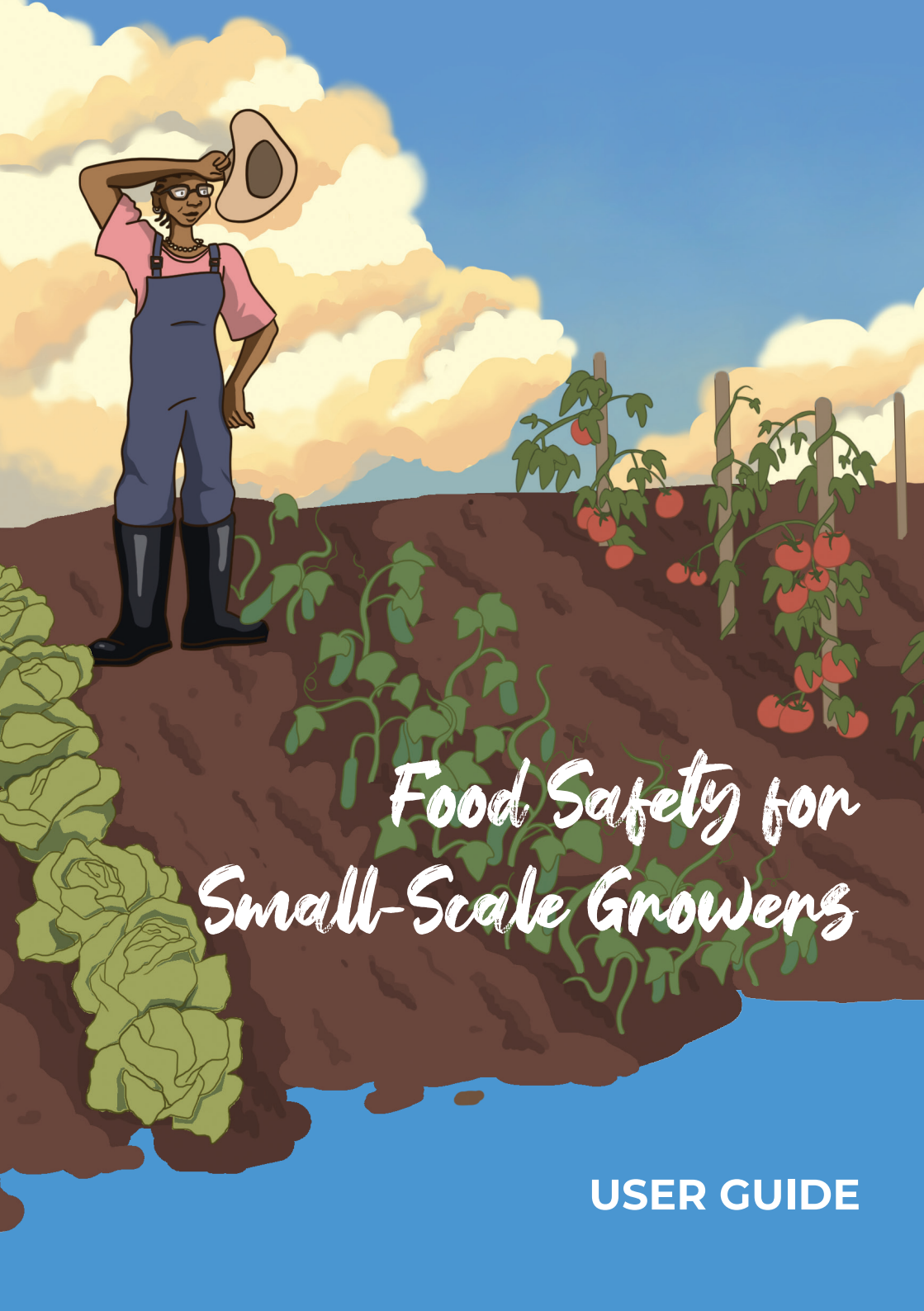


Food Safety for Small-Scale Growers

USER GUIDE

PURPOSE OF THIS MANUAL

Objective

The demand for enhanced food safety in fruit and vegetable supply chains continues to grow. Farmers play a crucial role in ensuring food safety at various stages - before and during production, harvest, post-harvest handling and on-farm storage.

Designed for both agricultural officers and small-scale farmers, this manual provides practical guidance on good agricultural and hygiene practices to maintain food safety throughout these stages.

Content

The manual offers hands-on information on implementing safe agricultural and hygiene practices, ensuring food safety from pre-production through post-harvest handling. It draws from field experiences and various resources, including training materials developed by the Food and Agriculture Organization of the United Nations (FAO) and the Fresh Produce Safety Centre of Australia and New Zealand, which are listed at the end.

The following individuals at the University of Pretoria contributed to the conceptualisation, writing, editing and illustration of this manual. Their valuable input and contributions are thereby acknowledged.

Prof. Lise Korsten: Head of the Plant Health and Food Safety division in the Department of Plant and Soil Sciences.
Dr Willeke de Bruin: Research officer and project manager at the Plant Health and Food Safety division in the Department of Plant and Soil Sciences.
Mr Tinashe Tanyanyiwa: Visual arts student at the School of the Arts at the University of Pretoria. Tinashe's father happens to be a small-scale farmer.

Co-funded by the European Union

FoodSafety for Africa

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

INTRODUCTION

Before diving into food safety topics, it's important to first understand the difference between food safety and food quality.

Food quality = The combination of a product's characteristics valued by the consumer. Food quality is subjective: it means different things to different people. It includes colour, size, appearance, vitamins / nutrition, easy preparation, taste and shelf life. Microorganisms that affect some of these factors are known as plant pathogens.

Food safety = Fresh fruits and vegetables should always be safe to eat. If they get contaminated, people can get sick or even die. Contamination can happen in different ways:

- **Pathogens** that come from humans, animals or birds. They are microorganisms that can make people sick.
- **Chemicals** can be harmful if not used the right way.
- **Foreign objects** like small bits of glass, metal or plastic that can hurt people.

Most of the time, fresh produce is safe. But sometimes, contamination happens, and people get sick. That's why farmers need to follow **Good Agricultural Practices (GAP)** - safe ways to grow and handle food. These practices also protect the environment and keep workers healthy.

Everyone who grows, harvests and handles food should follow food safety rules every day. If everyone does their part, the risk of contamination goes down, and farmers can keep selling safe, good-quality food.

Why food safety matters

- Keeps people healthy – Safe food doesn't make people sick.
- Helps farmers sell their food – Some markets and stores only buy food that meets safety standards, like limits on chemicals.

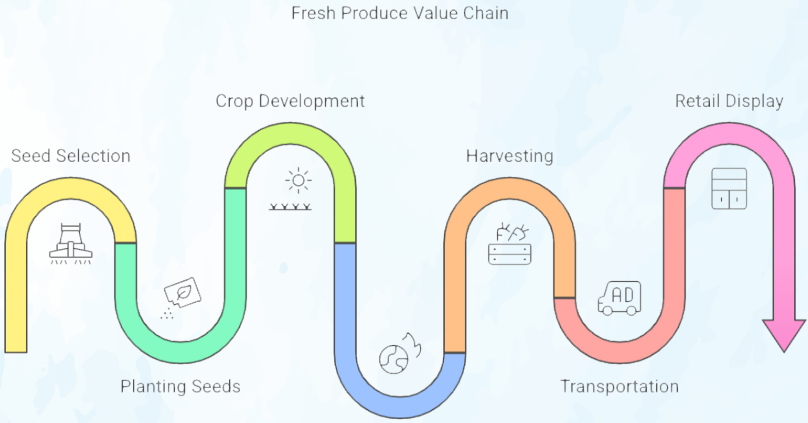


What can farmers do?

Farmers can help keep food safe by:

- Using good **seeds** to grow strong plants.
- Keeping **soil** clean so food isn't contaminated.
- Taking care of **crops** to prevent problems.
- Using clean **water** for watering and washing food.
- Using **fertilisers** safely so they don't leave harmful chemicals.
- **Controlling plant pathogens** without using too many chemicals.
- **Handling** food carefully after picking it.
- **Storing and transporting** food properly so it stays fresh and safe.

By following these simple steps, farmers can help make sure their food is safe, protect people's health, and keep selling their products. This manual will show easy ways to improve food safety at every step.





CHOOSING SEEDS

Using high-quality seeds is the first step to growing healthy crops. Always get your seeds from a trusted or registered supplier.

What to do:

✓ Use certified or good-quality seeds to ensure strong and healthy plants.

✓ Keep records of:

- The supplier's name (where you bought the seeds).
- The purchase date (when you bought them).



CHOOSING A SAFE GROWING AREA

Before planting, check your farm or greenhouse for anything that could contaminate your crops. If you find risks, take steps to remove or reduce them.

Identifying food safety risks

- Look for contamination risks in your fields, greenhouses or hydroponic systems.
- Common risks include:
  - Bacteria and viruses (from animals, people or dirty water)
  - Chemicals (like pesticides or old farm chemicals in the soil)
  - Physical hazards (like glass, metal, wood or jewellery)
- Watch for wildlife activity. Animals can contaminate crops, soil and water.

Preventing contamination risks

- Flood-prone areas – Avoid planting in places that flood easily, as floodwaters can carry pathogens and chemicals.
- Keep animals out. Fence off your fields to stop livestock from entering.
- Maintain septic tanks. Make sure they are in good condition and located far from water sources.
- Store compost and soil amendments safely. Keep them in a clean, dry area away from water and crops.
- Manage waste properly. Remove trash and rotting produce to prevent pests and diseases.

Checking for land contamination

- Know your land's history. If it was used for livestock, waste disposal or industrial purposes, the soil might still be contaminated.
- Check for long-lasting chemicals. Some pesticides and industrial chemicals stay in the soil for years and could affect your crops.
- Be aware of neighbouring farms. If nearby properties have livestock, feedlots or poultry farms, they could spread contamination through water runoff or wind.

WATER USE

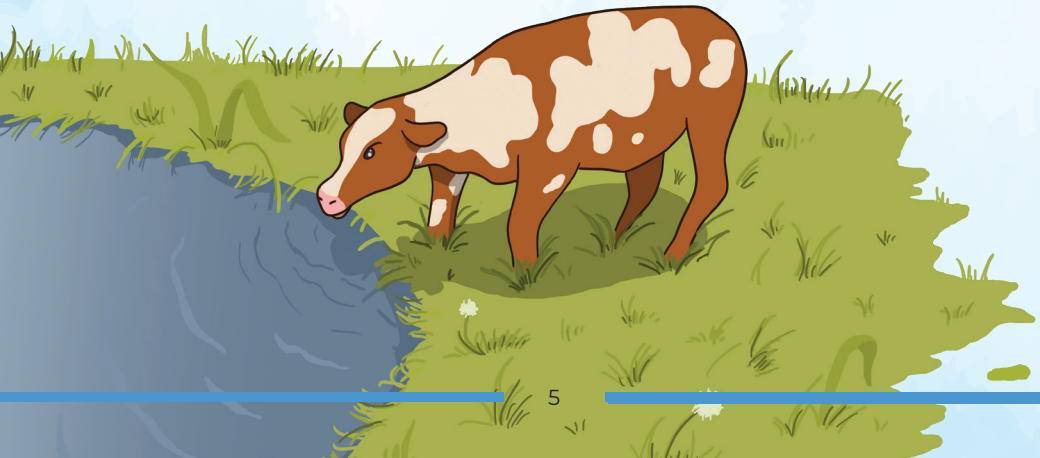
Water is important for growing and handling food, but it can also carry pathogens. Keeping water clean helps protect consumers from getting sick.

Choosing the right water source
Different water sources have different levels of safety. Use each type for the right purpose:

- ✓ Municipal (tap) water – Usually safe for all farm activities.
- ✓ Borehole water – Generally safe, but must be built properly and tested at least once a year for pathogens such as *E. coli* and chemicals. Contact your local agriculture department to learn where you can get the water tested.
- ✓ Surface water (rivers, dams, canals, ponds) – Can carry pathogens and should not be used for washing produce or mixing chemicals.

Keeping water clean

- Use municipal or tested borehole water for mixing pesticides and washing hands.
- Keep animals away from water sources to avoid contamination.
- If using surface water for irrigation, try drip irrigation to keep water off the crops.
- If municipal water is not available, use appropriate water treatment methods such as sand-filtration. Reliable instructions can be found on official websites, such as those of the Food and Agriculture Organization (FAO).



Using water after harvest

Fruits and vegetables are often washed before being sold. To prevent contamination:

- ✓ Never use untreated surface water for washing or cooling produce.
- ✓ Use clean municipal water for washing, cleaning and handwashing.
- ✓ If a hose touches soil, produce, or dirty water, clean and disinfect it before using it again.

Safe washing practices

- Wash dirty produce separately (e.g., those with soil or bird droppings). If possible, do this at the end of the day.
- If reusing water in washing tanks, add antimicrobial agents - ensuring they are approved for use with food products - and follow the instructions carefully to maintain water quality. Always check product labels to ensure the correct dosage is applied.
- Ask a specialist to help choose the right cleaning system for your farm.



Managing cleaning systems

- Follow instructions from chemical suppliers on how to use and monitor antimicrobial chemicals.
- Check chemical levels throughout the day and add more if needed.
- Change water regularly -when it looks dirty and at set times.
- Keep records of chemical levels and when more is added.
- Handle chemicals carefully - follow all safety instructions on labels.



SAFE USE OF SOIL AMENDMENTS & FERTILISERS

Farmers use different materials like soil, fertilisers and compost to help plants grow. Some of these, especially those made from manure, can carry harmful germs that might make people sick.

Choosing safe soil amendments

Soil amendments are materials added to improve the soil. These include:

- Manure and animal by-products (like bone meal or fish emulsion)
- Agricultural teas (liquid fertilizers made from plant or animal materials)
- Chemical fertilisers
- Compost

Chemical fertilisers and properly treated animal-based products are safer because they have a lower chance of carrying pathogens. If using agricultural teas, make sure they come from properly composted materials and clean water. Never use teas made with untreated animal materials or dirty water.

Avoiding high-risk materials

- Never use human waste on crops - it carries a very high risk of contamination.
- Raw (untreated) manure from cattle or chickens can contain pathogens. If using raw manure:
  - Apply it 90-120 days before harvest to give time for pathogens to break down.
  - Avoid using it on fast-growing crops like leafy greens and herbs.
  - Store manure away from fields and food-handling areas.
  - Sun-dry manure from cattle or poultry for at least 4 days before using it.
- Do not apply untreated manure where it can touch edible parts of crops.

Proper composting

Composting helps reduce pathogens. To compost correctly, you need:

- Heat to kill pathogens
- Turning and aeration to keep it oxygenated
- Moisture to help break down materials
- Time for proper decomposition



Safety tips

- Keep compost covered and away from rubbish to prevent contamination from animals.
- Apply compost before planting or in early growth stages. Mix it into the soil near plant roots.

SAFE USE OF CHEMICALS AND PESTICIDES ON THE FARM

Chemicals and pesticides help protect crops, but they must be handled with care to avoid accidents and contamination. Follow these guidelines to ensure safe use.

Handling chemicals and pesticides safely

- Store chemicals properly – Keep them away from food, containers and packaging materials.
- Only trained individuals should apply pesticides. Anyone handling chemicals must complete a certified chemical user course (e.g., CropLife).
- Keep children away from chemicals and pesticides at all times.
- Follow label instructions to meet maximum residue limits (MRL) and ensure safety.
- Buy only from approved suppliers. Never use second-hand or unlabelled pesticides.
- Use only approved pesticides for the specific fruits and vegetables you grow.
- Check the label before use. Ensure the pesticide is within its expiry date and is applied correctly.
- Wear protective gear. Always use gloves, safety glasses, long sleeves, long pants, boots and a hat when handling chemicals.

Transporting chemicals and pesticides

- Never transport pesticides with food, people or animal feed.
- Store chemicals in a safe place. The storage area should be:
  - Clearly labelled and lockable
  - Out of reach of children and animals
  - Away from water sources
  - Well-ventilated with good lighting
  - Designed to contain any spills or leaks
- Check and calibrate sprayers at least once a year to ensure accurate pesticide application.

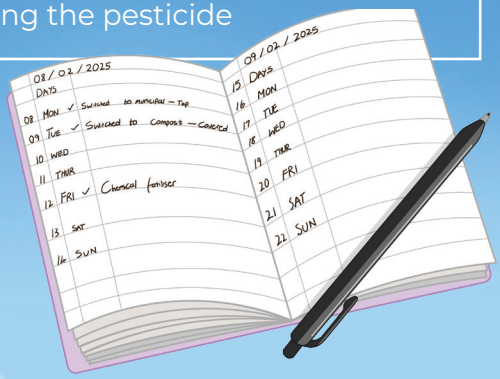


Applying pesticides and keeping records

- Use clean water (municipal quality) when mixing pesticides.
- Follow label instructions carefully. Apply pesticides only as directed.
- Avoid spraying in bad weather. Do not spray during strong winds (to prevent drift) or rain (to prevent runoff).
- Follow re-entry safety rules. Stay out of treated areas for the required time after spraying, as stated on the label.
- Observe the withholding period. This is the minimum time required between spraying and harvesting to ensure food safety.
- Wash up after handling pesticides. Take a shower immediately after cleaning and storing sprayers.

Keep records of every pesticide application, including:

- Date and location
- Name of pesticide and amount used
- Application rate and weather conditions
- Name of the person applying the pesticide



KEEPING YOUR FARM BUILDINGS & EQUIPMENT SAFE AND CLEAN

Properly built and well-maintained farm buildings and equipment help keep your produce safe from contamination.

Farm buildings

- Protect your crops and materials. Farm buildings should keep produce safe from damage, dirt and pests.
- Simple vs. enclosed structures – While open structures provide some protection, fully enclosed sheds with concrete floors are easier to clean and maintain.
- Good design matters – No matter the type of building, make sure it is well-designed and regularly maintained to prevent contamination.
- Lights – Use shatterproof lights or protective covers above areas where produce and packaging are handled.

Keeping equipment safe

- Use the right tools. Make sure all equipment is suitable for handling food.
- Store chemicals separately. Keep fuel, oil, fertilisers and manure-based products away from produce and food-handling areas.
- Check water storage tanks. Clean and disinfect water tanks at least once a year.
- Use safe knives. Always use solid-blade knives, not snap-off blades (e.g. Stanley blades), to prevent contamination. Wash all harvesting tools daily with soap, dip in a registered food contact sanitising solution and rinse with tap water.

Handling broken equipment

- Repair or remove damaged equipment. Broken tools, containers or surfaces can contaminate produce with plastic, metal or wood.
- Clean all food-contact surfaces. Crates, washing tanks and packing lines should be made from easy-to-clean, food-safe materials like plastic or stainless steel.
- Prevent water contamination. Cooling units in cold rooms should not drip water onto produce. Use a drip pan if needed.
- Regular maintenance – Inspect all facilities and equipment at least once a month. Keep a list of repairs and maintenance tasks.

Cleaning & sanitising
Keeping your farm and equipment clean is essential for food safety.

Managing waste & rubbish
- Stay organised. A clean farm is easier to maintain.
- Remove waste often. Don't allow rubbish or spoiled produce to pile up.
- Clean vehicles and tools. Wash vehicles, trolleys, bins and boots before bringing them into the packing area to reduce dirt and mud.

Cleaning tools & equipment
- Sanitise knives and tools daily. Store them safely and never place them directly on soil.
- Avoid using wood. Wood is hard to clean and sanitise. Don't use wooden containers for storing harvested produce.
- Never reuse waste containers. Containers that once held chemicals or waste should never be used for produce.
- Regular cleaning schedule – Floors, bins, storage areas, toilets and meal areas should be cleaned regularly, especially during peak seasons.
- Use dedicated cleaning equipment. Keep cleaning tools separate to prevent cross-contamination.

Cleaning surfaces & equipment
- Wash all food-contact surfaces daily. This includes washing tables, conveyor belts, sorting tables and brushes. Clean more often if needed.
- Use clean water. Water used for washing and sanitising should be of drinking-water quality.

How to clean equipment properly
1. Remove dirt and debris. Brush or rinse off any visible dirt.
2. Apply detergent and scrub. Use a detergent suited for fruit and vegetable residues.
3. Rinse with clean water. Make sure all detergent and debris are removed.
4. Sanitise surfaces. Use an approved sanitiser to kill microbes. Follow the product instructions carefully.
5. Keep transport vehicles clean. Don't forget to clean trucks and other vehicles used for transporting produce.

KEEPING PRODUCE COOL FOR QUALITY & SAFETY

Proper temperature management helps maintain freshness, reduce waste, and keep food safe.

Why temperature matters

- Fresh-cut products (like salads) must stay between 0-5°C to prevent food safety risks.
- Whole fruits and vegetables are less risky but still lose quality if exposed to high temperatures.
- Cooling produce quickly after harvest helps extend shelf life and reduce waste.
- Best temperatures for different produce:
  - Leafy green vegetables & berries: 0-4°C
  - Tomatoes & cucumbers: 7-10°C

Keeping produce cool in the field

- Use natural shade. Trees can provide good shade, but keep them away from buildings to avoid attracting pests.
- Harvest at the right time. Early morning or night harvesting helps keep produce cool.
- Use covers for protection. During the day, keep harvested produce under a light-coloured canvas to reflect heat.

Using water to cool produce

- Cold water works well for many fruits and vegetables, but only use safe, clean water (municipal-quality or equivalent).
- Borehole water may help cool produce if it is tested and safe to use.
- If reusing water in tanks, add a sanitiser. Check with your local agricultural department for approved sanitisers.
- Monitor and adjust chemical levels in cooling water as needed.

Transporting produce safely

- Use insulated or ventilated vehicles – Keep air circulating to prevent heat build-up.
- If using an open vehicle, create shade – Use a light-coloured canvas to reflect heat.
- Travel at night or early morning whenever possible to avoid heat.
- Never transport fresh produce with meat or fish to prevent contamination.

KEEPING ANIMALS & PESTS AWAY FROM PRODUCE

Animals and pests can spread pathogens and contaminate fresh produce. Take steps to keep them away from your farm and packing areas.

How animals, birds and insects spread contamination

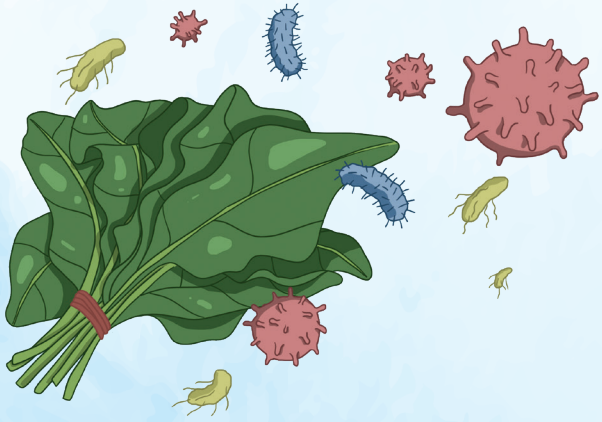
- All animals (wildlife, livestock, pets and pests like rats), birds and insects can bring pathogens into fields, water and equipment.
- They can also leave behind hair, feathers and droppings, which may contaminate food.
- Birds should not roost over packing and storage areas - use barriers or deterrents.
- To keep wildlife away, try fencing, netting, decoys, reflective tape or noise deterrents.
- Remove rotting or damaged produce and standing water to prevent attracting animals.

Keeping produce clean & safe

- Don't allow pets or livestock in fields or packing areas. They can bring in dirt, hair and pests.
- Check fields before harvest to look for signs of animal contamination. Do not harvest contaminated produce.
- Keep all facilities clean and free of areas where pests could hide or nest.
- Stop birds from gathering near storage or packing areas.

Using baits & traps safely

- Only use approved baits and traps for pest control.
- Keep bait blocks inside containers to prevent contamination.
- Mark all bait station locations on a map and check them regularly.
- Record how many bait blocks are replaced to track pest activity and adjust control measures if needed.



HEALTH & HYGIENE GUIDE FOR SAFE PRODUCE

Good hygiene is essential to keep fresh produce safe. Follow these simple steps every day to reduce food safety risks.

Toilets & handwashing

- Germs can spread easily through dirty hands and clothing.
- Provide clean, accessible toilets for workers and visitors, away from water sources and flood-prone areas.
- Handwashing stations must be near toilets and have:
  - Clean running water
  - Liquid soap
  - Single-use paper towels

When to wash hands

Everyone must wash their hands:

- ✓ After using the toilet
- ✓ Before starting work or returning from breaks
- ✓ After eating, smoking or handling animals
- ✓ Any time hands may be dirty

First aid & injury prevention

- Keep first aid kits stocked in key areas (packing facilities, harvest vehicles, chemical storage).
- Cover all cuts and wounds with waterproof bandages. If produce is contaminated with blood, discard it safely.
- Put up hygiene signs as reminders for workers.
- Check toilets, lunch areas and first aid kits regularly to ensure they are clean and well-stocked.

Preventing food contamination

- ⃠ No smoking, eating, spitting, chewing gum, coughing or sneezing near fresh produce.
- ⃠ No jewellery when handling food.
- ⃠ Sick workers should not handle produce. Anyone with nausea, vomiting, diarrhoea, fever or jaundice should be reassigned to other tasks.
- ⃠ Visitors must follow hygiene rules too.



KEEPING TRACK OF YOUR PRODUCE (TRACEABILITY)

Customers want to know where their food comes from and how it was grown. Keeping good records (traceability) helps farmers show that their food is safe and grown responsibly.

Why keep records?
Good record-keeping helps protect your business, especially if there is a food safety problem or a recall. We can't remember every detail about what happens to each box of produce, so writing things down is important.

Here's what you should record:
- If you buy produce from other farmers or suppliers, keep receipts that show what you bought, how much, and when.
- If you sell produce, keep invoices that show what you sold, when, and to whom.

Keeping track of your fields
It's helpful to divide your farm into sections (blocks) and give each block a name or number.

Write down what happens in each block:
- Fertilisers, soil treatments and pesticides – Record what you used and when.
- Harvesting – Write down the block number, what you harvested, and the date.
- Processing (washing/packing) – Keep track of the date, the block the product came from, and any chemicals used (like chlorine in wash water).

Labelling boxes
Put a traceability code on each box of produce so you can track when it was washed or packed.

Why is traceability helpful?

✓ If there's a food safety problem or customer complaint, you can quickly find out where the produce came from.
✓ If customers love your product, you'll know exactly which batch was successful!

Good traceability makes your business safer, more organised, and trusted by customers.

REFERENCES:

Codex Alimentarius Commission. 2003. Code of hygienic practice for fresh fruits and vegetables - CAC/RCP 53 – 2003

FAO. November 2010. Food Safety Manual For Farmer Field Schools - A training reference guide on food safety in global FFS programmes.

Fresh Produce Safety Centre – Australia and New Zealand (FPSC). Guides on food safety for small-scale growers.

Moe, J. 2021. Tomatoes and Produce Safety, Desert Farming Initiative - University of Nevada, Reno

Obadina, A. Guide for safe tomatoes and green leafy vegetables along the supply chain. Research Supporting African MSME's To Provide Safe and Nutritious Food (RSM2SNF).



