



**Operational research contract FMA169**

# **Generic HACCP Models for Food Assurance Programmes**

## **Implementation Guide**

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**Dated :**

September 2001

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#### Disclaimer

Every effort has been made to ensure the information in this report is accurate.

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## 1 INTRODUCTION TO OBJECTIVE 3

The original proposal for this project FMA 169 contained 3 objectives. The Report titled *Generic HACCP Models for Food Assurance Programmes* addresses Objectives 1 & 2. This Report addresses Objective 3, Implementation.

Initially MAF and the Researchers intended to work jointly to consult and liaise with the New Zealand Fresh Produce Industry to ensure implementation of the HACCP models developed in the first phase of this project.

The following outcomes were to be achieved :

- Working with MAF Food, consult and liaise with industry groups i.e grower, coolstore, packhouse, exporters, freight forwarders, transporters, packaging companies.
- Review of models subject to feedback.
- Test the auditability and verification capability for certification.
- Confirm with industry sectors as to ease of integration with current operational requirements.
- Identify gaps in existing knowledge where future research may be required.

However after further consultation with MAF Food, it was identified that an implementation guide which described opportunities to build on existing industry initiatives was more appropriate.

It should also be noted while the project has had an export focus the information that has been generated is applicable for fresh produce bound for sale on both the local and export markets.

## 2 COMMUNICATION AND CONSULTATION STRATEGY

It is essential for the producers, handlers and exporters of New Zealand Fresh Produce to accept the importance of addressing Food Safety throughout the supply chain. Consequently consultation with the industry has been ongoing throughout the development of this project, particularly with respect to the design and completion of the Product Descriptions and Generic Process Flows described in the Report titled *Generic HACCP Models for Food Assurance Programmes*.

During the development of this phase of the project it became evident that a number of industry initiatives are currently operating in the New Zealand Fresh Produce supply chain that relate to the production of safe food. These include:

- spray programmes designed to ensure MRLs are not exceeded,
- the Agrichemical Education Trust GROWSAFE programme,
- chemical residue testing,
- microbiological residue testing,
- water quality testing,
- staff training,
- cleaning regimes,
- production management programmes,
- Exporter Approved Supplier Programmes
- New Zealand Fresh Produce Approved Supplier programme,
- Integrated Fruit Production, and
- Integrated Pest Management.

At least some of these programmes include aspects of HACCP to a greater or lesser extent. Furthermore, these programmes are actively supported through participation from both individuals and relevant segments of the industry.

There is an opportunity for programme owners and participants to consider the outputs from this project when reviewing their existing operating regimes. This approach would potentially be an effective way of incorporating the outcomes of this project.

The communication and consultation strategy would benefit from a staged approach to industry. These are listed as follows.

### 2.1 Stage One

#### 2.1.1 Background Information for the industry

Internationally there is a growing interest and concern over the safety (particularly from a microbiological perspective) of edible plant products. This concern, at both the consumer and regulatory level, has been fuelled by some high profile (albeit quite product specific) food borne illness outbreaks, involving a number of deaths, which have been traced back to contamination of edible plants.

While New Zealand's exports of edible plant products are not at imminent threat from this trend, a number of countries (most notable the European Union) have signalled their intent to look at introducing regulatory requirements for the safety and hygiene of imported edible plant products.

New Zealand needs to position itself to be ahead of this trend, so that the introduction of any regulatory market access requirements by our trading partners can be quickly and effectively responded to. The establishment and implementation of scientifically valid guidelines for food safety in relation to the production, packing and storage of edible plant products will help ensure New Zealand both maintains its current access to markets and is able to protect its reputation as a supplier of safe food.

A previous MAF Operational Research project, reference FMA 101, was undertaken by MAF Biosecurity Authority in 1998 / 1999 in response to industry feedback that existing quality assurance specifications were causing difficulties. The objective of that project was to review research and design user-friendly HACCP models acceptable to industry for export plant integrity.

Project FMA 101 attempted to deliver a system to meet food safety, phytosanitary, market access and quality outcomes, whilst trying to introduce the concept of risk management - this was difficult to achieve in one document and unfortunately resulted in a diluted approach. It did not adequately address food safety issues in plant products and in particular did not identify scientific data to validate the identification of hazards.

It would be difficult to model any HACCP analysis in the fresh produce industry using the outcomes from the previous report because specific fresh produce food safety issues were not identified. As a result it was not possible to confirm specific hazards and the necessary controls and further specific work was required to address HACCP application in the fresh produce industry.

Further research was required in order to:

- Validate scientifically (wherever possible) the potential biological, chemical and physical hazards that have been identified, both for conventional and organic production systems;
- Review the models to ensure consistency with MAF/MOH application of HACCP principles.
- Produce HACCP models that can be incorporated into MAF Standards for plant product assurance programmes as such programmes are developed (i.e. organic official assurance programme, grade official assurance programme, fresh produce food safety official assurance programme).
- Provide sufficient guidance to the different levels of the sector to ensure both effective uptake of and maximum benefits from, the models.

MAF Food Assurance Authority applied for and received approval for funding from the 2000/2001 MAF Policy Operational Research fund for the development of HACCP models for MAF (Plants) certification of exported plant products. AgriQuality New Zealand tendered for the Project and were awarded Operational research contract FMA169 –“*Generic HACCP Models for Food Assurance*”

## 2.1.2

### Industry consultation

*Inform the industry of the process that was undertaken to achieve the results of Objective 1 & 2 (i.e. the Literature search and the Development of HACCP Models)*

The scope of this project covers: the production, packing, storage and distribution of fresh produce (i.e. fruit and vegetables), for export.

An extensive Literature search was undertaken to identify food safety issues, hazards, controls and desired outcomes over the range of crops listed below:

- Root crops - potatoes, carrots, onions,
- Fruit crops - apples, kiwifruit, summerfruit, sub-tropicals,
- Seeds/sprouts,
- Leafy green - lettuce, brassicas,
- Glasshouse - tomatoes, capsicums,
- Berryfruit, and
- Organic crops.

The information from the Literature search was analysed and the results were used to develop the HACCP models. Continuous consultation with MAF Food staff has been undertaken to ensure the application of HACCP principles was consistent with MAF Food's application of HACCP and followed Codex Guidelines on HACCP application.

## **2.2 Stage Two**

- Presentation to Key Parties is recommended. A presentation schedule may include but not be limited to:
  - Vegfed/ Fruitgrowers Fed - NZFPAS programme Committee
  - Plant Market Access Consultative Committee ( PMACC )
  - Horticulture Export Authority
  - Joint Produce Industry Conference
  - Organic Product Exporters of NZ ( OPENZ ) Executive
  - Individual Sector group AGM and Executive e.g. Avocado
  - Pipfruit Growers NZ Ltd
  - Zespri NZ
  - Ministry of Health
  - Crop & Food Research
  - Hort Research
- It is recommended that the final report be posted on MAF Food website with directions on how to obtain the supporting reports addressing Objectives One to Three.

As a MAF Policy Operational Research project the Final Report will be located at the MAF Policy address: <http://www.maf.govt.nz/mafnet/issues/policy/>.

In addition it would be useful for users to be advised of this information while browsing either the MAF Food or the MAF Biosecurity Plants locations on the MAF website.

### **2.3 Stage Three**

- Continued development and establishment of communication channels between MAF Food and relevant industry groups and individuals.

Further development of the work undertaken in this project would benefit from direct participation of relevant industry members in conjunction with MAF Food as/or when appropriate.

### 3.0 AUDITABILITY AND VERIFICATION CAPABILITY FOR CERTIFICATION

The process has been developed to ensure compatibility with International Codex requirements, the Ministry of Health's, and MAF Food's application of HACCP principles. In addition, the project outcomes have been developed in consideration of the existing Food Safety and/or related programme's currently operating in the Fresh Produce Industry.

Because this process has been followed, the structure described in the Report, *Generic HACCP Models for Food Assurance Programmes*, provides an internationally credible platform from which to develop or review existing Food Safety Programmes for Fresh Produce. The structure includes:

- An international Literature Search
- Product Descriptions
- Process Flows
- Hazard Identification
- Hazard Analysis and Significance
- Control Measures
- Critical Control Point Determination ( CCP )
- Critical Limits
- Monitoring of CCP's
- Corrective Action Taking
- Verification Procedures
- Documentation and record keeping

Appendix 1 lists a model example of how the structure can be applied to a specific crop production system.

Organisations and individuals can refer to the possible hazards identified in the project to ensure they have considered all hazards that are present or likely to be present in their own operations.

## 4.0 INTEGRATION WITH CURRENT INDUSTRY PROGRAMMES

The horticultural industry is facing demands from both regulatory and commercial parties for operating systems that ensure “customer” requirements are met. Customer requirements range from regulatory phytosanitary to commercial ethical staff practises, and include assurances of organic production and food safety. Most require the supplier to undertake a Hazard Analysis and identify any Critical Control Points (HACCP) as part of their system development.

The Final Report from Project FMA 101 dated May 2000 *To Review; Research and Design HACCP Models Acceptable to Industry for Export Plant Integrity* recommended the development of a separate Code of Practice. Since this recommendation was made the Fresh Produce Industry has taken more ownership and responsibility in the area of Food Safety (e.g. the New Zealand Fresh Produce Quality Assurance Programme contains considerable guidance information on the production of safe food). Industry members consulted during this project believe a separate Code is not appropriate. Some parties indicated willingness to work closer with MAF Food to ensure a unified approach to any further development of the programmes currently operating in the Fresh Produce Industry.

To facilitate the integration of the findings of this project it is critical that a close working relationship is developed with the Industry Federations and associated bodies such as:

- New Zealand Vegetable & Potato Growers Federation ( Vegfed )
- Fruitgrowers Federation of New Zealand
- The Plants Market Access Consultative Committee (PMACC)
- Pipfruit Growers New Zealand Inc.
- Horticulture Export Authority (HEA)
- Ministry of Health (MoH)
- Zespri International Ltd.

It is possible that the reports generated from this project could be used to support existing initiatives undertaken by the industry (e.g. the NZ Fresh Produce Approved Supplier Programme ( NZFPAS ) and various exporter programmes), particularly if it becomes necessary to negotiate food safety border access arrangements for New Zealand Fresh Produce with overseas regulatory authorities. Building on existing industry programmes would avoid a duplication of work in this area in addition to enhancing the uptake of Good Agricultural Practices and HACCP principles.

The produce industry is an international industry and is exposed to the impact of change on a global basis, which has led to the increased awareness of global initiatives such as The European Union Working Group Good Agricultural Practices ( EUREP GAP).

The NZFPAS programme has been developed using HACCP principles and Good Agricultural Practices for the domestic market. The NZFPAS Programme Committee have been working with the NZ Ministry of Health since the development of the programme. A natural progression would be to build on the findings of this project to develop international requirements (e.g. EUREP GAP). The Researchers believe that any such development to address international requirements would be enhanced by considering the outcomes from this project.

## 5.0 FUTURE RESEARCH

The International Literature Search has provided an important base and valuable resource that could be considered by industry groups when they are developing their research programmes. The industry sectors and Crown Research Institutes could define research projects which are specific to their areas e.g. the Potato sector of Vegfed could investigate the uptake of heavy metals by Potatoes.

There are a number of areas where further research or more information is required before a hazard can be determined as significant or not. These include:

- The significance of *Yersinia enterocolitica* presence in New Zealand,
- The level of health risk associated with *Cyclospora cayetanensis*,
- The uptake of residues in soil by plants and any conditions leading to the presence of heavy metals,
- Information for determining hazard significance for heavy metals in soil such as likely occurrence, evaluation, persistence and conditions leading to the uptake by plants.

The areas listed above are a small illustration of what future research areas may be worked on by the industry.

It is recommended that MAF Food consult with research bodies to communicate project outcomes.

The information collated through the literature search will become dated over time. The importance of up to date information needs to be considered. It may be necessary to undertake a similar literature search and review of the outcomes from this project from time to time.

## APPENDIX ONE: GENERIC HACCP MODEL FOR TOMATOES

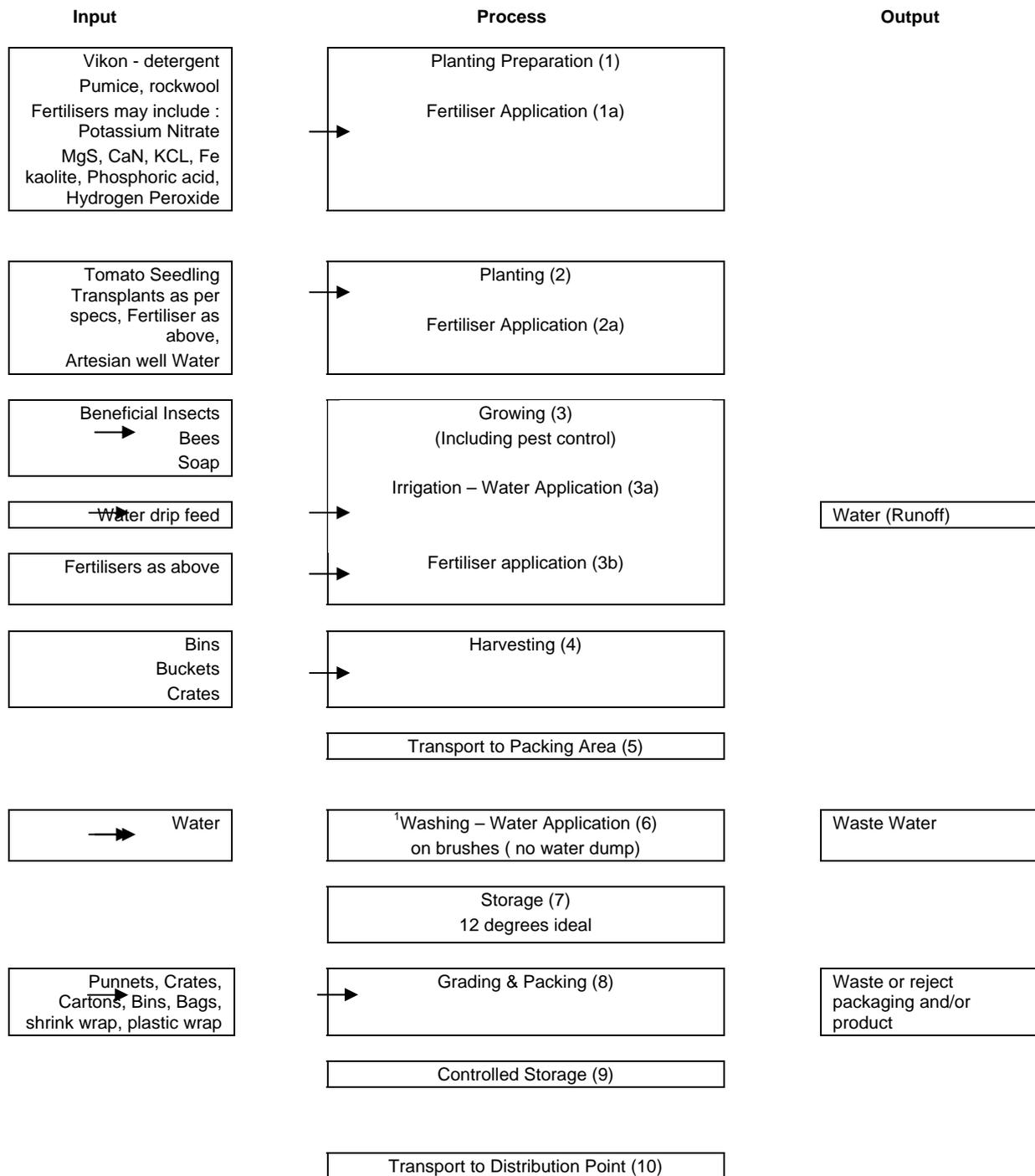
The following example demonstrates how the model could be applied to a Glasshouse hydroponic Tomato operation. Each operator would need to identify their specific requirements and adapt the model to suit their operation.

### A) Product Description

Description:	Tomatoes
Relevant safety information:	<ul style="list-style-type: none"><li>• Cooked or eaten raw.</li><li>• Almost always cut.</li><li>• Grown above ground.</li></ul>
Packaging:	Loose in cartons.
Durability & storage conditions:	Refrigerated storage.
Method of distribution:	Within New Zealand product is transported in refrigerated or un-refrigerated enclosed trucks. It is mainly exported as un-refrigerated airfreight but also some refrigerated sea freight.
Expected uses:	Cooked or eaten raw.
Vulnerable groups of population:	All groups may consume these raw and/or cooked.
Potential for abuse:	Not washed or refrigerated in the home and/or at the distribution centre/retailer.

## B) Process Flow

### Process Flow for Glasshouse Crops - Tomatoes



## C) Hazard Identification

### Tomato Crop in Artificial medium

Process Step	Hazard Source	Hazard
1 – Planting Preparation		
2 – Planting		
3 – Growing	Water	Norwalk-like Viruses Hepatitis A <i>E. coli</i> O157:H7 <i>Salmonella</i> <i>Campylobacter</i> <i>Shigella</i> <i>Giardia</i> <i>Cyclospora</i> <i>Yersinia</i> <i>Clostridium</i>
	Chemical Application	Chemical residues
4 – Harvesting	Contact with food-handlers	Norwalk-like Viruses Hepatitis A <i>E. coli</i> O157:H7 <i>Salmonella</i> <i>Campylobacter</i> <i>Shigella</i> <i>Giardia</i> <i>Listeria</i> <i>Clostridium</i>
	Physical Contamination	Various Physical e.g wood, metal, glass
5 – Transport	Physical Contamination	Refer Step 4
6 – Washing	Water	Refer Step 3
7 - Storage	Physical Contamination	Refer Step 4
8 - Grading/Packing	Contact with food-handlers	Refer Step 4
9 – Controlled Storage	Physical Contamination	Refer Step 4
10 – Transport	Physical Contamination	Refer Step 4

## D) Control Measures

### Tomato crop control measures

Process Step	Hazard Source	Hazard	Control Measure
1 – Planting Preparation			
2 – Planting			
3 – Growing	Water	Norwalk-like Viruses Hepatitis A <i>E. coli</i> O157:H7 <i>Salmonella</i> <i>Campylobacter</i> <i>Shigella</i> <i>Giardia</i> <i>Listeria</i> <i>Cyclospora</i>	Refer water control as a separate control measure
	Chemicals	Chemical Residues	Agrichemicals are not used outside condition of registration and rate of application as per manufacturer's instructions are followed.
4 – Harvesting	Contact with food-handlers	Norwalk-like Viruses Hepatitis A <i>E. coli</i> O157:H7 <i>Salmonella</i> <i>Campylobacter</i> <i>Shigella</i> <i>Giardia</i> <i>Listeria</i> <i>Clostridium</i>	Food handlers do not come to work when suffering from symptoms of a communicable disease (e.g. nausea, abdominal cramps, vomiting, diarrhoea). Food handlers maintain an appropriate degree of personal cleanliness including that cuts and wounds are covered and hands are washed and sanitised where applicable. Amenities provided for food handlers are kept in a good state of repair, clean and well-stocked.
	Physical Contamination by food handlers containers	Various physical sticking plasters wood , metal, glass	Harvest equipment is maintained. Food - handlers conduct their work in such a manner that reduces the opportunity for potential contamination from physical objects such as sticking plasters, wood, metal, glass, etc
5 – Transport	Physical Contamination containers	Various physical wood , metal, glass	Transport vehicles are soundly constructed and inspected before use.
6 – Washing	Contaminated Water	Refer Step 3	Refer Step 3
7 - Storage	Physical contamination containers	Various physical wood , metal, glass	Storage facilities are built in a manner to avoid access by pests and reduce opportunity for physical contamination and inspected before use
8 - Grading/Packing	Contact with food-handlers	Refer Step 4	Refer Step 4

Process Step	Hazard Source	Hazard	Control Measure
9 – Controlled Storage	Physical contamination containers	Various Physical Wood, metal, glass	Storage facilities are built in a manner to avoid access by pests and reduce opportunity for physical contamination and inspected before use
10 – Transport	Physical contamination containers	Various Physical Wood, metal, glass	Transport vehicles are soundly constructed and inspected before use.

## E) CCP Determination

### Tomato crop CCP determination

Process Step	Hazard Source	Q1	Q2	Q3	Q4	CCP Y/N
1 – Planting Preparation						
2 – Planting						
3 – Growing	Incorrect Chemical Application Water *	Yes	No	No		No
4 – Harvesting	Contact with food-handlers Containers	Yes	No	No		No
5 – Transport	Containers	Yes	No	No		No
6 – Washing	Water *					
7 – Storage	Containers	Yes	No	No		No
8 - Grading/Packing	Contact with ill food-handlers	Yes	No	No		No
9 – Controlled Storage	Containers	Yes	No	No		No
10 – Transport	Containers	Yes	No	No		No

\* NOTE : Water is to be treated separately for individual properties.

Q1 = do control measures exist for the identified hazard

Q2 = is the step specifically designed to eliminate or reduce a hazard to an acceptable level

Q3 = could contamination occur or increase to unacceptable levels

Q4 = will a subsequent step eliminate or reduce the likely occurrence of the hazard to an acceptable level.

## F) Documented Procedures for CCP's

### Documented procedures for CCPs - example for Agrichemicals

Controls:	Application of agrichemicals at any process step for any product type within the scope of this project
<b>Critical limits</b> ( Acceptable criteria )	
Parameters being checked	Chemical residues & Manufacturers instructions
Target level for each parameter.	Chemical residues in the final product do not exceed MRL's Instructions for application have been followed.
<b>Monitoring procedures</b>	
Responsibility for monitoring	Operator
What is going to be done	Application and harvesting according to label. Growsafe certified.
Monitoring method, sampling regime etc.	Measuring correct quantities of chemicals to manufacturers instructions. Determine the length time between application during ground preparation, planting, growing and harvest.
Monitoring frequency	For every application
How the observations are to be recorded	Maintenance of spray diary
<b>Corrective action procedures</b>	
Responsibility for taking corrective action	Operator
How is control restored	Do not apply chemical. Don't/delay plant(ing) Delay/don't harvest
How is control and disposition of non-conforming product managed	As above
Action taken to prevent the problem from happening again	Refer to manufacturers instructions
Escalating response is available if preventative action fails	Re-training
How the above actions are to be recorded	Component of spray diary

## G) VERIFICATION OF HACCP PLAN

Verification is the application of methods, procedures, tests and other evaluations, in addition to monitoring, to determine compliance with the HACCP plan's food safety objectives and control measures.

For this example the food safety objective is any chemical residue in final product not exceeding MRL's

For the control measures one of the main methods of verification is through audit and testing. Examples of this can be broken into internal and external:

### Internal

- a. Internal audits by a competent staff member,
- b. Obtaining a Certificate of Analysis (COA) from suppliers of manure, biosolids and other natural fertilisers to demonstrate the absence or control of potential hazards,
- c. Reviewing results of refresher training for food and packaging handlers to determine ongoing awareness and compliance with appropriate safe food procedures,
- d. Testing of tomatoes for biological and chemical hazards,
- e. Visual inspection of tomatoes for physical hazards, and
- f. Visual monitoring of food-handlers practices.

### External

- g. Third-party audits of each operation such as those carried out by auditors for industry export programmes,
- h. Third-party audits of product and service suppliers to determine safe practices are being followed, e.g. packaging, equipment, transporters, stores,

For each hazard and CCP, verification activities in addition to the activities described above, should be described as in the following example. E.g for AgriChemicals

Responsibility for validation / revalidation	Operator/System Manager/Quality Manager
How validation is to be done	Via spray diary showing correct application and timing Participation in random sampling programme
Responsibility for ongoing operator verification	Operator/System Manager/Quality Manager
When is ongoing operator verification to be carried out	Periodically
How is ongoing operator verification to be done	Internal audit Review operation Review records Targeted Sampling & testing as necessary
What follow up action is to be taken if non-compliance occurs	Identify and adequately control affected product Modify system to control CCP
How the above activities are recorded	Operator verification report