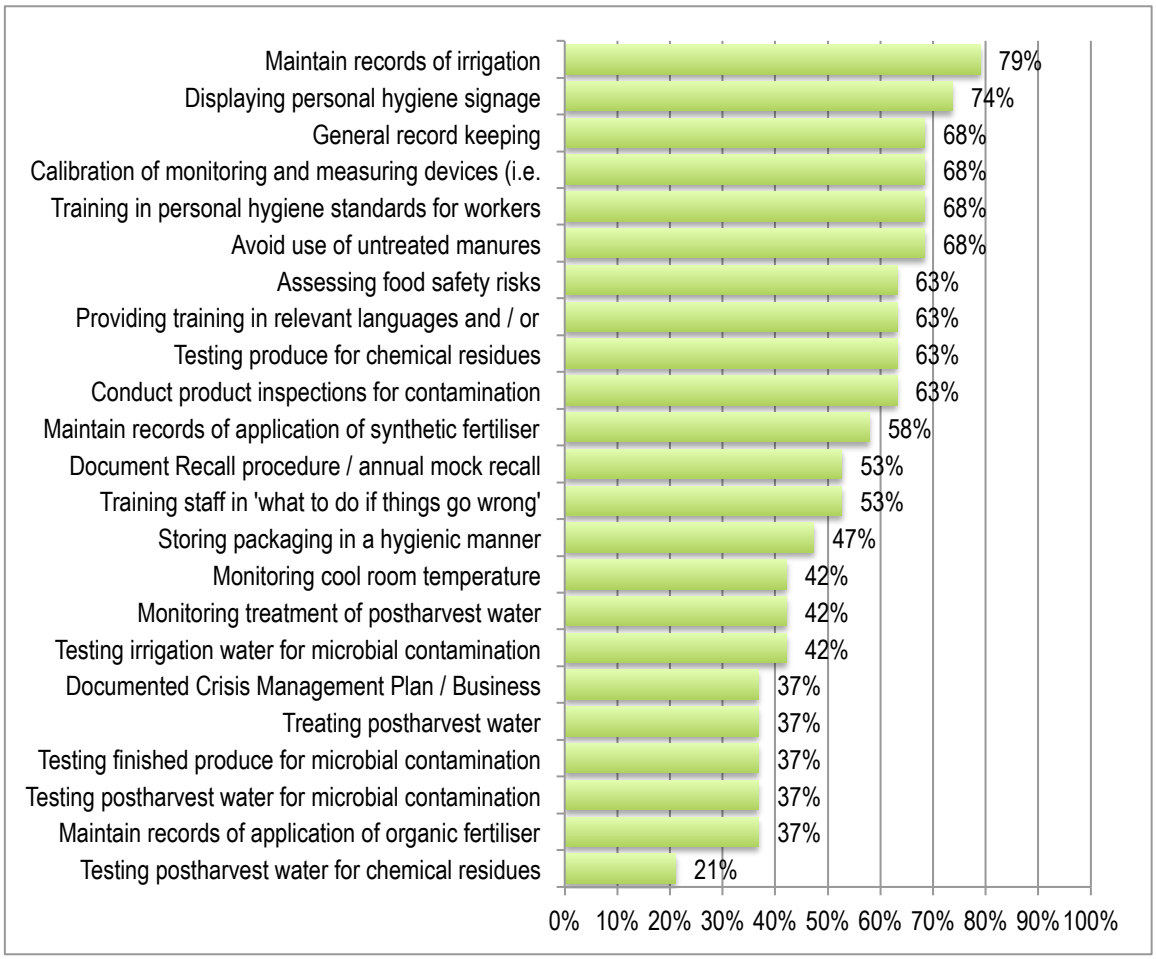


Figure 6-6 Practices implemented

7 Synthesis

7.1 Food safety risk potential in Australian vegetable supply chains

7.1.1 Hazard categorisation and management

The food safety hazard risk potential for the vegetable industry has been assessed for the recent crisis management plan (CMP) using a risk matrix. Therefore, this exercise has not been conducted for this project.

We suggest that, in addition to that matrix, the risk categorisation for microbial hazards from section 3.1.5 should be adopted or adapted to categorise Australian vegetable products by food safety risk.

The FAO/WHO hazard criteria are:

1. Frequency and severity of illness recorded
2. Size and scope of production
3. Diversity and complexity of the production chain and industry
4. Potential for amplification of foodborne pathogens through the food chain
5. Potential for outbreak control
6. Extent of economic and trade impact.

While an Australian categorisation is expected to be similar to FAO/WHO, it would be desirable to check it against Australian information and conditions, i.e. production and supply chain conditions for different vegetable categories as well as the mode of transmission (typical, most frequent) and type of pathogen. Points 5 and 6 would need to be understood in the Australian context.

If adequate information and data for the suggested risk categorisation does not exist, it should be produced with a view to reducing compliance requirements for low risk produce/supply chains.

The vegetable industry must acknowledge that neither microbes nor the public distinguish between (vegetable) levied and non-levied produce. The public may not even distinguish between fruit and vegetables, especially in the case of a foodborne illness outbreak involving fresh produce. Therefore, an approach for all of horticulture, at least in regards to risk categorisation and streamlining/alignment of systems should be considered.

Australia has a good track record in regards to food safety management. However, changes in how people consume horticultural produce, especially the increase in the use of fresh and minimum processed, prepacked food may increase the risk potential. The change in eating habits combined with a trend of selling through farmers markets, especially for organic produce from smaller farms, could increase the risk of foodborne illnesses occurring.

The answer to this is not necessarily more or stricter regulation. An overall improved awareness of how foodborne illnesses can develop and spread, and how to prevent this occurring would go a long way towards minimising risks.

Ample general information on risks and preventative measures for producing, marketing and preparing vegetables safety does exist (the do's and don'ts). However, this information is not as well positioned as other vegetable health messages. More often than not the information about prevention appears in highly technical or medicinal language and/or not engaging formats. Only when an incident has occurred, media pick up the message and then reporting styles may become sensationalist, which is not helpful.

For the public, messages about health benefits of vegetables should definitely include easy to follow information about how to make sure vegetables are not carriers of human pathogens.

7.1.2 Uncertainties in science

While good general information is available to guide good practice, for many microbiological thresholds, food safety standards rely on published data from overseas or from guidelines made for other purposes e.g. recycled materials and water, or safety of waterways used for primary contact (drinking or swimming). This means that thresholds may be too strict or too lax. It would be desirable to have sound, well-researched thresholds for Australian conditions. They should take new developments in detection technology and understanding of pathology and epidemiology into account.

7.2 Public perceptions and political sensitivity

A series of food-related scares and disputes, most notably mad cow disease, dioxin contamination, beef hormones, GMOs and melamine in milk powder, but also food related illnesses such as the 'German sprout incident' have made consumers sensitive to food safety and associated policies, even though these scares occurred in other countries. Modern communication is bringing these types of incident into everybody's conscience.

The regulation of food safety represents an important dimension of public policy/public safety for four main reasons.

Firstly, food safety is an area of public policy that directly affects the wellbeing and sensitivities of the population. For consumers, food safety frequently is an emotional issue because it affects their personal health and safety. Few areas of policy failure, or perceptions of policy failure, are as politically delicate as those associated with food safety.

Secondly, the regulation of food safety has important economic dimensions. Policy failure or the lack of political transparency associated with food safety has often worsened a failure of markets to provide higher levels of food safety. The highly integrated nature of today's food supply chain means that economic and personal impacts (e.g. litigation) can become more severe than in the past.

Thirdly, the regulation of food safety has a critical trade dimension. Differing food standards can play a role in competition between retailers, states or countries.

Finally, few areas of government regulation of businesses can have such an important cultural dimension. Both national and ethnic cultures and even religions are associated with distinctive attitudes toward food and food safety.

To show the importance of food safety we are citing the US website 'Government Executive': The 'Four Most Politically Sensitive Budget Cuts':

1. Traveling: From Airports to National Parks
2. **Public Safety: From Food Inspection to Border Security**
3. Education: From Head Start to Teachers
4. Defence: From Manufacturing to Public Shows

In short, food safety is a critical regulatory area, with implications for producers, trade and public attitudes. Policies and regulation may therefore be designed to meet requirements of those in charge of generating rules and to respond to public perception or fears as much as they are what they should be: evidence based guidelines that protect consumers from harm.

7.3 Regulation and legal issues

The issue of regulation and, following on from that, legal issues is well described in a recent ABARES review.

ABARES assessment of food regulation in Australia

The 2013 ABARES Review of 'Selected Regulatory Burdens on Agriculture and Forestry Businesses'[22] states the following:

"Some progress towards harmonisation has been made since 2007, but although broad support for nationally consistent food regulation remains, this has not been achieved. While national consistency remains on COAG's agenda, the ability of state and territory governments to vary aspects of the Model Food Provisions has increased the compliance burden for businesses operating in multiple jurisdictions than might be the case under nationally consistent regulation. Unless specific food safety outcomes require variations unique to particular areas, divergence from the model legislation can create an unnecessary regulatory burden.

Notwithstanding the Australian Government has no constitutional powers to regulate food, it may still have a role in creating a nationally consistent system. For example, there is a sound case to re-evaluate the provisions included in Annex B of the Model Food Act to ascertain the necessity that they be open to jurisdictional variation. In addition, the potential for each state and territory government to enter in to identical contractual agency arrangements with the Australian Government to strengthen accountability for achieving regulatory outcomes is worth exploring."

Finding 23 of the ABARES review:

'Further Australian Government involvement in facilitating improvements in the consistency of food regulation between jurisdictions could potentially reduce unnecessary regulatory burdens.'

[22] Gibbs, C, Harris-Adams, K & Davidson, A 2013, Review of Selected Regulatory Burdens on Agriculture and Forestry Businesses, ABARES (Report to client prepared for the Department of Agriculture's Agricultural Productivity Division), Canberra, November

The ABARES recommendation will hopefully be adopted and benefit vegetable growers. Aligning and streamlining regulation should support participation in food safety schemes and compliance.

Drivers for regulation and food safety standards or schemes

The main question to be asked when considering improving food safety regulation and standards should be: 'What needs to be done to protect consumers, and especially vulnerable groups like the elderly, the very young and people with existing health problems, from food safety hazards?" Unfortunately, fear of litigation, competition in the market, public perceptions and political sensitivities appear to also be strong drivers for regulation and the design of standards. These additional drivers may be a reason for increasing compliance requirements and associated costs for all in the food industry.

7.4 The need to respond by several agencies

Food safety regulation is designed to prevent food-based hazards affecting people. Individual regulators often interpret overarching guidelines and Acts slightly differently, which may result in differences between state regulations. Food safety response plans that show how several agencies communicate and act together to adequately respond to food safety related emergencies therefore differ somewhat based on differences in rules.

While state based agencies have their own rules and plans, agricultural industries also have their own emergency plans in place with the recently prepared CMP for the vegetable industry an example. Unfortunately, a food safety related emergency (illness outbreak) will very likely not remain within state borders and can easily affect more than one type of primary industry or food product. Multiple plans prepared by multiple agencies and based on somewhat diverging regulations, which if not aligned and communicated properly complicate prevention and also would hinder effective responses.

It was not within the scope of this project to investigate the alignment, suitability and technical strength of regulation or response plans, however, doing so may be worthwhile as also pointed out by ABARES.

7.4.1 The 'people factor'

The greatest risk for achieving adequate prevention and responses may not be a lack of implementing regulation and good systems or plans. It could rather be a lack of coordination and communication. Interagency competition or a lack of leadership and incompetence are major risk factors that must be considered. The 'people factor' is an important, often overlooked issue.

Enquiries into disasters have repeatedly exposed that the action of individuals, paired with their level of competence, has had a major impact on the development and outcome of an emergency. The German sprout incident (Appendix 7) is a good example of this issue.

Effective prevention and response rely on having good information for decision-making, and established communication channels to minimise risks due to human error, incompetence or carelessness.

7.5 New and emerging hazards, food safety awareness and a through-chain preventive approach

Detailed, reliable information on the impacts and trends of food related incidents are quite fragmentary and unsystematic. Impacts of incidents can range from thousands of dollars to meet the cost of monitoring and analysis, to many millions of dollars due to prosecutions, bankruptcy, product disposal, compensation for revenue loss, damage to brand or reputation, as well as loss of income through illness or loss of life.[23]

It can be expected that the more we make fruits and vegetable ready to eat (i.e. cut, peeled and pre-packed), the more risky they potentially become because of increased opportunities for microbial growth (including human pathogens).

Currently, changes in detection of pathogens on food products including vegetables may be due to an increase in value adding or an improvement in analytical technology and increased frequency of monitoring. Our data collection is not yet sufficient to interpret trends in food safety or understand all potential consequences.

Improved data capture and analysis may assist in better identifying the critical risks points in the supply chain and streamlining / aligning regulation; i.e. base regulation on sound technical and statistical data.

A through-chain preventive approach must be based on good data and communication. As mentioned earlier, the main aim of any approach should be the protection of consumers. This study has shown that food safety awareness and preparedness is lacking in some sectors of the supply chain. This is the case in spite of existing regulation. More regulation is not expected to make a difference while improved awareness and support in improving systems may be a way of maintaining a good food safety record for Australia.

Food safety awareness including understanding of risks and legal requirements is usually good in businesses that are 3rd party certified. However, a driver for awareness often is the need for compliance, and awareness may not be equally high throughout the business.

Many smaller businesses, especially those selling directly to consumers appear to not be fully aware of food safety related risks (posed by vegetables) to human health or industry economics and their legal obligations.

[23] Barbara Thomson, Roland Poms, Martin Rose (2012) "Incidents and impacts of unwanted chemicals in food and feeds", Quality Assurance and Safety of Crops & Foods,4,77-92

8 Conclusion and recommendations

8.1 Conclusions

The food safety environment for the Australian vegetable industry is not uniform on all levels. This applies to regulations, standards and systems, participation or certification, awareness of risks and requirements, and attitudes.

The environment is also changing due to changed production (mechanisation, integrated crop protection - ICP), purchasing (e.g. organics, farmers markets, convenience food) and consumption patterns (raw, unwashed). While changed production practices would in the main improve food safety, the other changes listed above have the potential to increase the risk of an incident occurring.

Regulatory and policy environments are also changing. There appears to be a trend to increase regulation for fear of political sensitivity and litigation while, at the same time, the public sector's capacity to enforce rules is declining. Major retailers and processors appear to have taken over the task of implementing food safety systems throughout their supply chains. This means that sectors outside these major supply chains even though they handle a small proportion of produce, can pose a risk to all of the industry. It may therefore be in the interest of major players to assist in improving food safety awareness and practices in all sectors to avoid food safety incidents.

8.2 Recommendations

The following recommendations are based on our synthesis and conclusions from the desktop study and industry survey. They focus on practical, ultimately achievable issues and align with the Food Safety Program Logic presented in 8.2.4 of this report.

8.2.1 How can food safety related risk management be improved?

Third party certification schemes - multiple systems

An issue that is regularly raised by vegetable producers is that of needing certification to multiple standards to meet the requirements of different customers. One impact of this is that producers are required to pay multiple standard and certification fees, which is financially challenging. The bigger impact is on a producer's time. Each time a system is updated, every 2-3 years, the producer must spend considerable time understanding the impacts they may have on the business. They are then required to implement the changes and train their workers. It is not unusual for larger businesses to be certified to 4, 5 or 6 standards or schemes in order to meet customer requirements. Therefore the time and money spent on system changes are significant.

While it would be advantageous for the vegetable industry to have a single, straightforward, overarching system that covers all aspects of sustainable vegetable production and supply chain management, this is not likely to occur. What is achievable is the recognition of a suite of systems approved by all suppliers. With this approach, producers can identify which of the approved systems best meet their needs and business activities. The main objective of this approach would be to streamline record keeping requirements to a meaningful minimum and

reduce compliance costs. A further objective would be improved data gathering that allows refining systems and informing customers and consumers based on evidence.

As a part of mutual recognition of systems, auditing could be streamlined via:

1. Generating scientific data to assist in objectivity of decision-making in auditing
2. Harmonizing auditing schemes so they cover all major quality and food-safety concerns
3. Making the auditing processes uniform and transparent.

Food safety for the sake of safe food is a non-competitive issue, and there must be a way to ensure that growers spend their time and resources on understanding and controlling hazards, not systems. Currently a project is being undertaken, funded by the Horticulture Australia Limited Across Industry Committee, that is looking at this issue, and we encourage the vegetable industry to support this initiative.

Recommendation 1: Realise mutual recognition, harmonising and streamlining of record keeping and auditing by multiple third party certification schemes applicable to vegetable growers.

The 'science' behind the critical limits

Growers are required to comply with many critical limits e.g. irrigation water, postharvest water, manures, produce. These limits may change depending on the activity and the commodity. There are two main concerns related to this issue.

Firstly, it is questionable whether the limits that are currently being used are suitable for the Australian context. Some of the critical limits we currently use have been established using data from research completed in other countries. While this data is backed by research, it has not necessarily been scientifically verified under Australian conditions. An example is the limit for pre-harvest water to be used on produce that is considered ready-to-eat and that has an edible skin. When reviewing the scientific data available at the time, there was no research publicly available from Australia to assist with setting this limit. The limit of E. coli ≤ 126 / 100ml was sourced from research completed after the 2006 foodborne illness outbreak in spinach from California in the United States. This is also the limit considered suitable for recreational water (for primary contact) in the United States. This limit was deemed to be the most suitable based on the available research at the time. This and other limits based on research from countries outside Australia may not be appropriate for the Australian industry, its environment or population.

A second question is whether producers understand the limits and practices to use to ensure they are compliant with them. Once the limits have been established, it is imperative that vegetable producers understand how they apply to their situation, how to best manage their operation to achieve these limits and actions to implement if these limits have not been met.

Recommendation 2: Determine which critical limits used in food safety schemes need to be reconsidered or newly established for Australian conditions.

Vegetable supply chain members non-certified via 3rd party food safety systems

A significant threat to the vegetable industry are those producers that are not certified to a food safety systems or have not implemented sufficient food safety practices to control the hazards present in their operation.

There are many ways to encourage all producers to adopt best practice in their operation to reduce the likelihood of a foodborne illness outbreak. These include mandatory certification, development and enforcement of Primary Production Standards or development or encouragement to implement a 3rd-party audited food safety system. Raising awareness of risks and best practices as well as legal obligations would be a first step.

For some producers, the costs involved in all of these options would be too great. An alternative option to consider is the development of a food safety self-assessment tool. This tool could include resources to help producers identify and control risks on their property and a self-assessment checklist that can be developed into an action plan. The producer may be given an option to lodge the checklist with an industry body or organisation that can assess the checklist, and provide further resources or links to assist with continuous improvement (e.g. as per the EnviroVeg model mentioned below).

The self-assessment tool could also be used as a stepping-stone for those wishing to gain certification to a system. It could be based on the self-assessment in "Developing an Approved Supplier Program for Fresh Produce, National Quality Management Working Group (Australia) 1999" This guide was prepared with support from Horticulture Australia. It identified the major food safety hazards and associated best practices to address these. It includes self-assessments, one for growing and harvest and the other for handling, packing and storage The Horticulture Australia EnviroVeg approach also provides a good example for the use of paper or Internet based self-assessments to help identifying risks and improving practices. Such a tool could be rolled out to growers that do not have a food safety program as well as farmers markets, processors, packers, wholesalers and any other business that work with or purchases product from vegetable producers without a food safety system in place.

Recommendation 3: Foster awareness of food safety risks and legal requirements. Implement extension to assist growers and supply chain members from different backgrounds, growing and handling different produce who currently do not have suitable food safety measures in place e.g. investigate the development of a self-assessment tool.

Educating the Public

As the last point of contact in the fresh-produce chain, retailers could play a proactive role in educating the public on safe food-handling practices. Programs retailers may use to educate the public include the following:

- Use of membership cards and frequent shopper cards to store data on buying patterns of regular customers
- Tailor-made food safety information to send to customers e.g. with catalogues or magazines
- Posting signs on the sides or handles of shopping carts to deliver food-safety information to the customer before they enter the store

- Posting point-of-sale signs, wall hangings, and floor markers
- Distributing fliers with information in shopping bags to keep the customer informed and aware of food-safety issues concerning the item purchased
- Posting food-safety information on retailer websites
- Sponsoring radio/TV and other media programs, cooking shows and magazines promoting food safety
- Using videos in store to impart knowledge of safe food-handling practices
- Using demonstration stations in the store to sample new food items while incorporating food-safety education.

Recommendation 4: Educate the public about food safety using appealing methods and understandable content.

8.2.2 Gathering information and data from the supply chain

Many projects, such as this one, need to establish industry information to ensure that project resources are being allocated to the right area. There is real value in information that is sourced from vegetable producers, as it can help shape where project funding is best used and where time is best spent.

Getting this information in a timely and cost effective manner is difficult. Surveys are a popular tool for gathering information, but response rates to these surveys are often very low. One reason is that many projects include a survey and growers are being asked many of the same questions multiple times.

We need to understand the best way to get better and more representative information from the producers and the supply chain. One suggestion may be to time the surveys to coincide with major industry events, such as the AUSVEG Convention. Project teams could take part in the Trade Show and gather information from vegetable producers and supply chain members that attend the Convention. It would even be more efficient to combine several surveys into one if possible. Dairy Australia for instance managed to interview > 400 farmers for a 'client stocktake' using a well designed survey and a professional survey company to do so.

Another option is to look at real incentives for those that provide information. Often prizes are offered, but these do not seem to raise the response rate. Free training session, reduction in levies or reduced rates for attendance at industry events may encourage vegetable producers to provide information.

Recommendation 5: Investigate options to gather representative information and data from and for vegetable producers that do not place a burden on them and that use harmonised survey methods.

8.2.3 Getting information and feedback to growers about food safety and compliance

Vegetable producers put a significant amount of time, effort and money into complying with food safety systems, while this time, effort and money may be best spent understanding the

issues and managing them. Respondents to the survey asked for more research and extension to better understand food safety matters.

There are a number of ways to help vegetable producers get information that can assist them to ensure the produce they handle is safe. Examples of this include:

- Identifying QA "Champions" – there are a number of producers who have put a significant amount of effort into developing, implementing and maintaining food safety systems in their operation. Some of these producers have developed practical and effective processes that not only meet the requirements of their food safety system, but also add value to their business. These champions would need to be rewarded.
- Developing a QA forum – with the advent of social media, more and more producers are using platforms such as Facebook, Twitter and LinkedIn to network with others and find out about issues and events. On one or more of these platforms could be used for a group for producers, supply chain members and those involved in extension, providing a place for members to bring forward ideas, ask questions and raise issues related to QA.
- Developing a weekly QA Alert – From the forum, a Weekly Alert could be developed and distributed to vegetable producers. The Alert could summarise the major issues or questions raised on the forum, put forward a helpful tip to assist with record keeping, communicate research that has been completed and introduce key stakeholders that can help producers understand and identify food safety hazards and comply with systems.

Recommendation 6: Get useful information and feedback to growers about food safety and compliance performance; it has to help them to improve practices and streamline systems.

8.2.4 Fostering and enhancing food safety in the vegetable industry

A program logic approach to fostering and enhancing food safety in the vegetable industry has been developed (Table 8-1). The concept breaks down inputs, outputs and outcomes or impacts. It includes an overall goal, a brief description of the situation, as well as assumptions and external factors. The program logic is a draft for consideration and further planning by Horticulture Australia and AUSVEG. It can be used to design further RD&E activities for and by the vegetable industry.

<table>
<tr><td colspan="6">Fostering and enhancing food safety in the vegetable industry DRAFT FOR CONSIDERATION</td></tr>
<tr><td>Overall goal:</td><td colspan="5">Activities in the area of vegetable food safety are designed to reduce the risk of vegetable related illness outbreaks (prevention).
Excellent awareness of and commitment to best practices and sensible systems by all involved in the vegetable food supply chain.</td></tr>
<tr><td>Situation:</td><td colspan="5">The vegetable industry has a good track record in food safety. Several food safety QA systems exist; over time they have increased in complexity and compliance costs. This appears to be driven by a fear of litigation and, to a degree, competitiveness between vegetable buyers who are system owners. Rules or limits used are not all based on scientific or statistical evidence. The increase in complexity, rules and record keeping for those who operate under a food safety system has not reduced the overall risk to the industry because.</td></tr>
<tr><td colspan="3">DESIRED OUTCOMES / IMPACT</td><td colspan="2">OUTPUTS</td><td>INPUTS</td></tr>
<tr><td>Long-term results
Changed conditions</td><td>Intermediate results
Changed practices</td><td>Short-term results
Changed skills, knowledge, attitudes aspirations</td><td>Participation / Engagement
Who needs to be involved / informed?</td><td>Approaches / Activities
What should be done (consider how and why)?</td><td>Requirements / Prerequisites</td></tr>
<tr><td>▪ Food safety compliance requirements are straightforward, aligned & mutually recognised
▪ They are based on risk categories and good data / science
▪ Food safety is an integral part of vegetable business management, not a costly ‘add on’ to satisfy buyers and auditors
▪ Data capture on participation in food safety schemes and food relates illnesses is adequate as a basis for decisions</td><td>▪ All vegetable supply chains use adequate food safety practices as part of business management
▪ Growers and their supply chain links receive suitable support (e.g. easy to understand information and training) to enable adequate food safety practices
▪ Food safety systems use new technologies that reduce costs (apps, web based)</td><td>▪ All people working in vegetable supply chains understand their important role in regards to food safety, esp. food safety awareness and preparedness in smaller and LOTE businesses is adequate
▪ Vegetable businesses know how to use sensible food safety systems to improve efficiency
▪ Retailers do not use food safety as a ‘tool to create competition / differentiation’</td><td>▪ HAL and researchers - publish or research required data
▪ AUSVEG to disseminate information
▪ System owners - embrace alignment, focus, technology use, streamlining, mutual recognition
▪ LOTE vegetable businesses, small businesses, farmers markets etc. – embrace food safety</td><td>▪ Fill gaps in data based on risks categories e.g. limits for microbial levels
▪ Retailers and relevant organisations provide feedback to supply chain partners on the nature of hazards found to guide information / training
▪ Adequate awareness campaigns for employees, LOTE vegetable businesses, small businesses, farmers markets etc. to achieve ‘buy in’
▪ Development of APPs
▪ Educate the public</td><td>▪ Willingness to improve the situations
▪ Funds to support data creation and use of new technologies to improve systems and save costs
▪ Increased public awareness about food safety and improved food safety management in households and in all sectors of the vegetable supply chain</td></tr>
<tr><td colspan="3">Assumptions: Food safety is not negotiable; a fresh food related illness outbreak, even if traced back to a very small business, will affect the entire industry.
The greatest risk to food safety is human error, lack of understanding of how one person’s action may impact on the entire supply chain, carelessness or indifference.</td><td colspan="3">External factors: Retailers’ attitude towards a focus on food safety itself rather than a focus on its use for competitive advantages.
Current regulation and compliance costs influencing the ability of smaller businesses to implement a third party audited system and attitudes towards QA.</td></tr>
</table>

Table 8-1: Program Logic for fostering and enhancing food safety in the vegetable industry

References

Technical references

Technical references have been provided as footnotes throughout the report.

Information for vegetables growers

Self-assessments

http://www.gaps.cornell.edu/farmassessmentws.html

Fact sheets for direct sales

http://www.nyfarmersmarket.com/food-safety/links.html

Fact sheet for small landholdings – suitable for all growers involved in direct sales

Kondinin Group Fact sheet, WA small landholder series: Quality assurance — food for thought:

http://www.agric.wa.gov.au/objtwr/imported_assets/content/fm/small/nw49_quality%20assurance_lr.pdf

Appendix 1: Certification Body information

Name	Company
Elise Le Page-King	Aus-Qual
Kimberly Coffin	SAI-Global
Marc Barnes	BSI incorporating NCSI
Jacklin Bosco	SGS Australia
Kym Pratt	Siliker
Barbara Altamore	Sci Qual International
Phil Thompson	AsureQuality Limited

Certification databases

JAS-ANZ Certified Organisation Search:

http://cab.jas-anz.org/CABPublic/Pages/PublicSearch.aspx

BRC Directory

http://www.brcdirectory.com/

SQF Institute Assessment Database

http://www.sqfi.com/suppliers/assessment-database/

Appendix 2: Survey distribution

Organisation and individuals that received an invitation to complete the Food Safety Survey or pass it on to contacts in vegetable supply chains are listed below.

All Vegetable Growers and other industry contacts via the AUSVEG "WEEKLY ALERT"		
Adelaide Central Market	Freshcare Limited	Perfecta Exports P/L
AgVita Analytical	FruitWest	Plant Health Australia
AHR (Gordon Rogers)	Green Ochre	PMA
Annabel Training and Support	Greenhill Bros	Premium Fresh Tasmania
AsureQuality	Grow SA	Queen Victoria Market Pty Ltd
Aus-Qual	Growcom	Rudge Produce Systems
Australian Farmers Markets Association	Hamley	Rural Training Initiatives
Australian Organic Ltd	Harvest Moon	SA, Vic, Tas, WA, NSW and Qld Farmers' Market Associations
Australian Rural Leadership Foundation	Hobart Farmgate Market	SAI-Global
Barden Produce	Hort VC Group	Sassafras Farms
Bioden Pty Ltd	Horticulture Australia Limited	Sassafras Orchards
Brisbane Market Limited	Houstons Farm	Sci-Qual
Bulmer Farms	Impact Fertilisers	SGS Australia
Bundaberg Fruit and Vegetable Growers	Incitec Pivot	Siliker
Canberra Farmers Market	J & A Brandsema	Simplot
Chaplin Bros	Kim Jorgensen	Smith and Georg
Coal River Products	Maelroan Computers	SQF Australia
Coles	Melbourne and Perth Market Authority	Sydney Markets
Craigie Bros	Metcash	Tasmanian Chamber and Commerce
Cynthia Mahoney and Associates	Moore' Farm Fresh Vegetables	Tasmanian Institute of Agriculture
DDJ Clark Pty Ltd	NCSI	TasTAFE
Department and Agriculture and Food (WA)	Newcastle Markets	TFGA
Department of Agriculture, Fisheries and Forestry (Qld)	North Coast Institute of TAFE	The Chamber of Fruit and Vegetable Industries, WA
Department Primary Industries (Tas)	Northern Territory Horticulture Association	TQA Australia
Elphin Grove Pty Ltd	NSW Farmers	Trial Bay Quality Assurance
Field Fresh Tasmania	NSW Primary Industries	Vegetable Growers of Victoria
Food Standards Australia New Zealand	Optimum Standard	Victorian Farmers' Markets Association
Fresh Logic	Palmer Produce	Whitsunday Marketing and Development
Fresh Produce Group	Peracto	Wynyon Pty Ltd
Fresh State		

Appendix 3: Human pathogens that can be distributed via fresh produce

Alphabetical

Amebiasis

Anisakiasis

Ascariasis (Intestinal roundworm infection)

Anthrax

Botulism (Clostridium botulinum)

Brainerd diarrhea

Brucellosis (Brucella infection)

Campylobacteriosis (Campylobacter infection)

Cholera (Vibrio cholerae infection)

Ciguatoxin (Marine toxins)

Cronobacter

Clostridium botulinum (Botulism)

Clostridium perfringens

Cryptococcosis (Cryptococcus)

Cryptosporidiosis (Cryptosporidium infection)

Cyclospora (Cyclospora infection)

Cysticercosis (formerly known as Isosporiasis)

Diphyllobothriasis (Diphyllobothrium infection)

E.coli spp.:

Diarrheagenic Escherichia coli

Enterohemorrhagic Escherichia coli (EHEC)

Enterotoxigenic Escherichia coli (ETEC)

Escherichia coli O157:H7 and other Shiga toxin-producing Escherichia coli (STEC)

Giardiasis (Giardia infection)

Helicobacter pylori

Hepatitis A—Viral Hepatitis

Intestinal roundworm infection (see Ascariasis)

Isosporiasis (see Cysticercosis)

Leptospirosis

Listeriosis (Listeria infection)

Marine toxins (Ciguatoxin)

Nontuberculosis Mycobacterium species

Norovirus

Rat-bite fever

Rotavirus

Salmonella infection (see also Salmonellosis)

Salmonella enteritidis

Salmonella typhi (Typhoid Fever)

Shigellosis (Shigella infection)

Staphylococcus food poisoning (Staphylococcus aureus)

Toxoplasmosis (Toxoplasma infection)

Traveler's diarrhea

Trichinellosis/Trichinosis (Trichinella infection)

Typhoid Fever (Salmonella typhi infection)

Viral gastroenteritis

Vibrio parahaemolyticus

Vibrio vulnificus

Vibrio cholerae infection (Cholera)

Yersinia enterocolitica

By Type

Bacterial

Anthrax

Botulism (Clostridium botulinum toxicity)

National Botulism Surveillance System

Facts about Botulism (Emergency preparedness)

Brainerd Diarrhea

Brucellosis (Brucella infection)

Brucellosis

Campylobacteriosis (Campylobacter infection)

Cholera (Vibrio cholerae infection)

Clostridium botulinum

Clostridium perfringens

E.coli

Diarrheagenic Escherichia coli

Enterohemorrhagic Escherichia coli

Enterotoxigenic Escherichia coli (ETEC)

Escherichia coli O157:H7 and other Shiga toxin-producing Escherichia coli (STEC)

Helicobacter pylori

H. pylori

Leptospirosis

Listeriosis (Listeria infection)

Non-tuberculosis mycobacterium species

Rat-bite fever

Raw milk

Salmonella

Salmonellosis (Salmonella infection)

Salmonella enteritidis

Salmonella typhi (Typhoid Fever)

Shigellosis (Shigella infection)

Staphylococcus food poisoning (Staphylococcus aureus)

Traveler's diarrhea

Typhoid Fever (Salmonella typhi infection)

Vibrio parahaemolyticus

Vibrio vulnificus

Yersinia (Yersinia enterocolitica infection)

Yersinia enterocolitica

Fungal

Cryptococcosis (Cryptococcus)

Parasitic

Amebiasis (Entamoeba histolytica infection)

Anisakiasis (Anisakis infection)

Ascariasis (Intestinal roundworm infection)

Cryptosporidiosis (Cryptosporidium infection)

Cyclosporiasis (Cyclospora infection)

Cysticercosis (formerly known as Isosporiasis)

Diphyllobothriasis (Diphyllobothrium infection)

Giardiasis (Giardia infection)

Toxoplasmosis (Toxoplasma infection)

Traveler's diarrhea

Trichinellosis/Trichinosis (Trichinella infection)

Viral

Hepatitis A

Norovirus

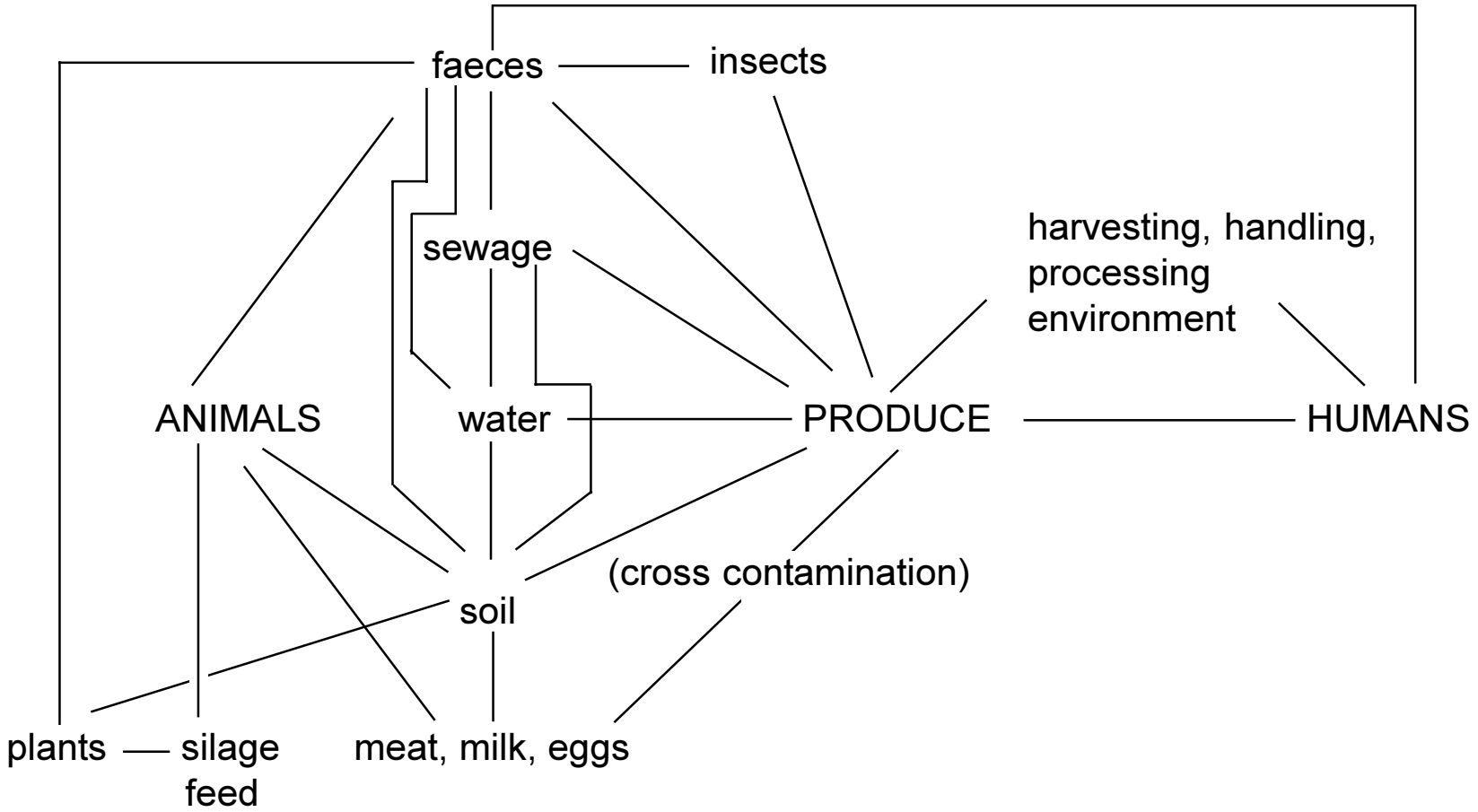
Rotavirus

Viral gastroenteritis

Non-infectious

Marine toxins (Ciguatoxin)

Appendix 4: Mechanisms by which raw vegetables may become contaminated with pathogenic microorganisms



Appendix 5: Foodborne illness incidents involving vegetables in Australia 2006-2010

Source: www.ozfoodnet.gov.au/internet/ozfoodnet/publishing.nsf/Content/reports-1, Evidence key: D: Descriptive evidence implicating the vehicle; A: Analytical epidemiological association between illness and vehicle; M: Microbiological confirmation of aetiology in vehicle and cases.

When	Where	How	Cause	Total affected	Hospitalised	Fatalities	Evidence	Epidemiological study	Food vehicle	Commodity
Sep-10	Qld	Fair/ festival/ mobile service	Staphylococcus aureus	3	Unknown	0	M	Case series	Rice noodle	Grains/beans
Nov-09	NSW	Takeaway	Salmonella Stanley MLVA 2-15 (14)-0-0-496	32	7	0	D	Descriptive case series	Suspected salads, wraps, burgers	Suspected salad and/or sandwiches
Nov-09	Tas	Commercial caterer	Norovirus	14	0	0	A	Cohort	Green salad suspected	Suspected salad and/or sandwiches
Oct-09	NSW	Restaurant	Unknown	4	0	0	D	Descriptive case series	Suspected salad items	Suspected salad and/or sandwiches
Sep-09	NSW	Restaurant	Norovirus	13	0	0	D	Cohort	Suspected salad items	Suspected salad and/or sandwiches
Sep-09	Qld	Bakery	Norovirus	24	Unknown	0	D	Descriptive case series	Sandwiches (various fillings)	Salads and/or sandwiches
Sep-09	SA	Commercial caterer	Norovirus	22	0	0	D	Descriptive case series	Sandwiches and baguettes	Salads and/or sandwiches

When	Where	How	Cause	Total affected	Hospitalised	Fatalities	Evidence	Epidemiological study	Food vehicle	Commodity
Jul-09	NSW	Restaurant	Unknown	6	0	0	D	Descriptive case series	Unknown – sandwiches suspected	Suspected salad and/or sandwiches
May-09	NSW	Takeaway	Unknown	4	1	0	D	Descriptive case series	Unknown - sandwiches suspected	Suspected salad and/or sandwiches
May-09	WA	Restaurant	Salmonella Typhimurium	8	2	0	D	Descriptive case series	Unknown	Unknown
May-09	WA	Restaurant	Salmonella Typhimurium 6	5	0	0	D	Descriptive case series	Unknown	Unknown
Mar-09	ACT	Private residence	Salmonella Typhimurium 170	5	0	0	D	Descriptive case series	Zucchini bake	Mixed dishes
Feb-09	NSW	Aged care facility	Clostridium perfringens enterotoxin A	25	0	0	M	Descriptive case series	Suspected vegetable gravy	Suspected gravy
Jan-09	NSW	Restaurant	Salmonella Chester	14	2	0	M	Descriptive case series	Fresh chillies used to prepare chilli sauce	Salads and/or sandwiches
Sep-08	NSW	Commercial caterer	Viral	8	0	0	D	C	Mixed sandwiches	Salads and/or sandwiches

When	Where	How	Cause	Total affected	Hospitalised	Fatalities	Evidence	Epidemiological study	Food vehicle	Commodity
Jun-08	Vic	Restaurant	Unknown	9	unknown	0	D	D	Ready to eat uncooked foods such as salads	Salads and/or sandwiches
Apr-08	Qld	Restaurant	Clostridium perfringens	2	0	0	M	D	Refried Mexican beans	Mixed dishes
Feb-08	Vic	Commer-cial caterer	Salmonella Typhimurium 170	18	2	0	A	C	Chicken and pasta salad and ham	Salads and/or sandwiches
Feb-08	Vic	Commerci al caterer	Campylobacter	4	0	0	A	C	Chicken and pasta salad	Salads and/or sandwiches
Feb-08	NSW	Commerci al caterer	Bacillus cereus and Clostridium perfringens	75	0	0	M	D	Curry pumpkin, curry chicken, rice with lamb	Mixed dishes
Oct-07	Qld	Private residence	Norovirus	5	0	0	D	Salad, suspected	Fresh produce	Qld
Sep-07	Qld	Primary produce	Shigella sonnei biotype g	55	3	0	M	Baby corn	Fresh produce	Qld
Sep-07	Qld	Restaurant	Norovirus	24	0	0	A	Mixed salad	Fresh	Qld

When	Where	How	Cause	Total affected	Hospitalised	Fatalities	Evidence	Epidemiological study	Food vehicle	Commodity
									produce	
May-07	NSW	Restaurant	Unknown	14	0	0	D	Raw capsicum, onions, fresh herbs, chicken and/or beef	Mixed foods	NSW
Mar-07	WA	Restaurant	Salmonella Typhimurium U307	75	6	0	A	Caesar salad	Fresh produce	WA
Oct-06	NSW	Private residence	Unknown	7	0	0	D	Watermelon	Fresh produce	NSW
Oct-06	Qld	Private residence	Norovirus	5	0	0	D	Salad, suspected	Fresh produce	Qld
Sep-06	Qld	Restaurant	Norovirus	24	0	0	A	Mixed salad	Fresh produce	Qld
Jul-06	NSW	Restaurant	Unknown	6	0	0	D	Sandwich	Sandwich	NSW

Appendix 6: Examples of food related incident reporting in media

Timing	Location	Incident and reporting
Jul-13	Australia	"Health risk as crops watered with effluent", The Sydney Morning Herald, July 7, 2013.
Apr-13	Australia	FSANZ approves irradiation for tomatoes and capsicum for domestic and export markets. Considerable trade and general negative media coverage in New Zealand (major export market) and some/lesser in Australia. Industry advised and updated.
Apr-13	US/Australia	US NFP Environment Working Group releases "Dirty Dozen" list of fresh produce residue concerns. Makes it into Australian print media on back of organic versus conventional coverage. Apples, vegetables, summer fruit, strawberries and table grapes implicated and industry advised.
Mar-13	Australia	"Woolworths customer hopping mad after frog allegedly found in bag of salad", The Age, March 5, 2013Extensive media coverage following consumer detection of a frog in a packet of Woolworths-branded fresh-cut salad. Consumer took to social media with numerous witty lines that media picked up and ran with, which largely diffused food safety implications. Industry advised. HAL discussions with supplier regarding prevention practices, past R&D, etc.
Feb-13	US	US Centres for Disease Control & Prevention report "Attribution of Foodborne Illnesses, Hospitalizations, and Deaths to Food Commodities by using Outbreak Data, United States, 1998-2008". More illnesses were associated with leafy vegetables (2.1m or 23%) than any other commodity, followed by dairy (1.3m or 14 %), fruits-nuts (1.2m or 12 %) and poultry (900,000 or 10%). Of all illness, 46% was attributed to produce. No known Australian coverage. Industry advised. PMA-drafted response if needed.
Mar-13	Australia	World Wildlife Fund-Australia and National Toxics Network release report on the human health impacts of exposure to pesticides, especially those that may be affecting Australia's Great Barrier Reef. Some coverage on environmental and health social media but no apparent general media coverage.
Dec-12	Australia	Today Tonight item on residue violations detected in 2/4 frozen imported raspberry packs. Other residues also detected and considered. Response from Tasmanian grower Richard Clark and Richard Mulcahy (AUSVEG). Coles and Woolworths provide written responses.
Oct-12	Australia	Today Tonight item on chemical residues detected on frozen imported vegetables. Raised issue of "from or via New Zealand". Item also focussed on zebra chip disease and fresh imports from New Zealand. Kevin Clayton Green (AUSVEG), Jo Imig (NTN), Nick Xenephon and others comment.
Jun-12	Australia	Recall of Jmark/Gourmet Selections Greek Salad distributed in WA only due to E. coli contamination. Vegetable ingredients suspected and focus of media attention but cause later confirmed as feta cheese.
Jun-12	US/Australia	Annual pesticide residue rankings from the Environmental Working Group. Picked up by Biological Farmers of Australia with limited general media leveraged from this. Usual coverage by Choice and Today Tonight does not eventuate. Apples, vegetables, strawberries and summer fruit advised.
May-12	China/ Australia	Media reports from China of Chinese cabbage being treated with formaldehyde and leeks treated with copper sulphate post-harvest in order to keep produce fresh in transit. Carried by Melbourne Herald Sun. AUSVEG comments.[1]

Feb-12	Australia	The Friends of the Earth's report, The Dose Makes the Poison, identifies Australian fruit and vegetables most at risk of pesticide residues above safe levels in the past decade. Lists apples, strawberries, pears, grapes, lettuce, nectarines and peaches and also names wheat and bread. APAL's Stuart Gray rejected the report's findings on apples based on 99.9% compliance in NRS programme for the past ten years
Nov-11	Australia	Animal, vegetable or chemical in Fairfax compares organic to conventional carrots, pears, stonefruit, tomatoes, apples and parsley. Pro- organic article on residues on all products reported in various surveys.
Nov-11	Australia	23rd Australian Total Diet Survey finds residues associated with mushrooms, citrus, avocado, celery, cucumber, strawberries and nectarines. Industry advised and a number investigate further. No negative media coverage.
Oct-11	UK	Potatoes and leeks contaminated with E. coli O157 sicken 250 and one death in UK. Issue is that UK authorities did not make the incident public. Industry advised. No apparent media coverage.
Oct-11	Australia	ABC Health & Wellbeing item on washing fruit and veg before consumption sparks consumer feedback on labelling, imports, local, APVMA, GM, organic, waxing, sprouts, etc.
Sep-11	Australia	Today Tonight item on residues associated with frozen vegetables imported from NZ but suspected to have originated from China. Growcom and Ausveg respond. Attention drawn to Country of Origin Labelling.
Sep-11	Queensland/ Australia	Reports of diuron, atrazine and metachlor residues along Great Barrier Reef coast. Focus on APVMA and registration issues rather than horticulture.
Jun-11	Australia	Media advertising and PR campaign by Choice63, National Toxics Network, WWF, a number of prominent Australians, etc. to discredit pesticide registration and use. Extensive media coverage from various interest groups including AUSVEG64 and CropLife Australia. Banana industry specifically implicated in coverage and ABGC advised.
May-11	Australia	A spike in illness associated with the parasites Blastocystis hominis and Dientamoeba fragilis is suspected to be connected to the use of human biosolids sent to 20 farms in NSW by Sydney Water, according to Dr Kerryn Phelps, former head, AMA. Widespread national print coverage. Freshcare response – no biosolids allowed65.
May-11	Australia	Birth defect cluster in northern NSW sparks investigation. Exposure to herbicide atrazine through contaminated water supplies named as possible cause of gastroschisis, a condition where a baby's intestines and organs grow outside the body through a hole in the abdominal wall. Wide print media coverage. APVMA responds.
May-11	Germany/ Australia	Enteroaggregative E. coli O104:H4 – an unusual, highly virulent Shiga-toxin-producing strain of the common E. coli bacterium – outbreak in Germany and France. 3,816 sickened including 840 hospitalised with haemolytic-uremic syndrome (HUS) and 54 deaths. Reported by some as "The deadliest E. coli outbreak in history." Spanish organic cucumbers, tomatoes and lettuce initially suspected but German sprouts from Egyptian fenugreek seed the most likely suspect. Epidemiology chaos and blame game hampered response. Widespread international media coverage. Industry comment provided by AUSVEG and Brismark in Australian media.
Feb-11	Australia	Today Tonight item on residues with imported products, nutritional content and residues on organic produce. Advised industry and retailers.
Jan-11	Australia	7PM Project item on dimethoate and fenthion, including industry and government interviews. No apparent media follow-up.

Nov-10	Australia	Choice and Today Tonight pick up “Dirty Dozen” item from USA. “Children eating pesticides” article in media. APVMA responds.
Nov-10	Australia	Choice runs item on “What is fresh?” Media includes “Fresh food tricks.” No response.
Sep-10	Australia	Food Intolerance Network says FSANZ is not doing enough with food labelling to protect Australian children from additives. Also mentioned behavioural problems associated with eating too much tomato, broccoli and oranges. Wide media coverage.
Jun-10	Bowen/ Australia	Herbicide (glyphosate) sabotage destroys 7 million nursery seedlings and commercial hydroponic tomato crop at Bowen. Fourth such incident in ten years. Substantial national coverage in radio, print and television; little related to contaminated product reaching market. AUSVEG and local industry (and politicians, etc) present views.
May-10	Australia	Rockmelon, mint and lettuce dish suspected of Cyclospora sp. contamination. 314 cases linked to this outbreak.
Apr-10	Australia/ China	Toxic Chinese vegetables raise health fears media coverage (China Daily and subsequently various Australian media) following 9,610kg of vegetables identified as having MRL violations of three pesticides. Australian response covered by AUSVEG (although AUSVEG media release reported as 10,000 tonnes).
Apr-10	Sydney/ Australia	Man dies after using chemicals to spray vegetables. Domestic incident received national coverage regarding safe use of home garden products. Chemical/s not confirmed. Bodnaruk and Dal Santo researched background. APVMA took lead.
Mar-10	Australia	FSANZ micro survey reveals issues with herbs, sprouts and strawberries. Industry network responds with technical response and works with FSANZ on strategy for release.
Mar-10	Australia	60 Minutes item 21/03/10 on endosulfan and carbendazim targeting all horticulture but macadamia in particular. Continuation of Sunlands Fish Hatchery and Noosa River issue. Across industry engagement, APVMA, FSANZ, retail, etc. Australian Macadamia Society took lead with media. AUSVEG appeared on Today programme.
Jan-10	Australia	Media coverage (rural/industry) regarding ethical sourcing policies of Coles and Woolworths. Are these legal? Do they apply to imports? Advised AUSVEG, industry services, et al.67
Jul-09	Australia	Media coverage: Consumers blind to toxic dangers at greengrocer. Stoush between NSW government, NSW Greens and Choice. FreshTest also involved.
Apr-09	Australia	Media coverage: Fruit and vegies new allergy scare. Mentions apples, pears, celery, kiwifruit, tree nuts, bananas and peppers.
Mar-09	Australia	Choice: Pesticide ban. Endosulfan banned in Australia and New Zealand.
Jan-09	Australia	Media coverage: Facts on deadly food bugs withheld. (Study into antibiotic resistant “superbugs” suppressed. Some reference to lettuce, but main issue with chicken, beef and pork.
Oct-08	Australia	Media coverage: Contamination scare spreads to vegies (China melamine issue). Products mentioned were fresh garlic, pears, peas, frozen mixed vegetables, canned mushrooms and tomato paste.
Feb-08	Australia	Today Tonight: Chemical reaction from strawberries. Included Choice plus “The Dirty Dozen”: peaches, strawberries, nectarines, plums, apples, capsicums, celery, cherries, grapes, potatoes, spinach and raspberries. Also challenged FreshTest to make results public.
Nov-07	Australia	Media coverage: How safe is my food. “It’s hard to imagine lettuce as a potential killer.”

May-07	Australia	Media coverage: Salmonella link to fresh produce from Northern Territory. Specific mentions of fresh basil, bean sprouts, cucumber, mint and snake beans.
Mar-07	Australia	Media coverage: Fresh food linked to food poisoning. Summary of 27 outbreaks of gastroenteritis between January 2001 and June 2005 across Australia due to fresh, uncooked produce including orange juice, cucumbers, lettuce and alfalfa sprouts, resulting in alm
Feb-07	Australia	Today Tonight: The hidden chemicals in fruit and veg. E. coli in salad vegetables; residues in apples, peaches, mangoes, herbs and salad vegetables.
2007	Victoria and Queensland	Mixed fruit and vegetable salad causes 18 reported illnesses from Norovirus in Victoria and 24 in Queensland.
2007	Queensland	55 cases of Shigella sonnei confirmed from baby corn.
Oct-06	Melbourne / Australia	All fruit and veg sold on 31/10/2006 at Bayswater Safeway store recalled after “foreign object” contamination, most likely intentional. Store closed while police investigate.
Sep-06	US	An estimated 4,000 people fell ill and four died after consuming packaged spinach contaminated with E. coli.
Aug-06	Australia	A Current Affair: Fruit and vegetables – they could make you sick.
Aug-06	Australia	Choice: Fresh fruit and vegetables are not always as fresh as you might think. Strawberries and tomatoes were tested.
Aug-06	Queensland Australia	Round-up rotters sabotage crops. Water used for spraying at Bowen contaminated with glyphosate. Media focus was residues on vegetables in supply chain.
2003	Australia	Cucumber contaminated with Salmonella Litchfield. Six confirmed ill.
Jun-02	Sydney Australia	Media coverage: Chemical reactions: major investigation finds industrial waste sold as fertiliser.
2001	Australia	Iceberg lettuce Salmonella Bovismorbificans outbreak. 32 confirmed cases.
2001	Australia	Tomato and cucumber salad contaminated with Campylobacter leaves 27 people ill.

Appendix 7: Foodborne illness outbreak, Germany 2011

2011 Germany *E. coli* O104:H4 outbreak

A novel strain of ***Escherichia coli* O104:H4 bacteria** caused a serious outbreak of foodborne illness focused in northern Germany in May through June 2011. The illness was characterized by bloody diarrhea, with a high frequency of serious complications, including hemolytic-uremic syndrome (HUS), a condition that requires urgent treatment. The outbreak was originally thought to have been caused by an enterohemorrhagic (EHEC) strain of *E. coli*, but it was later shown to have been caused by an enteroaggregative E. coli (EAEC) strain that had acquired the genes to produce Shiga toxins.

Epidemiological fieldwork suggested fresh vegetables were the source of infection. The agriculture minister of Lower Saxony identified an organic farm[2] in Bienenbüttel, Lower Saxony, Germany, which produces a variety of sprouted foods, as the likely source of the *E. coli* outbreak.[3] The farm has since been shut down.[3] Although laboratories in Lower Saxony did not detect the bacterium in produce, a laboratory in North Rhine-Westphalia later found the outbreak strain in a discarded package of sprouts from the suspect farm.[4] A control investigation confirmed the farm as the source of the outbreak.[5] On 30 June 2011 the German *Bundesinstitut für Risikobewertung (BfR)* (*Federal Institute for Risk Assessment*), an institute of the German Federal Ministry of Food, Agriculture and Consumer Protection, announced that seeds of fenugreek imported from Egypt were likely the source of the outbreak.[6]

In all, 3,950 people were affected and 53 died, 51 of which were in Germany.[7] A handful of cases were reported in several other countries including Switzerland,[8] Poland,[8] the Netherlands,[8] Sweden,[8] Denmark,[8] the UK,[8][9]Canada[10] and the USA.[10][11] Essentially all affected people had been in Germany or France shortly before becoming ill.

Initially, German officials made incorrect statements on the likely origin and strain of *Escherichia coli*.[12][13][14][15]The German health authorities, without results of ongoing tests, incorrectly linked the O104 serotype to cucumbers imported from Spain.[16] Later, they recognised that Spanish greenhouses were not the source of the *E. coli* and cucumber samples did not contain the specific *E. coli* variant causing the outbreak.[17][18] Spain consequently expressed anger about having its produce linked with the deadly *E. coli* outbreak, which cost Spanish exporters200M US$ per week.[19] Russia banned the import of all fresh vegetables from the European Union until 22 June.[20]

Details

Beginning 2 May 2011, German health authorities reported the outbreak of bloody diarrhea accompanied by hemolytic-uremic syndrome (HUS).[21] On 22 May 2011, German health authorities said "Clearly, we are faced with an unusual situation", one day after the first death in Germany. *Escherichia coli* infection is common, infecting 800 to 1200 people a year in Germany, but is usually mild.[22][23] Until 25 May it occurred in northwest Germany mostly.[24]

On 26 May 2011, German health officials announced that cucumbers from Spain were identified as a source of the *E. coli* outbreak in Germany.[25] On 27 May 2011, German officials issued an alert distributed to nearby countries, identifying organic cucumbers from Spain and withdrawing them from the market.[14] The European Commission on 27 May said that two Spanish greenhouses that were suspected to be sources had been closed, and were being investigated.[26][27] The investigation included analyzing soil and water samples from the

greenhouses in question, located in the Andalusia region, with results expected by 1 June.[28] Cucumber samples from the Andalusian greenhouses did not show *E. coli* contamination,[29][30][31] but a cross-contamination during transport in Germany or distribution in Hamburg are not discounted; in fact, the most probable cause is cross-contamination inside Germany.[32][33] The Robert Koch Institute advises against eating raw tomatoes, cucumbers and lettuces in Germany to prevent further cases.[34]

On 31 May 2011, an EU official said that the transport chain was so long that the cucumbers from Spain could have been contaminated at any point that occurred along the transit route.[35] Spanish officials, said before that there was no proof that the outbreak originated in Spain; Spanish Secretary of State for European AffairsDiego López Garrido said that "you can't attribute the origin of this sickness to Spain."[27]

On Tuesday 31 May, lab tests showed that two of the four cucumbers examined did contain toxin-producing *E. coli* strains, most likely because of cross-contamination in Germany according to experts,[33] but not the O104 strain that was found in patients. The bacteria in the other two cucumbers have not yet been identified.

Genomic sequencing by BGI Shenzhen confirm a 2001 finding that the O104:H4 serotype has some enteroaggregative *E. coli* (EAEC or EAggEC) properties, presumably acquired by horizontal gene transfer.[36][37][38]

The only previous documented case of EHEC O104:H4 was in South Korea in 2005 and researchers pointed at contaminated hamburgers as a possible cause.[39]

On 4 June, German and EU officials had allegedly been examining data that indicated that an open catering event at a restaurant in Lübeck, Germany, was a possible starting point of the on-going deadly *E. coli* outbreak in Europe.[40][41] German hospitals were nearly overwhelmed by the number of *E. coli* victims.[42]

A spokesman for the agriculture ministry in Lower Saxony, warned people on 5 June to stop eating local bean sprouts as they had become the latest suspected cause of the *E. coli* outbreak.[43] A farm in Bienenbuettel, Lower Saxony, was announced as the probable source,[44][45] but on 6 June officials said that this could not be substantiated by tests. Of the 40 samples from the farm that were being examined, 23 had tested negative.[46] But on 10 June it was confirmed by the head of the Robert Koch Institute that the bean sprouts were the source of the outbreak, and that people who ate the bean sprouts were nine times more likely to have bloody diarrhea.[47][48] The WHO have confirmed on 10 June this statement on the update 13 of the EHEC outbreak.[49]

According to the head of the national *E. coli* lab at the German Federal Institute for Risk Assessment, the strain responsible for the outbreak has been circulating in Germany for 10 years, and in humans not cattle. He said it is likely to have got into food via human feces.[50]

A joint risk-assessment by EFSA/ECDC, issued 29 June 2011, made a connection between the German outbreak and a HUS outbreak in the Bordeaux area of France, first reported on 24 June, in which infection with *E. coli* O104:H4 has been confirmed in several patients.[51] The assessment implicated fenugreek seeds imported from Egypt in 2009 and 2010, from which sprouts were grown, as a common source of both outbreaks, but cautioned that "there is still much uncertainty about whether this is truly the common cause of the infections", as tests on the seeds had not yet found any *E. coli* bacteria of the O104:H4 strain.[52][53] The potentially contaminated seeds were widely distributed in Europe.[54] Egypt,

for its part, steadfastly denied that it may have been the source of deadly E. coli strain, with the Minister of Agriculture calling speculations to that effect "sheer lies."[55]

Affected countries

Overview

Most or all victims as of 21 July 2011 were believed to have been infected in Germany or France. Confirmed cases are listed below according to their location when diagnosed.

Number of cases reported to the WHO as for 21 July 2011[10]

Country	Deaths	HUS cases	Non-HUS cases
Austria	0	1	4
Canada	0	0	1
Czech Republic	0	0	1
Denmark	0	10	15
France	0	7	10
Germany	48	857	3078
Greece	0	0	1
Luxembourg	0	1	1
Netherlands	0	4	7
Norway	0	0	1
Poland	0	2	1
Spain	0	1	1
Sweden	1	18	35
Switzerland	0	5	0
United Kingdom	0	3	4
United States	1	4	2
Total	**50**	**908**	**3,167**

International response

European Union

On 22 May, Health Commissioner John Dalli of the European Commission declared the issue to be an 'absolute priority', saying that the Commission is working with member states, particularly Germany, to identify the source of the outbreak.[56] Speaking again on 1 June, Commissioner Dalli noted that the outbreaks have been limited in origin to the Greater Hamburg area and declared that any product ban would be disproportionate. He also said that he is working with Agriculture Commissioner Dacian Cioloş "to address the hardship

faced by this group of our citizens that has also been hit hard by the *E. coli* outbreak".[57] He also said on June that "In future we need to see how the timing of the alerts can be closer to the actual scientific basis and proof."[58]

By 7 June, EU Ministers held an emergency meeting in Luxembourg to discuss the growing crisis, which had left 23 people dead, more than 2,000 ill so far.[58][59]Germany's Federal Agriculture Minister, Ilse Aigner, repeated her warnings to EU consumers to avoid eating any bean sprouts, cucumbers, tomatoes and salads.[59]

The United States Center for Disease Control (CDC) and the United States Department of Agriculture has long been concerned regarding risks involving the *E. coli* risk in raw bean sprout production.[58]

EU member nations

Apart from the German government, which warned against the consumption of all raw cucumbers, tomatoes and lettuce,[60] several countries implemented restrictions or bans on the import of produce.

Non-EU European nations

Many other European countries took restrictive actions or lost sales of produce, including Albania, Croatia,[61] and Russia.

The ban on EU vegetables was lifted on 10 June, but stiff safety measures remained in place.[62]

Middle East

Many countries took restrictive action. Egypt was a focus of the epidemiological investigation because the fenugreek seeds were imported into Germany from Egypt.

Egypt's Minister of Health Ashraf Hatem denied his nation had any patients infected with the new *E. coli* strain, due to the strict precautions brought in to test over-seas tourists entering the country on 2 June.[63][64]

Responding to claims that Egyptian fenugreek seeds were the cause of the *E. coli* outbreak, Egyptian Minister of Agriculture Ayman Abu-Hadid told the Egyptian press the problem had nothing to do with Egypt and instead asserted, "Israel is waging a commercial war against Egyptian exports."[65]

North America

Canada and the United States reported cases of *E. coli* infection that had been acquire in Europe.

On 2 June Canada brought in stricter anti *E. coli* related food inspections[66] and by 3 June the Public Health Agency of Canada said that no Canadians had been reported sick with the strain as of that date. The Canadian Government also brought in heavier import and hygiene restrictions on EU cucumbers, lettuces and tomatoes.[67]

The United States Department of Agriculture (USDA) and the Food and Drug Administration (FDA) stated that emerging strains of *E. coli* are a significant problem, but regulatry bodies in the USA have concentrated on the more infamous *E. coli* O157 serotype.[68][69]

FDA noted that nearly all of America's fresh produce is grown in the U.S. and areas of Central America, and the EU has not been a significant source of fresh produce for the US.[70]

Other countries

Other countries, including Nigeria, Hong Kong, Thailand expressed concern regarding imported produce.

Economics

By 1 June both Italian, Austrian, and French cucumber sales had begun to decline sharply, but the Austrian Health Ministry official Dr. Pamela Rendi-Wagner, claimed Austrian customers were still safe.[71]

On 3 June, the governments of Spain, Portugal and Germany said that they would formally request EU agricultural aid for farmers affected by the outbreak.[72] That day also saw Russia set up plans for new imports of cucumbers from Ukraine, Azerbaijan, Egypt and Turkey.[73][74]

By 7 June, the EU's farmers had reported they had lost millions of dollars in exports during the outbreak, with Fepex, Spain's fruit and vegetable industry group, saying its growers had lost $256,000,000 in turnover.[59] French, Swiss, Bulgarian, German, Dutch, Belgian and Portuguese producers have also been similarly affected.[59]

That day, the EU proposed issuing £135,000,000 in agricultural compensation to its farmers. The EU agriculture commissioner said the EU's farmers could get back up to 30% of the cost of vegetables they were unable to sell.[75] The EU's health commissioner, John Dalli, had formally criticised earlier that day Germany for rushing out "premature conclusions" about the source of an outbreak, and only helped to spread alarm among the public and farmers and untimely leading to the damaging the EU's agriculture sector.[76] John Dalli also told the EU parliament in Strasbourg that claims had to be scientifically sound, unbiased and fool-proof in nature before it was publicised in future.[77]

Spain then rejected a €150,000,000/£135,000,000 the European Commission's compensation deal for there for farmers who were hit by the *E. coli* outbreak, on 8 June, saying it was too small.[78] France, European Union's largest agricultural grower, said it would support the plan to compensate producers hurt by the outbreak, according to the French Agriculture Minister Bruno Le Maire.[45]

Ministers from both EU and Russian were scheduled to meet on 8 June over Russian's earlier decision to ban all its vegetable imports from the EU.[79]

On 8 June, it was reckoned that the EU's *E. coli* O104:H4 outbreak cost $2,840,000,000 in human losses (such as sick leave), regardless of material losses (such as dumped cucumbers).[80]

Consumers across Europe were shunning fruit and vegetables en masse by 8 June, as the German government's against eating raw cucumbers, tomatoes, lettuce and sprouts remained on. EU farmers claimed to have losses up to C$417,000,000 ($611,000,000) a week as ripe vegetables produce rotted in their fields and warehouses.[81] On 8 June, The EU Farm Commissioner Dacian Ciolos said that the EU had increased its offer of compensation to farmers for the losses caused by *E. coli* outbreak to C$210,000,000 ($306,000,000).[81]

Specific countries

On 8 June, Dacian Cioloş, the European Commissioner for Agriculture & Rural Development, increased the compensation offer to €210 million ($306.2 million) for farmers who lost money due to the outbreak.[82][83]

Several countries reported economic losses, particularly Spain. By 7 June, the EU's Farmers had reported that they had lost millions of dollars in exports during the outbreak, with Fepex, Spain's fruit and vegetable industry group, saying its growers had lost $256,000,000m in turnover.[59] Spain rejected the European Commission's €150,000,000/£135,000,000 compensation deal for their farmers who were hit by the *E. coli* outbreak, on 8 June, saying it was too small.[78]

Other countries reporting losses included Bulgaria,[84] Croatia,[61] and Switzerland,[85][86] Russia requested further Turkish and Azerbaijani cucumber imports to replace banned EU imports.[74][87]

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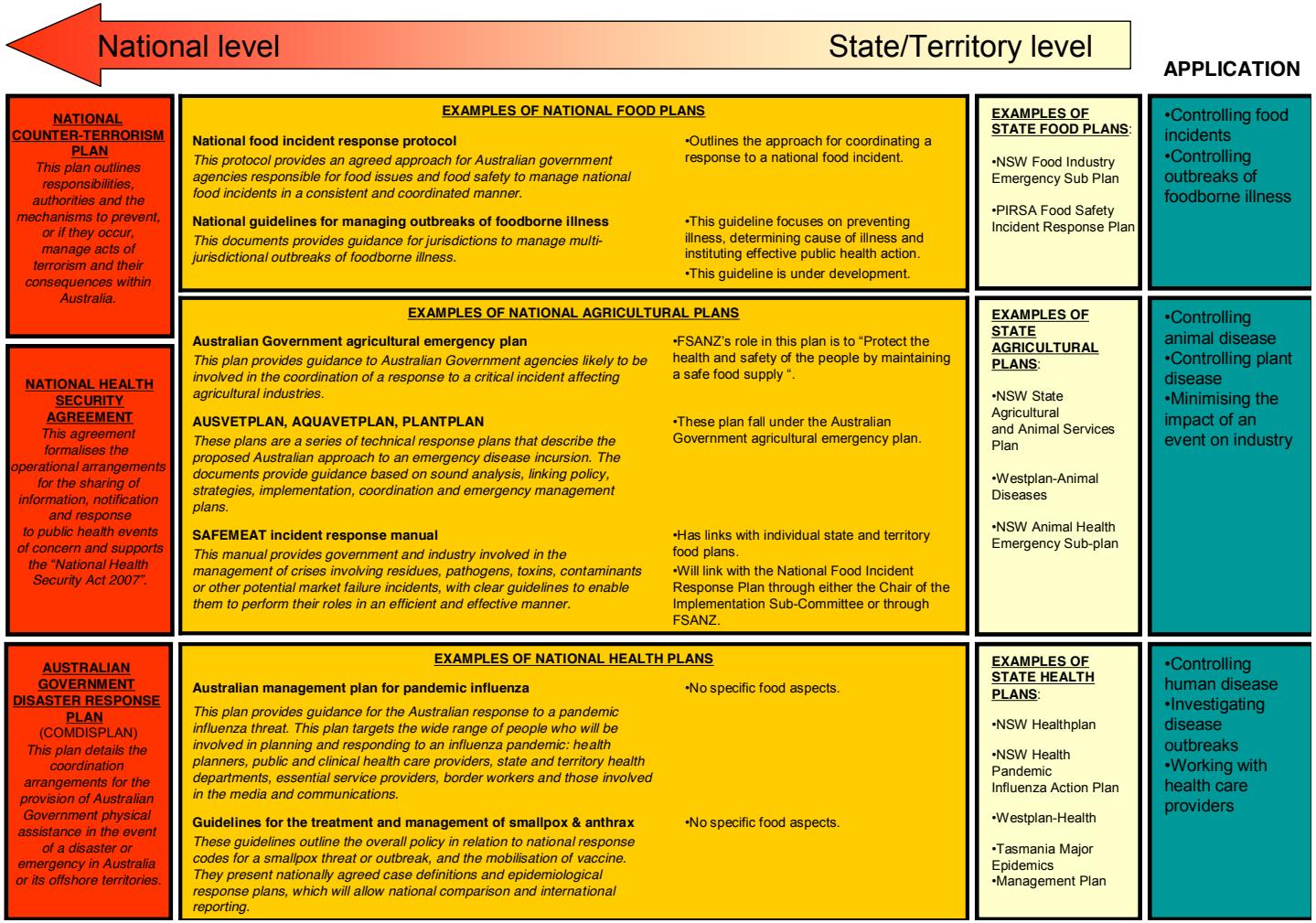
Appendix 8: Relationship between emergency response plans and protocols of Australian government agencies[24]



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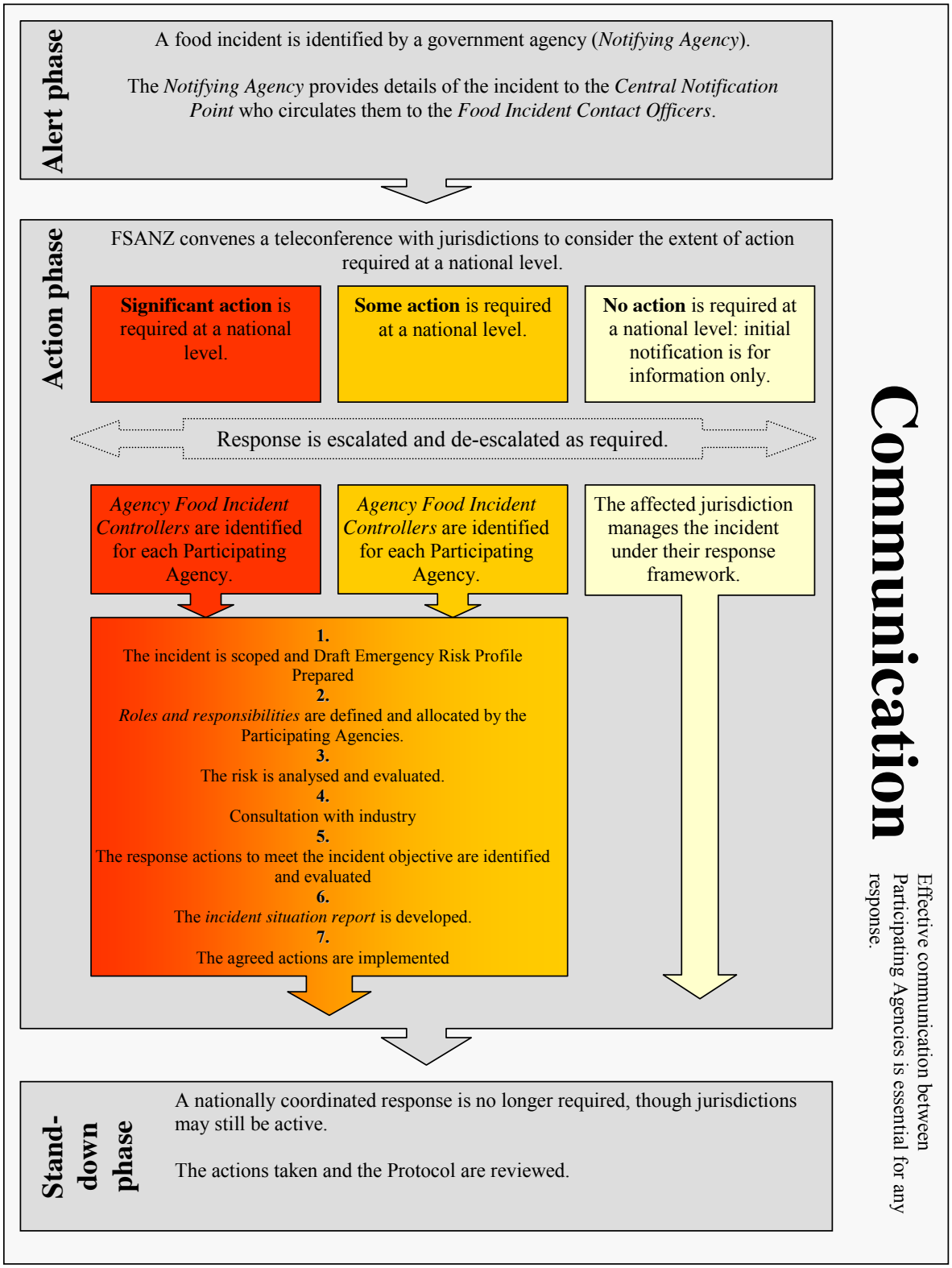
Alert phase
A food incident is identified by a government agency (*Notifying Agency*).
The *Notifying Agency* provides details of the incident to the *Central Notification Point* who circulates them to the *Food Incident Contact Officers*.
Action phase
FSANZ convenes a teleconference with jurisdictions to consider the extent of action required at a national level.
Significant action is required at a national level.
Some action is required at a national level.
No action is required at a national level: initial notification is for information only.
Response is escalated and de-escalated as required.
Agency Food Incident Controllers are identified for each Participating Agency.
Agency Food Incident Controllers are identified for each Participating Agency.
The affected jurisdiction manages the incident under their response framework.
1. The incident is scoped and Draft Emergency Risk Profile Prepared
2. *Roles and responsibilities* are defined and allocated by the Participating Agencies.
3. The risk is analysed and evaluated.
4. Consultation with industry
5. The response actions to meet the incident objective are identified and evaluated
6. The *incident situation report* is developed.
7. The agreed actions are implemented
Stand-down phase
A nationally coordinated response is no longer required, though jurisdictions may still be active.
The actions taken and the Protocol are reviewed.
Communication
Effective communication between Participating Agencies is essential for any response.

Appendix 9: Comparison of definitions in state legislation (Food Acts)

Food Standards Code Standard 3.1.1	**ACT - Food Act 2001 Section 11**	**NSW – Food Act 2003 Number 43 Section 7**	**QLD – Food Production (Safety) Act 2000 Section 10**	**NT – Food Act 27 January 2012 Section 9**	**WA– Food Act 2008 Section 11**	**SA – Food Act 2001 Section 7**	**VIC – Food Act 1984 Section 4C**	**TAS – Food Act 2003 Section 7**
…primary food production means the growing, cultivation, picking, harvesting, collection or catching of food, and includes the following –	…primary food production is the growing, raising, cultivation, picking, harvesting, collection or catching of food, and includes the following:	…primary food production means the growing, raising, cultivation, picking, harvesting, collection or catching of food, and includes the following:	…the production of primary produce includes the following — a) the growing, cultivation, picking, harvesting, collection or catching of animals, plants or other organisms;	…primary food production means growing, raising, cultivating, picking, harvesting, collecting or catching food, and includes the following activities:	…primary food production means the growing, raising, cultivation, picking, harvesting, collection or catching of food, and includes —	…primary food production means the growing, raising, cultivation, picking, harvesting, collection or catching of food, and includes the following:	…primary food production means the growing, raising, cultivation, picking, harvesting, collection or catching of food, and includes the following—	…primary food production means the growing, raising, cultivation, picking, harvesting, collection or catching of food, and includes the following:
a) the transportation or delivery of food on, from or between the premises on which it was grown, cultivated, picked, harvested, collected or caught;	a) the transport or delivery of food on, from or between the premises where it was grown, raised, cultivated, picked, harvested, collected or caught;	a) the transportation or delivery of food on, from or between the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught,	b) the transportation or delivery of primary produce;	a) transporting or delivering food on, from or between the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught;	a) the transportation or delivery of food on, from or between the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught;	a) the transportation or delivery of food on, from or between the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught;	a) the transportation or delivery of food on, from or between the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught;	(a) the transportation or delivery of food on, from or between the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught;

Food Standards Code Standard 3.1.1	**ACT - Food Act 2001 Section 11**	**NSW – Food Act 2003 Number 43 Section 7**	**QLD – Food Production (Safety) Act 2000 Section 10**	**NT – Food Act 27 January 2012 Section 9**	**WA– Food Act 2008 Section 11**	**SA – Food Act 2001 Section 7**	**VIC – Food Act 1984 Section 4C**	**TAS – Food Act 2003 Section 7**
b) the packing, treating (for example, washing) or storing of food on the premises on which it was grown, cultivated, picked, harvested, collected or caught;	b) the packing, treating (for example, washing) or storing of food on the premises where it was grown, raised, cultivated, picked, harvested, collected or caught;	b) the packing, treating (for example, washing) or storing of food on the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught,	c) the freezing, packaging, refrigeration, storage, treating or washing of primary produce;	b) packing, treating (for example washing) or storing food on the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught;	b) the packing, treating (for example, washing) or storing of food on the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught;	b) the packing, treating (for example, washing) or storing of food on the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught, or on premises that are associated with the premises on which the food was grown, raised, cultivated, picked, harvested, collected or caught;	b) the packing, treating (for example, washing) or storing of food on the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught;	(b) the packing, treating (for example, washing) or storing of food on the premises on which it was grown, raised, cultivated, picked, harvested, collected or caught, or on premises that are associated with the premises on which the food was grown, raised, cultivated, picked, harvested, collected or caught;
c) any other food production activity that is regulated by or under an Act prescribed by the regulations for the purposes of this definition.	e) any other food production activity that is regulated under an Act prescribed by regulation for this subsection.	e) any other food production activity that is regulated by or under an Act prescribed by the regulations for the purposes of this subsection.		e) any other food production activity that is regulated by or under a prescribed Act.	e) any other food production activity that is regulated by or under an Act prescribed by the regulations for the purposes of this subsection.	e) any other food production activity that is regulated by or under an Act prescribed by the regulations for the purposes of this subsection.	e) any other food production activity that is regulated by or under an Act prescribed by the regulations for the purposes of this subsection.	e) any other food production activity that is regulated by or under an Act prescribed by the regulations for the purposes of this subsection.

Appendix 10: Industry Survey

Food safety survey

Food safety vegetable survey

Horticulture Australia Limited has contracted RMCG to find out what food safety means to vegetable businesses and how they approach the management of food safety. Is a potential consumer health scare a real concern for the vegetable industry or certain industry sectors or is it a non-issue?

We would like to understand whether growers and supply chain partners have implemented a 3rd party certified food safety system or use their own management approach. We will be keen to know how and why you have chosen what you do for food safety and how it works for your business.

We would very much appreciate if you could complete this survey before 30 October. In addition, we would like to talk to a number of business owners about their food safety practices. If you are interested in talking with us, please indicate this at the end of the survey.

If you complete the survey, and provide your details, you have the opportunity to win an iPad mini.

If you have questions, please get in touch with Doris on 0438 546 487 or email dorisb@rmcg.com.au.

Personal information

1. What is your postcode?

Postcode

*2. What is your age?

- ○ Up to 25
- ○ 26-35
- ○ 36-50
- ○ 51-64
- ○ 65+

*3. What is your gender?

- ○ Male
- ○ Female

Operation type

Food safety survey

***4. Which of the following would best describe your business? Select all that apply.**

- [ ] Grow for export market(s)
- [ ] Grow for fresh market
- [ ] Grow for processing market
- [ ] Protected cropping
- [ ] Grow and pack for fresh market
- [ ] Grow for quick serve restaurants (i.e. McDonalds, Hungry Jack's)
- [ ] Grow and process for processing market
- [ ] Packing only
- [ ] Processing only
- [ ] Wholesale / market agent only

Other (please specify)

***5. Do you believe it is a legal requirement for you to implement a food safety system in your business?**

- ◯ Yes
- ◯ No
- ◯ Unsure

Vegetable growers

***6. Do you grow vegetables?**

- ◯ Yes
- ◯ No

Thanks for your time

This survey is for vegetable growers only, so not further information is required from you at this time.

Thank you.

Business information

Food safety survey

*7. What vegetable commodity or commodities do you grow? Select all that apply.

- [ ] Lettuce
- [ ] Capsicums (no chillies)
- [ ] Broccoli
- [ ] Beans
- [ ] Green peas
- [ ] Carrots
- [ ] Pumpkins
- [ ] Sweet corn
- [ ] Cauliflowers
- [ ] Cabbage
- [ ] Celery
- [ ] Zucchini
- [ ] Cucumbers
- [ ] Sweet potatoes
- [ ] Beetroot
- [ ] Chinese cabbage
- [ ] other Asian veg
- [ ] fresh culinary shallots
- [ ] Parsley

Other (please specify)

*8. How many hectares of vegetables do you grow?

- ( ) 0-10 hectares
- ( ) 10-50 hectares
- ( ) 50-100 hectares
- ( ) 100-200 hectares
- ( ) 200-500 hectares
- ( ) 500-1000 hectares
- ( ) 1000+ hectares

*9. What markets do you supply? Select all that apply.

- [ ] Supermarkets (e.g. Woolworths, Coles, Aldi)
- [ ] Other retail (e.g. comer stores, greengrocers)
- [ ] Roadside stalls
- [ ] Farmers markets
- [ ] Quick serve restaurants (e.g. McDonalds, Hungry Jack's)
- [ ] Market agents / wholesale
- [ ] Restaurants / catering companies
- [ ] Processors
- [ ] Packhouses

Other (please specify)

Food safety survey

***10. How many full-time equivalent employees do you have (including yourself and other family members)?**

- 1-5
- 5-10
- 10-20
- 20-50
- 50-100
- 100+

***11. Do you employ workers who do not speak English?**

- Yes
- No

Food safety

12. What do you believe are the biggest food safety risks to the vegetable industry?

Foodborne outbreak

When two or more people get the same illness from the same contaminated food, the event is called a foodborne illness outbreak.

***13. Are you aware of any foodborne illness outbreaks that have occurred in Australia in commodities that you grow?**

- Yes
- No

***14. Are you aware of any foodborne illness outbreaks that have occurred in in other countries in a commodity that you grow?**

- Yes
- No

Food safety survey

***15. In your opinion, how likely is it that a foodborne illness outbreak could occur in a commodity you grow?**

- ◯ Highly likely
- ◯ Likely
- ◯ Unlikely
- ◯ Highly unlikely
- ◯ Almost impossible

***16. In your opinion, how would a foodborne illness outbreak in a commodity you grow potentially affect your business?**

- ☐ Reduction in sales
- ☐ Loss of market
- ☐ Damage to reputation
- ☐ Increased cost of running business in the future
- ☐ Increased imports
- ☐ No effect

Other (please specify)

Food safety systems

***17. Do you think it should be mandatory for all vegetable growers to be certified to a 3rd-party audited food safety system?**

- ◯ Yes
- ◯ No

18. Reason for answer:

***19. Do you think levy money should be used for research into food safety or improving food safety systems?**

- ◯ Yes
- ◯ No

Food safety survey

***20. Do you think levy money should be used for extension of food safety information or improving food safety systems?**

- ○ Yes
- ○ No

***21. If training about food safety or food safety systems was available, would you participate?**

- ○ Yes
- ○ No

***22. What would you be willing to pay for the training?**

***23. What benefits do you believe businesses that are certified to a food safety system should receive?**

- ☐ Decreased insurance premiums
- ☐ Premium paid for produce
- ☐ Ability to label produce as food safety certified
- ☐ Reduction in levies

Other (please specify)

Is your business certified?

24. Are you currently certified to a 3rd-party audited food safety system?

- ○ Yes
- ○ No

Food safety system information

Food safety survey

***25. Which 3rd-party audited food safety system(s) are you certified to? Select all that apply.**

- [ ] BRC
- [ ] ISO 22000
- [ ] SQF
- [ ] Coles requirements
- [ ] ISO 9001
- [ ] Freshcare Food Safety and Quality
- [ ] GlobalG.A.P
- [ ] Nuture (formally Nature's Choice)
- [ ] HACCP
- [ ] An organic standard
- [ ] WQA

Other (please specify)

***26. How long have you maintained certification for?**

- ◯ < 1 year
- ◯ 1-2 years
- ◯ 3-5 years
- ◯ 5-10 years
- ◯ > 10 years

***27. What is the primary reason for being certified to a 3rd-party audited food safety system?**

- ◯ Required by a specific customer
- ◯ Improved access to markets
- ◯ To improve business performance
- ◯ To improve credibility
- ◯ To reduce the risk of produce contamination
- ◯ To reduce the risk of foodborne outbreaks

Other (please specify)

Food safety survey

*28. To what extent have these food safety systems:

	Greatly	Somewhat	A little	Not at all	Negative effect
Assisted in improving operational efficiency?	○	○	○	○	○
Assisted in identifying and controlling food safety hazards?	○	○	○	○	○
Assisted in improving product or service quality?	○	○	○	○	○
Assisted in improving employee performance?	○	○	○	○	○
Assisted with improving general record keeping?	○	○	○	○	○
Other	○	○	○	○	○

Other (please specify)

*29. How valuable are these food safety systems to your business?

- ○ Very valuable
- ○ Some value
- ○ Little value
- ○ No value
- ○ Negative effect on business

*30. What are the major benefits these food safety systems have had to your business? Select all that apply.

- ☐ Reduced number of recalls or rejections
- ☐ Improved cleanliness of facility
- ☐ Increase in price received for produce
- ☐ Increased markets
- ☐ Reduction in chemical use
- ☐ Better control of stock
- ☐ Increased production efficiency
- ☐ No benefits to business
- ☐ Only burden, negative impact on business

Other (please specify)

*31. Could the food safety system(s) you have implemented be improved?

- ○ Yes
- ○ No

Food safety survey

32. If yes, how could the food safety system(s) be improved?

***33. Would you maintain certification if your customer / market did not require you remain certified?**

- ◯ Yes
- ◯ No

34. What are the most difficult aspects of implementing and maintaining certification to the food safety system(s)?

Has your business ever been certified?

***35. Have you ever been certified to a 3rd-party audited food safety system?**

- ◯ Yes
- ◯ No

Previous food safety system information

***36. What food safety system(s) were you certified to? Select all that apply.**

- ☐ BRC
- ☐ ISO 22000
- ☐ SQF
- ☐ Coles requirements
- ☐ ISO 9001
- ☐ Freshcare Food Safety and Quality
- ☐ GlobalG.A.P
- ☐ Nuture (formally Nature's Choice)
- ☐ HACCP
- ☐ An organic standard
- ☐ WQA

Other (please specify)

Food safety survey

***37. What was the primary reason you became certified to a food safety system?**

- ◯ Required by a specific customer
- ◯ Improved access to markets
- ◯ To improve business performance
- ◯ To improve credibility
- ◯ To reduce the risk of produce contamination
- ◯ To reduce the risk of foodborne outbreaks

Other (please specify)

Reasons for dropping certification

***38. What was the primary reason for dropping certification to the food safety system (s)?**

- ◯ Too expensive
- ◯ Too much paperwork
- ◯ Customer no longer required certification
- ◯ Product risk low

Other (please specify)

Business never certified?

***39. Why have you never been certified to a 3rd-party certified food safety system?**

***40. What would entice you to become certified to a 3rd-party certified food safety system? Select all that apply.**

- ☐ Less expensive to implement and maintain
- ☐ Less paperwork to complete
- ☐ Customer 'forced' you to become certified in order to maintain market
- ☐ Foodborne outbreak in vegetable industry
- ☐ Foodborne outbreak in commodity you grow

Other (please specify)

Food safety survey

General food safety practices

***41. Which of the following practices do you have in place? Select all that apply.**

- [ ] Maintain records of application of synthetic fertiliser
- [ ] Maintain records of application of organic fertiliser and manure
- [ ] Maintain records of irrigation
- [ ] Conduct product inspections for contamination
- [ ] Avoid use of untreated manures
- [ ] Testing irrigation water for microbial contamination
- [ ] Testing postharvest water for microbial contamination
- [ ] Testing finished produce for microbial contamination
- [ ] Testing postharvest water for chemical residues
- [ ] Testing produce for chemical residues
- [ ] Treating postharvest water
- [ ] Monitoring treatment of postharvest water
- [ ] Training in personal hygiene standards for workers
- [ ] Displaying personal hygiene signage
- [ ] Providing training in relevant languages and / or pictorially
- [ ] Training staff in 'what to do if things go wrong'
- [ ] Calibration of monitoring and measuring devices (i.e. thermometers, cool rooms)
- [ ] Monitoring cool room temperature
- [ ] Storing packaging in a hygienic manner
- [ ] General record keeping
- [ ] Documented Crisis Management Plan / Business Continuity Plan
- [ ] Document Recall procedure / annual mock recall
- [ ] Assessing food safety risks

Other (please specify)

Requirements for suppliers of vegetables to your business

***42. Are all suppliers of vegetables to your business required to maintain certification to a 3rd-party food safety system?**

- ( ) Yes
- ( ) No

Food safety survey

Supplier food safety requirements

***43. Which of the following 3rd-party certified systems do you accept for suppliers of vegetables? Select all that apply.**

- [ ] BRC
- [ ] ISO 22000
- [ ] SQF
- [ ] Coles requirements
- [ ] ISO 9001
- [ ] Freshcare Food Safety and Quality
- [ ] GlobalG.A.P
- [ ] Nuture (formally Nature's Choice)
- [ ] HACCP
- [ ] An organic standard
- [ ] WQA

Other (please specify)

Supplier requirements

***44. Why do you not require suppliers of vegetables to maintain certification to a 3rd-party audited food safety system?**

***45. Do you require suppliers of vegetables to provide any of the following? Select all that apply.**

- [ ] Chemical application records
- [ ] Fertiliser and / or manure application records
- [ ] Microbial test of produce
- [ ] Chemicals residue test of produce
- [ ] Declaration that produce is free from contamination

Other (please specify)

Phone survey or on-site visit

Food safety survey

***46. Would you be willing to participate in a more detailed phone survey or site visit?**

- ◯ Yes
- ◯ No

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In order to go into the draw to win an iPad mini, please enter the following details. These details will not be given to any other parties, and will only be used to contact you in the event that you win the randomly drawn prize, or have indicated that we can contact you for a more detailed interview.

47. Contact details

Name:	
Company:	
Email Address:	
Phone Number:	

Thank you

Thank you for completing this survey. If you have any questions about this survey, please do not hesitate to contact the Project Manager, Doris Blaesing on 0438 546 487.