NRDC/ZEGA Training Trust

Basic Food Safety
Level 1

Trainers Handbook

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Contents

1. Introduction

Food safety training is essential for all persons who handle produce.

Supervisors and senior workers are paramount in the implementation of rules and procedures and the monitoring of actual standards of performance.
Therefore it is essential that this group of people have a thorough understanding of the principles and practices of 'Due Diligence' in relation to Food Safety on the Farm and in the Pack House.

The Level 1 Course is designed for Supervisors and senior workers in all sections of production, harvesting, grading and packing of Vegetable produce for export and aims to explain the risks to food Safety and how these risks can be controlled in the work place.

Length of the Course:

Training takes approximately five (5) hours
and
Assessment two (2) hours at a later date

Profile of Trainees for the Level 1 Course

Trainees who will benefit from and should be considered for the Level 1 Course include:

- Small Scale farmers
- Crop Block supervisors
- Harvesting Supervisors
- Spray men
- Drivers
- Intake and Depot staff
- Line Supervisors in the Pack House
- Quality controllers

To facilitate course delivery Trainees for the course should be grouped according to work area and language fluency.

Typically: Field or Pack House
English or Vernacular

2. Course Aims and Objectives

Aims

The Course aims to raise participant's awareness and understanding of the principles and practices of Basic food Safety as they apply to the production, harvesting, grading and packing of fresh vegetables for export.

Objectives

To enable course participants to:

- Appreciate the importance of the production of 'Safe Food' for the local and international markets
- Understand how produce may become contaminated with chemicals, food poisoning bacteria and foreign bodies
- Understand and implement practical measures to prevent or minimise the risk of contamination of vegetable produce by chemicals, food poisoning bacteria and foreign bodies
- Be able to explain procedures and hygiene rules to workers in their teams
- Understand the need to ensure that procedures to protect the safety of vegetable food products are implemented at all times.

3. Content of Basic Food Safety Training at Level 1

1. The need to produce safe food

Moral responsibility — Food Safety is for everybody
Legal requirements
Buyer and consumer concerns and requirements
International and market initiatives, e.g. GFSI, EUREP GAP, etc

2. Due diligence

Definition
Risk assessment
Policies, procedures and work instructions
Importance of worker training and implementation of written procedures
Evidence of compliance: Provision of facilities, equipment & materials
Observation of work in progress
Employee testimony
Records

3. Risks to food safety

Identification of risks relevant to vegetable production in Zambia

Biological	Food poisoning bacteria
Physical	Foreign bodies
Chemical	Pesticides, disinfectants & perfumes

Characteristics of key risks:

Food poisoning bacteria	Effects, sources and transmission
	Requirements for survival and multiplication
Foreign bodies	Types and sources
Chemicals	Types and sources
	Methods of contamination

4. Measures to prevent contamination with, and to control, food poisoning bacteria

Importance of prevention of contamination
Water sources and water testing
Use of animal manure
Use of disinfectants and sanitising agents
Cleaning of equipment
Provision and use of toilets and hand washing facilities
Hygiene rule for personnel
First aid provision
Pest and rodent control

5. Measures to prevent contamination with foreign bodies

Use of insectocutors, fly screens and rat traps
Glass register and routing inspection of fittings
Separation of export produce from inputs, rejects and rubbish
Records if issue and 'return' of plasters, knives, etc and use of metal detectors
Head covering, no jewellery, long nails or use of nail polish etc.

6. Measures to prevent contamination with chemicals

Pesticides — Choice and 'quality' of product
Application in accordance with label recommendations
Accuracy of application

	Observation of the harvest interval
	Prevention of drift from neighbouring crops
Disinfectants	Use of food grade products
	Observation of label recommendations
Perfumes	Significance of ‘foreign tastes and smells’
	Use of un-scented ‘soap’
	Exclusion of personal use of perfumes and hand creams

7. ***Roles and responsibilities of Supervisors***

Organisation of facilities, equipment and materials

Responsibility for:

Training workers and explaining what they are required to do
Explaining the Hygiene Rules
Monitoring work in progress
Communication with the manager
Recording
Action when work is not being done correctly
Action when staff do not obey the hygiene rules

Learning Outcomes

On completion of the course the participant should be able to:

- Explain the need to produce safe food
- Identify the three major causes of risk to food safety
- State the most likely sources of food poisoning bacteria in vegetable production
- Explain how food poisoning bacteria may contaminate vegetable produce
- Explain how to minimise and control the risk of contamination with food poisoning bacteria
- Identify common types of foreign bodies that may occur in vegetables produce
- Explain how to exclude or detect the presence of foreign bodies in the produce
- Explain when pesticide residues in excess of the approved MRL may occur in vegetable produce
- Explain how to minimise the risk of pesticide residues occurring in the produce
- Explain how to prevent produce becoming contaminated with disinfectants and perfumes
- Describe procedures that must be implemented in their work place to ensure that the vegetable produce remains ‘Safe to Eat’
- Explain these procedures and the Farm Hygiene Rules to workers in their teams
- Know the supervisors and Managers role’s in ensuring that procedures to ensure safe food production are practiced at all times.

4. Programme for Delivery & Assessment

Food Safety Level 1

Course Programme

Day	Time allowed	Content	Presentation Method	Trainers Notes
One	30 minutes.	Introduction - Aims and format of the course - Importance of food safety to producers, buyer & consumers	Trainer to present	*Important that all trainees realise that food safety is for everybody all the time not just Europeans on the day of the Audit*
	60 minutes	Risks to food safety - Food poisoning Bacteria Effects, sources, growth and multiplication Transmission - Foreign bodies Types and sources - Chemicals Types and sources How produce may be contaminated	Trainer to present	*Important to* - *Explain that this is a factual discussion and nobody is being accused of being dirty or ignorant* - *illustrate presentation with pictures and examples from the work place* - *Humour often breaks the ice when discussing sensitive subjects*
	Coffee			
	60-90 minutes	Work place procedures to minimise and control the risk of contamination with food poisoning bacteria, foreign bodies and chemicals	Trainer to discuss with class or to get class to prepare presentations	*Choice of presentation method will depend on class experience. Only experienced supervisors will be able to prepare presentations at this stage.*
	Lunch			
	2 hours	Evaluation of procedures in the farm or pack house Or Preparation and presentation of items for worker training	Trainer to oversee and prompt or add information as necessary	*These activities are designed to revise the instruction given in the morning and to help the trainees see and think about how the principles of food safety apply to the every day practices in the work place.*
Two	2 hours	Written or oral examination		

5. Materials List

Basic Food Safety Level 1

Materials List

Delivery	Flip chart & stand Markers Assorted posters Class register		
Handouts *Per person*	Basic Food Safety Level 1 Trainees Handbook Wash your hands Rules for harvesters/pack house workers		
Demonstration Materials	Hand washing:	Soap, chlorine, towel, bowl & bailer, bucket with tap, paper towel	
	Crates	Clean & dirty	
	Wet pad	Clean and dirty	
	Picking bag:	Fertiliser sack & designated clean bag	
	Knives, scissors, chopping board, brushes etc. Pallet Assorted foreign bodies		
Presentation Materials	Large sheets of paper Coloured pens	} }	needed if using Exercise 2 in the afternoon session
Assessment	Written test papers And/or Proformas for answers to oral questioning		

6. Class Register

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Register of Training

Course: **Food Safety Level 1**

Venue: …….. **Date:** ……

Instructor: …….

Name	NRC No.	Farm	Position	Signature
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

Total Participants: …… **Signed:** …….
Instructor

7. Practical Exercises to Support Presentations and Training
in
Basic Food Safety at Level 1

1. Evaluation of Food Safety Practices on the Farm or in the Pack house

Suitable for use when delivering training 'on the farm'
Time needed: About 2 hours

Farm site or Pack house to be divided into key areas in relation to procedures affecting the safety of the produce.
Divide trainees into two groups and allocate areas to each group.

Typically:	Farm situation	Pack house situation
	Group 1 Farm	*Group 1 Pack house*
	Spraying	Intake
	Use of animal manure	Cold room management
	Harvesting	Grading & packing produce
	Field shelter	Over wrapping
	Group 2 Farm	*Group 2 pack house*
	Transport	Quality control
	Cold room	Packing
	Field toilets	Cleaning floors and tables
	Crates and wet pads	Cold chain management

Each group to visit the sites allocated to them and to prepare an explanation of the food safety measures in place in those sites
(Allow about 30 minutes)

Group 1 then to take the role of Site Supervisor for the areas allocated to them and Group 2 to take the role of potential buyers/technical advisors.

Group 1 members present and explain what happens in the areas allocated to them and Group 2 members observe, question and offer advice as necessary.

Reverse the roles to allow Group 2 to present to Group 1.

Trainer to:
- Act as time keeper
- Check that all relevant points are covered and to prompt or add information or explanation as necessary.

2. Explanation of Hygiene Rules and Work Procedures

Suitable for use when training is not delivered on a Farm site or when access to the site is not possible, e.g. due to busy export day or wet weather.
Time needed +/- 2 hours

Hygiene rules and Suitable work practices to be divided into sections.

e.g. Use of field toilets
Handling produce
Hand washing and inspection
Spraying
Use of animal manure
Crates and wet pads
Sickness and injuries
Cleaning floors, crates, wet pads, tables, etc

Divide the trainees into pairs and allocate one topic to each pair.

Each pair is to prepare to explain the topic that they have been allocated to a group of workers.
Each pair should prepare a picture poster to support their explanation
Each pair should present their explanation to the Group.

Trainer to:

Act as time keeper
Observe and guide during the preparation phase
Check that all relevant points are covered and prompt or add comment as necessary.

3. Review of Food safety Practices on the Farm/in your Department

Designed to encourage trainees to relate what they have learnt to their own work place.
Suitable for use as a home work exercise to compliment either of the previous activities.

1. Describe briefly how vegetables are handled on the farm / in your Department.

2. Produce a list of all the activities that you do to ensure that the vegetables are ‘safe to eat’.

3. Produce recommendations for additional things that you think could be done to improve the safety of the vegetables that are produced at your work place.

Answers to be handed in …….

8. Assessment of Level 1

Introduction

Assessment is essential to confirm that learning has taken place.
Level 1 Candidates have significant responsibility for the day to day implementation of food safety practices:
Key responsibilities include:

Explaining Hygiene Rules to staff
Giving instructions about work to be done
Monitoring performance to ensure that procedures and rules are followed at all times
Reporting to the manager and taking corrective action as necessary.

The Level 1 Candidate is the person who is 'On Site' at all times when produce is being handled.
Therefore it is essential to confirm that, after training they have adequate knowledge and understanding to be able to carry out their roles and responsibilities.

Assessment methodology

Knowledge and understanding is to be assessed using a series of questions.
Conduct of the assessment should follow the following guidelines:

- Assessment should be conducted several days after the instruction has been given to allow the candidate time to assimilate the information
- Questions may be asked in written form or orally as appropriate for the candidate.
- Questions may be presented in English or an appropriate vernacular language.
- Time allowed to answer the questions asked in the form of a written test should be +/- 2 hours. Time is not critical as the assessment is of knowledge and understanding not the ability to write quickly
- Answers should be marked in accordance with the guidelines provided
- The pass mark for the assessment is **70%**
- Candidates who do not obtain sufficient marks may have a second attempt when they should either attempt the whole paper, (serious failure) or just the questions that proved to be a problem on the first attempt. Re-assessment will often need to be done orally as often the problem is not lack of knowledge but inability to express this knowledge easily on paper.

The practical assessment of implementation of learning in the work place is recognised as being desirable but is considered to be not possible within the variability and constraints of the work place and the framework of the Level 1 course delivery and assessment.

Feedback for assessment results to candidates is essential:

Candidates are motivated by having their knowledge and ability recognised
Candidates will learn from discussion regarding areas where marks were lost.

Feedback should ideally occur within two weeks of completing the course assessment, otherwise the information looses relevance and impact.

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Level 1 Food Safety

Written Test

Time Allowed +/- 2 hours

Please answer all questions in the spaces provided.

1. Explain what is meant by the term ‘Due Diligence’.

4 marks

2. Outline two (**2)** reasons why Buyers and Supermarkets want to make sure that the vegetables sold in their shops are safe to eat.

4 marks

3. Explain how to ensure that written procedures are put into practice on the farm and in the pack house.

4 marks

4. Describe the symptoms of food poisoning and name one bacteria that will cause these symptoms.

4 marks

5. State four (4) places where food poisoning bacteria can be found.

4 marks

6. Outline four (4) ways in which food poisoning bacteria may get from an animal or infected person on to the produce.

4 marks

7. State the conditions that bacteria need to grow and multiply.

4 marks

8. Name four (4) types of ‘foreign Body’.

4 marks

9. List four (4) rules that you have in place on the farm or in the pack house to stop foreign bodies contaminating the produce.

4 marks

10. Outline four (4) ways of making sure that produce is not contaminated with pesticide.

4 marks

11. a. Outline three (3) ways of making sure that produce is not contaminated with chemicals used for cleaning.

3 marks

11. b. Explain how to ensure that vegetables are not contaminated with rat poison.

1 marks

12. List four (4) things to check for when inspecting the hands of harvesters and pack house workers.

4 marks

13. In relation to washing hands, comment on the following:

    a. The reason(s) for using soap

    b. The type of soap that should be used

    c. The reason why chlorine may be added to the water

    d. Why it is important to use running water in a ‘Once use only system’.

4 marks

14. a. Explain why people must use the toilets provided on the farm and not ‘help themselves’ in the bush.

    b. Explain why it is necessary to keep toilets clean.

4 marks

15. a. Explain why people who have vomited or had diarrhoea in the last 24 hours should not be allowed to work with the produce.

b. Explain how to make sure that sick people do not handle the produce.

4 marks

16. a. Explain why animals must be kept out of the field and pack house.

b. Explain why all rats, flies and cockroaches in the pack house must be killed .

4 marks

17. Explain what should happen if any of the following occur:

a. There is some soil on the produce.

b. There are visible signs of chemical residue on the produce.

c. The bottom of the crate is muddy.

d. The produce is hot and dehydrated on arrival at the pack house.

4 marks

18. a. What should you do if you cut your finger whilst handling the produce.

2 marks

18. b. How can you make sure that plasters used to cover wounds do not contaminate the produce.

2 marks

19. State four (4) things that are important aspects of the management and use of crates.

4 marks

20. a. Explain how to make sure that produce is not contaminated whilst it is being transported from field to pack house.

b. Explain how to make sure and to prove that refrigerators are working at the correct temperature all the time.

4 marks

21. Outline four aspects of the correct use and management of a field shelter.

4 marks

22. List Five (5) rules or procedures that you have in place at your place or work to ensure that the vegetables are safe to eat.

5 marks

23. a. Explain how the management of the company can ensure that these rules are put into practice all the time

b. Explain what contribution you can make to ensuring that these rules are put into practice all the time.

5 marks

24. List two new things that you have learnt on the level 1 course and explain how you will put these into practice when you return to work.

6 marks

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Level 1 Food Safety

Written Test (Specimen Answers)

Time Allowed +/- 2 hours

Please answer all questions in the spaces provided.

1. Explain what is meant by the term 'Due Diligence'.

   4 marks

   Due diligence is a defence in law
   Implementation of all reasonable procedures and practices to ensure that the food produced for sale is safe to eat

2. Outline two (2**)** reasons why Buyers and Supermarkets want to make sure that the vegetables sold in their shops are safe to eat.

   4 marks

   To comply with European Legislation
   To protect their reputation

3. Explain how to ensure that written procedures are put into practice on the farm and in the pack house.

   4 marks

   Explain the procedures to Supervisors and managers
   Train all staff to be able to follow the procedures
   Supervise the implementation at all times
   Take action when procedures are not followed correctly

4. Describe the symptoms of food poisoning and name one bacteria that will cause these symptoms.

   4 marks

   Stomach pain, vomiting and diarrhoea
   Dehydration and death in vulnerable groups, very young, old, impaired immunity

   Suitable example, e.g. Clostridium sp.

5. State four (4) places where food poisoning bacteria can be found.

   4 marks

   4 places, e.g. *Human faeces, or hands after using the toilet, open wounds*
   Nose and throat, animal manure, soil, rats and flies

6. Outline four (4) ways in which food poisoning bacteria may get from an animal or infected person on to the produce.

4 marks

4 relevant methods, e.g.
Animal manure on surface of field splashes on to produce or sticks to the harvesting crate
Produce is handled by somebody who has not washed their hands
Flies move from animal or human faeces then on to the produce
Contaminated water is used to wash crate, wet pads, tables etc.

7. State the conditions that bacteria need to grow and multiply.

4 marks

Moisture *Suitable temperature*
Food *Time*

8. Name four (4) types of 'foreign Body'.

4 marks

4 types, e.g. *Glass, used plasters, pieces of metal, mouse droppings, hair, string, finger nails, etc.*

9. List four (4) rules that you have in place on the farm or in the pack house to stop foreign bodies contaminating the produce.

4 marks

4 relevant rules, e.g.
Issue of plasters is recorded
Jewellery must not be worn
Head must be covered
Finger nails must be short and not painted

10. Outline four (4) ways of making sure that produce is not contaminated with pesticide.

4 marks

Use only approved products
Apply the correct amount
Label sprayed fields
Observe the harvest interval

11. a. Outline three (3) ways of making sure that produce is not contaminated with chemicals used for cleaning.

3 marks

Use only food grade products
Use only the amount specified on the label
Store securely in a suitable designated store

11. b. Explain how to ensure that vegetables are not contaminated with rat poison.

1 marks

Place the bait is approved rat traps
Store the bait in an approved, separate, designated store

12. List four (4) things to check for when inspecting the hands of harvesters and pack house workers.

4 marks

Hands have been washed, nails are short and clean, sores are covered, no jewellery is worn, etc.

13. In relation to washing hands, comment on the following:

a. The reason(s) for using soap

Facilitates cleaning
Kills bacteria

b. The type of soap that should be used

Germicidal soap
Unscented

c. The reason why chlorine may be added to the water

To kill bacteria

d. Why it is important to use running water in a 'Once use only system'.

4 marks

Water does not become contaminated and lead to the contamination of hand washed in the water later

14. a. Explain why people must use the toilets provided on the farm and not 'help themselves' in the bush.

Flies will visit the faeces and may then go on to the produce
There are no hand washing facilities

b. Explain why it is necessary to keep toilets clean.

4 marks

To encourage people to use them
To reduce the number of flies present that may contaminate produce later

15. a. Explain why people who have vomited or had diarrhoea in the last 24 hours should not be allowed to work with the produce.

They have a large number of food poisoning bacteria in their gut and there is an increased risk that these will contaminate their hands and the produce that they handle

b. Explain how to make sure that sick people do not handle the produce.

4 marks

Have a rule that says that people who have had sickness or diarrhoea in the last 24 hours must not come for work
Send people who visit the toilet more than normal whilst at work, to the clinic

16. a. Explain why animals must be kept out of the field and pack house.

Animal faeces contain food poisoning bacteria and these may get on to the harvesting crates or on to the produce

b. Explain why all rats, flies and cockroaches in the pack house must be killed.

4 marks

These may transmit bacteria and foreign bodies on to the produce

17. Explain what should happen if any of the following occur:

a. There is some soil on the produce.

Heavy soiling *Reject produce*
Light soiling *Wash in disinfected water*

b. There are visible signs of chemical residue on the produce.

Reject the produce
Inform the supervisor and manager immediately

c. The bottom of the crate is muddy.

Change the crate

d. The produce is hot and dehydrated on arrival at the pack house.

4 marks

Reject the produce if the condition is outside the stated tolerance limits
Inform the supervisor and farmer or manager immediately

18. a. What should you do if you cut your finger whilst handling the produce.

2 marks

Report to the supervisor and cover the wound with a plaster
Discard produce contaminated with blood, according to approved protocol

18. b. How can you make sure that plasters used to cover wounds do not contaminate the produce.

2 marks

Use blue plasters that can be detected with a metal detector
Record all issues and check the plasters issued during the day can be accounted for at the end of the day

19. State four (4) things that are important aspects of the management and use of crates.

4 marks

Must not be used for sitting on
Must not be used for rubbish or chemicals
Must not be used for personal belongings
Must be washed thoroughly in clean water with disinfectant before use
Must be stored in a clean environment

20. a. Explain how to make sure that produce is not contaminated whilst it is being transported from field to pack house.

Transport in a clean trailer with a covering or a wet pad over each crate
Do not use the trailer for chemicals or carrying people

b. Explain how to make sure and to prove that refrigerators are working at the correct temperature all the time.

4 marks

Carry out routine maintenance
Check and record temperatures regularly

21. Outline four aspects of the correct use and management of a field shelter.

4 marks

Produce must be stacked to allow air circulation
Area must not be used for sitting, eating or storing personal belongings
Produce must not be placed on the floor
Produce from different field must be kept separate

22. List Five (5) rules or procedures that you have in place at your place or work to ensure that the vegetables are safe to eat.

5 marks

5 relevant rules, e.g.
Hands must be washed before people harvest or handle the produce
Sick people are not allowed to work
Jewellery is not allowed

Harvest interval for pesticides must be observed
Equipment must be cleaned before use

23. a. Explain how the management of the company can ensure that these rules are put into practice all the time

Explain rules to all staff
Display rules for reference
Supervise behaviour
Take appropriate action when rules are broken

b. Explain what contribution you can make to ensuring that these rules are put into practice all the time.

5 marks

Make sure that you know and understand all the rules
Explain the rules to your team
Supervise your team members all the time
Take appropriate action when rules are broken

24. List two new things that you have learnt on the Level 1 course and explain how you will put these into practice when you return to work.

6 marks

9. Training Records and Feedback to Employers

Training Records

Instructors must keep records of the training that is carried out.
Key aspects that must be recorded include:

Class register showing:
- Names of participants
- NRC no.
- Signature
- Position
- Date
- Name and signature of the Instructor

Outline of the training that was carried out

Results of assessments
Copies of certificates issued

Records of training can be used when planning training:
- Who has already been trained?
- When is revision of training due?

Records of Training also provide evidence for Market Label Audits to show that training has been carried out.

Feedback to the manager

Involvement of the managers in the training process is important.
Managers will support training programmes if they know what is happening and see the relevance of the training to activities in the work place.

- Discussion with managers will highlight areas where particular emphasis is needed during training.
- Feedback of results will help managers to see which employees are particularly interested or able in topics relating to food hygiene
- Knowledge of what was in the course and what course participant should be able to do after the course will help the manager to utilise trained staff fully and ensure that learning is put into practice.

Appendix 1

Reference Notes for Instructors

Basic Food Safety

(Vegetable production, harvesting and packing)

Course Notes

1. Reasons why Food Safety is important

There are four primary reasons why implementation of practices that will ensure that food is safe to eat are important:

- Buyers and Supermarkets involved in the marketing of our export vegetables are required to comply with European Legislation
- The European consumer of the product is sensitized to issues relating to food safety and is seeking assurance that food offered for sale is safe to eat
- Buyers, supermarkets and consumers will all complain if the produce is not up to standard and complaints will lead to fines, poor publicity and loss of sales
- It is a moral and legal responsibility of all food producers to ensure that food offered for sale is safe to eat. Food safety is for everybody, all the time not just for Europeans on the day of the Audit.

Client profiles for buyer, supermarkets and consumers are appended for reference.

2. Due Diligence

Producers are required to show that they have all the necessary precaution in place to ensure that the vegetables are not contaminated in any way.
Due Diligence, i.e. the implementation of adequate procedures is a defense in law and failure to show adequate 'Due Diligence' will result in loss of the contract.
Vegetable production is a very competitive market. Projects compete on price and demonstration of acceptable levels of 'Due Diligence' is a requirement just to be in the market place at all.
Supervisors and employees need to understand the importance of 'Due Diligence'. Job security depends on the continuation of contracts.

Adequate procedures will include:

- Policy statement(s)
  This formalizes the company's commitment to the production of safe food and will outline how this is to be achieved
- Written procedures
  These outline how each stage of the production or aspect of production is to be carried out and managed
- Staff training and supervision
  It is essential that everybody knows what to do and that procedures are followed at all times
- Monitoring and control
  What standards are acceptable, who is responsible, what checks and tests must be made and what should happen when standards are not met or food safety is compromised

Owners and Managers are responsible for:

- Investigating what is required

- Providing and setting up what is required
- Devising and documenting the procedures
- Ensuring that all the procedures are known and understood by their staff
- Setting standards and ensuring that adequate monitoring and control is implemented

Supervisors are responsible for:

- Explaining the procedures to their team members
- Ensuring that the procedures are followed all the time
- Reporting to the management any problems encountered with the implementation of the procedures
- Record keeping.

Employees are responsible for:

- Their own actions and are expected to follow instructions and obey rules accurately and completely at all times.

Note: This does not absolve the Supervisors of their responsibilities to supervise work being done.

3. Types of risk

Risks to food safety are categorized under three headings:

Biological risks	Food poisoning bacteria
Physical risks	Foreign bodies
Chemical risks	Pesticides and disinfectants

Understanding of the characteristics of each type or risk is an aid to identifying potential problems and implementation of suitable control measures.

3.1 Bacteria

General characteristics of Bacteria can be summarized as follows:

- All are very small, single celled, living organisms. 25,000 fit onto the end of a needle
- They are too small to see and are usually recognised by the effects that they cause.
- Are found almost everywhere.
- Breed by division
- Breed very rapidly. One bacteria will become two in about twenty minutes under favourable conditions. Therefore one bacteria becomes 1,000,000 bacteria in about 24 hours.
- Need warmth, water, food and time for a colony to develop.
- Transferred from place to place by water splash and direct contact with contaminated surfaces, e.g. people's skin, dirty hands, dirty equipment, in dirty water etc.
- There are many types of bacteria, some of which are beneficial, e.g. Nitrifying bacteria and others that are pathogenic, e.g. Cholera
- Bacteria may be partially removed by washing and killed by adequate exposure to Bacteriacidal chemicals or heat.

Food poisoning bacteria

All people carry a small number of Food Poisoning bacteria at all times and symptoms only occur when these numbers become large.
Food poisoning bacteria cause vomiting, diarrhea, stomach ache.
Death may occur in vulnerable groups of people e.g. the old, the sick, the very young and people with impaired immunity.

Food poisoning bacteria are found in many places
e.g. Noses, throats, skin, open wounds, guts, faeces of humans, animals, some insects and birds
Birds, flies, rats and mice
Contaminated water, dirty crates, soil and animal manure

Examples of Food poisoning bacteria are given in Appendix 2.

Food poisoning bacteria may be moved around / transmitted by
Use of contaminated water for washing and irrigation
Dipping crates in dirty water
'Cleaning' tables with dirty cloths
Unwashed hands, particularly after using the toilet
Coughing, sneezing, nose picking, scratching, defecating etc.
Animals, flies, birds and rodent pests

Control of food poisoning bacteria relies on having effective procedures to minimise the risk of contamination and to reduce their rate of multiplication. Washing and disinfection of produce will reduce the bacterial population but are unlikely to give 100% kill.

Procedures to reduce the risk of contamination include:
- Use of potable or disinfected water for irrigation and washing
- Provision of adequate and convenient toilet and washing facilities
- Staff training in personal hygiene
- Implementation and monitoring of personal hygiene procedures
- Exclusion of animals and mobile children from the field
- Composting and incorporation of animal manure
- Trellising crops where appropriate
- Use of separate field and pack house crates and not placing crates on grading tables
- Removal of rubbish to deter rodents and flies
- Rapid removal of field heat
- Maintenance of the cold chain

3.2 Foreign bodies

Foreign bodies are solid objects that are not part of the produce
These include:
Dead flies, caterpillars, mouse and rat droppings, soil, metal staples, knives
Bits of jewelry, finger nails, hair, glass, flakes of paint, used plasters
Cigarette ash, bits of vegetable waste
Control of Foreign bodies relies on having effective procedures to minimise the risk of contamination.

These procedures include:

- Banning smoking, eating and drinking in the field or packing area
- Ensuring that field shelters cold store and packing areas have ceilings and walls that are clean and free from loose debris
- Fitting plastic covers on all light fittings
- Providing clean overalls and head covering in the packing area
- Allowing only short nails and no use of nail polish
- No loose items, jewelry, watches, coins, etc. to be taken into the field or pack house
- Opening boxes away from the grading tables
- Reducing dust contamination by damping down roads, encouraging grass establishment and using dust covers during transport of produce
- Fitting fly and bird screens
- Recoding the issue and checking the returns of knives, plasters etc.
- Use of a metal detector.

3.3 Chemical contaminants

Chemical contaminants include:

- Pesticide residues
- Scents from soaps
- Disinfectants

Exclusion of these contaminants relies on having effective procedures to control their use.

Procedures to reduce the risk of pesticide residue include: -

- Use only pesticide products that have a label recommendation and are acceptable to the buyers
- Application in accordance with label recommendations
- Staff training in application, with particular reference to measuring, mixing, marking out and application
- Implementation of measures to prevent spray drift
- Calibration of applicators
- Observation of harvest intervals
- Production on land that is free from non-approved chemical residues

Procedures to reduce the risk of contamination with disinfectant chemicals and scents or perfumes include:

- Use of only food grade products
- Use of unscented germicidal liquid soap products
- Use of disinfectants at the recommended rate
- Implementation of rules that ban the use of scents and perfumes whilst handling the produce.

4. Precautions that may be required at each stage

The standard of food safety required remains constant, “vegetable produce offered for sale must be safe for human consumption”
However each production situation is individual due to the variability of crops, farm sites, procedures, equipment and staff involved.
Therefore the methods needed to protect the food will vary according to the situation and confirmation that the methods implemented are adequate is obtained by ‘end testing’.
Tests used will include:

Residue analysis for pesticides

Swabbing surfaces to detect the presence of bacteria after cleaning or a period of use

Testing vegetable products for the presence of food poisoning bacteria or other indicator bacteria, e.g. *E coli*

Instances of foreign bodies in the produce and complaint by customers will also be recorded and used to determine the effectiveness of the control measures implemented.

Production managers and Extension staff need to be able to identify possible risks, evaluate the significance of each risk identified and recommend or implement suitable and adequate control measures.
Whilst it is not possible to be precise about exactly what will be required in each situation there is however a degree of commonality in the procedures used in the industry. Common practices are outlined below.

4.1 In the Field before harvest

Useful precautions include:

- Keep people and animals out of the production fields unless working under supervision. Particular care will be needed when fields are close to housing
- Use only pesticide products that are approved for use on that crop
- Apply according to label recommendations and restrictions
- Maintain sprayers and check the calibration regularly
- Measure accurately and mix thoroughly
- Mark out area to be sprayed so that overlap is avoided
  Harvest intervals are based on the application of the correct amount of product
- Train and supervise the spray team
- Keep spray drift to a minimum by spraying in the morning or evening and not using very fine sprays on windy days. Erect drift barriers or leave adequate space between blocks of crops
- Observe harvest intervals
- Place notices in areas that have been sprayed
- Note time sprayed in the spray records
- Ensure that there is effective communication between spray team and harvesting manager

4.2 Harvesting

Useful precautions include:

- Recruit clean, responsible people as pickers
- Ensure that pickers wear clean clothes
- Pickers should wash their hands in chlorinated water or with running water and liquid, non-scented germicidal soap before starting work then after toilet visits, eating, scratching, etc. This operation should be supervised.
- Washing facilities should be adequate in number and placed at sites that are convenient for harvesters. There should be a soak away for the used water.
- Toilet facilities should be adequate in number, (1/5ha harvest area), sited well away from the field shelter,(150m), and maintained in a clean condition. Cleaning procedures and schedules should be documented.
- Pickers should be told not to come to work if they are ill, particularly if they have an upset stomach, vomiting or diarrhoea.
- Pickers who show signs of ill health should be removed from the field, sent to the clinic and a note given to the block supervisor
- Produce picked by persons found to have gastric complaints should be discarded
- Pickers hands should be inspected for sores and long fingernails
- Sores should be covered with approved, recorded waterproof blue plasters and long fingernails should be trimmed
- Pickers should be trained to harvest and handle produce correctly and carefully to avoid physical damage
- Produce should not be held in the hand for longer than necessary or wrapped in a chitenge
- Produce should be covered with a clean wet pad.
- Wet pads should be wet with clean water, washed in chlorinated water or boiled daily and kept off the ground
- Produce should be removed to the field shelter quickly (particularly on hot days)
- Crates must be labeled individually to facilitate produce traceability
- Crates in the field shelter should be half filled and stacked to allow good air circulation
- Crates and picking baskets must not be used for holding food or seating
- Produce should be removed to the cold store quickly
- Drivers must be trained to handle the produce carefully and to keep batches of produce separate. Drivers must drive carefully at all times
- Transport vehicles must not be used for other purposes
- Trailers and shelter floor should be cleaned regularly. The procedures and schedules for this should be recorded
- All containers should be thoroughly cleaned with detergent and bacteriocide
  Note: Chlorine is only effective at the right concentration (200ppm) in clean water. Therefore washing water should be changed frequently. Chlorinated water should also be kept out of the sun.
- Picking crates / baskets should be emptied into clean pack house crates at the shelter to avoid contamination of the produce with soil when the crates are stacked
- Soiled produce should be left in the field or picked into a separate container and washed before packing

4.3 Transport

Useful precautions include:

- Covering of produce
- Ensuring that transport is clean before use
- Not transporting produce with other items, chemicals, fertilizers, people, animals etc.
- Collecting produce every two hours from the field shelters

4.4 In the Cold Store

Useful precautions include:

- Keep the door closed as much as is possible
- Fit plastic strips or automatic door closing mechanisms
- Check and record the temperature daily
- Calibrate the thermometer weekly
- Pre-cool produce if possible
- Stack produce to allow good air circulation around all crates
- Check the rate of cooling of produce in crates
- Control the humidity or use clean wet pads to reduce dehydration
- Keep the floor, walls and ceiling clean
- Implement an active policy of vermin control in and around the store
- Ensure that batches of produce are kept separate and that all the crates are labeled to facilitate traceability and stock rotation. Produce stock management must be on a 'First in First out' basis

4.5 Intake, Grading and Packing

Useful precautions include:

- Keep inputs, produce and rejects and rubbish separate
- Recruit clean, responsible people as packers
- Ensure that packers wear clean overalls and head covering
- Packers hands should be inspected for sores and long fingernails
- Sores should be covered with approved, recorded waterproof blue plasters
- And long fingernails should be trimmed
- Packers should wash their hands in chlorinated water or with liquid, non-scented germicidal soap before starting work then after toilet visits, eating, scratching, etc. This operation should be supervised
- Washing facilities should be adequate in number and there should be a soak away for the used water.
- Toilet facilities should be adequate in number, (1/25), and maintained in a clean condition. Cleaning procedures and schedules should be documented.
- Packers should be told not to come to work if they are ill, particularly if they have an upset stomach, vomiting or diarrhoea.
- Packers who show signs of ill health should be removed from the grading hall, sent to the clinic and a note given to the pack house supervisor
- Produce packed by persons found to have gastric complaints may be discarded
- Packers should be trained to handle produce correctly and carefully to avoid physical damage
- Produce should not be held in the hand for longer than necessary

- Produce should be graded and packed as quickly as possible in a cool area Produce should not be allowed to accumulate on the grading table
- Produce should be removed to the cold store quickly
- All containers, tables and floor should be thoroughly cleaned with detergent and bacteriocide. Procedures should be documented and the activity recorded.
- Cold store temperature should be monitored and recorded
- Temperature sensors should be calibrated and the calibration recorded
- Produce in store should be packed and sold on a first in first out basis
- Rubbish should be removed frequently and bins cleaned to avoid attracting rats and flies
- Fly screens and plastic door flaps should be fitted
- Insectocutors should be installed
- There should be a pest control policy for the packing area

4.6 Farm and Home catering

Precautions should include:

- Training staff in basic food hygiene
- Provision of adequate facilities
- Employing clean, healthy people
- Sending sick employees to the clinic, not allowing them to work
- Restricting access to the cooking area to authorised persons only
- Inspecting hands, covering open wounds and providing gloves if necessary
- Installing suitable hand washing facilities and providing germicidal soap or sanitiser
- Using separate utensils and chopping boards for raw meat, vegetables and cooked food or washing tools and boards between tasks
- Keeping the floor, walls, ceiling and tables clean
- Disinfecting tables, boards and washing cloths frequently
- Keeping raw and cooked food separate in the refrigerator
- Using stocks of perishable foods whilst they are fresh and / or within the ‘Use by’ date
- Eating or refrigerating cooked food immediately after cooking
- Empty rubbish bins frequently and keep them clean to avoid flies and other vermin
- Fit fly screens
- Control vermin as a matter of routine not just when a problem becomes apparent
- Check temperatures in the refrigerator
- Cook food thoroughly
- Reheat food thoroughly (70^{O} C for at least 2 minutes in the centre of the food)

Appendix 1.

Food Poisoning Bacteria

Salmonella	Found in the guts and excreta of animals Quite common in raw poultry and eggs
Clostridium perfringens	Found in the guts of humans and animals and also in soil These bacteria produce spores which may not be killed during cooking. These spores germinate and reproduce rapidly if food is not eaten immediately. This bacteria is a common form of food poisoning
Staphylococcus aureus	Found in nose, mouth, cuts and boils These multiply rapidly if transferred to food and produce a toxin that is not destroyed by cooking.
Bacillus cereus	Usually associated with rice although also found on other cereals. Spores survive on dry grain and throughout cooking. Toxins are produced in cooked rice left out to cool and these toxins are not destroyed by reheating.
Campylobacter jejuni	Found in the guts of domestic animals and birds This bacteria is a major cause of Diarrhea.
Listeria monocytogenes	Found in the guts of animals and humans, also in soil and sewage. These bacteria will continue to grow in the refrigerator and are a particular problem in soft cheese, pate and prepared salads.

Appendix 2

Materials to be issued to Trainees

- **Trainees Handbook;** **Basic Food Safety**
  Format for photocopying and folding into A5 book format
  Format by page number

- **Rules for people who harvest vegetables**

- **Rules for people who work in vegetable pack houses**

- **Certificate proforma**