

Where Are Produce Safety Risks on the Farm?

Participants will explore the farm through the lens of food safety and discover how various farm activities can pose a risk to fresh produce and learn possible ways to reduce the risk.

TEACHING OBJECTIVES: WHY DO THIS?

- Foodborne illness risks are present on every farm.
- No farm can completely eliminate food safety risk. However, understanding where the risks can occur will help beginning farmers take steps to reduce the risk of transmitting foodborne illness in fresh produce.

BEST LOCATION

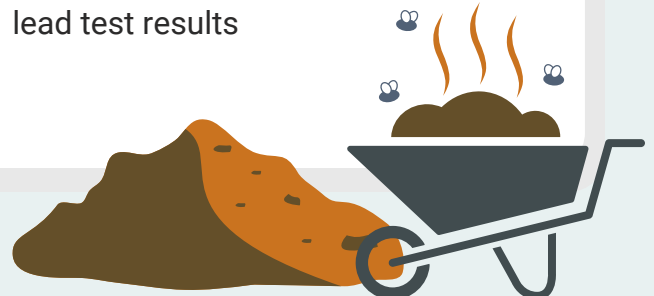
On a farm that grows produce

BEST TIME OF YEAR

During the growing season

LEARNING OBJECTIVES: WHAT CAN PARTICIPANTS LEARN?

- Identify common food safety risks on farms:
 - Humans
 - Animals (including wildlife, livestock, and pets)
 - Water
 - Soil amendments
 - Chemical and physical contaminants
- Recognize symptoms of communicable illness and injury that pose a risk to produce
- Describe how to scout a farm for the presence of animals
- Use a water testing kit and interpret test results
- Use a soil testing kit and interpret lead test results





IMPORTANCE FOR BEGINNING FARMERS

Beginning farmers want to provide fresh, healthy and safe produce for their customers. Understanding and managing food safety risks is an important part of achieving that goal.

Reducing the liability risk to the farm from a customer getting ill is also an important reason to pursue produce safety practices.

UNIQUE ASPECTS OF THE CURRICULUM

Other produce safety curricula and resources are often quite technical and assume some prior knowledge, or at least familiarity with, food safety, the Food Safety Modernization Act (FSMA) and Good Agricultural Practices (GAP).

Facilitator Planning & Preparation

Activity	Estimated Instructional Time
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Primary Activity 1: Animal Scouting	One hour
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Primary Activity 2: Water Sampling	Two hours over the course of two days
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Primary Activity 3: Soil Sampling for Lead	Two hours over the course of two days
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Technical Content

KEY WORDS

Communicable illness A disease that can be transmitted from one person to another. Examples of contagious or infectious diseases include norovirus, hepatitis A and salmonellosis (the disease caused by salmonella bacteria).

Foodborne illness An illness caused by consuming food contaminated with bacteria, viruses, parasites or toxins. Commonly referred to as "food poisoning."

Domestic animals Animals kept as livestock, working animals or pets (e.g., chickens, goats, cattle, horses, dogs, cats, etc.).

Feces The bodily wastes (e.g., poop) excreted by an animal.

Lead A naturally occurring element that is found in small amounts in the earth's crust and can also be found in amounts that are hazardous to human health in some soils, especially those in urban areas that may have been contaminated by paint and gas made before 1975.

Mitigation Taking action to reduce the severity of something. In this context, reducing the severity and potential impact of a produce safety risk.

Particulate Tiny individual fragments of a substance.

Scouting The practice of walking a farm for the purpose of observing something (e.g., crop diseases, pest pressure or wildlife signs).

Wildlife Animals naturally found in the environment (e.g., deer, rabbits, wild turkeys, raccoons, mice, Canada geese, songbirds, moles, voles, etc.).



FACILITATOR BACKGROUND INFORMATION

All types of produce are susceptible to contamination that can cause foodborne illness. Foodborne illness makes people very sick and can result in hospitalization, long-term health problems and sometimes death. Those who are more vulnerable to severe illness include young children, older adults and immunocompromised individuals.

All farms, regardless of scale, location or types of produce grown, are susceptible and should try and reduce risks.

The following are common sources of produce safety risks on a farm:

- **Humans** can spread illness when handling fruits and vegetables, most commonly through unwashed hands.
- **Animals**, including livestock, pets and wildlife, spread illness by pooping in fields or produce-handling areas or moving through fields and feeding on crops. They can also contaminate produce when manure storage areas are too close to food in the fields or through runoff from manure storage.
- **Water** used on the farm for various activities can carry and spread disease if the water is not safe to begin with, or becomes contaminated. Water testing is an important step to understand whether water is safe to use for:
 - Irrigation
 - Sprays
 - Cooling
 - Washing
 - Cleaning
 - Handwashing





FACILITATOR BACKGROUND INFORMATION (continued):

- **Manure and other soil amendments** that have not been properly treated can spread illness if not properly handled and applied. This can include:
 - Application too close to harvest
 - Improper/incomplete composting
 - Improper storage
 - Runoff
 - Manure or amendments spread by wind
 - Cross contamination of tools, equipment, shoes, etc.
- **Chemical and physical contaminants** are also a risk. Examples include:
 - Spills of cleaning products, fertilizers or pesticides
 - Broken glass or wood splinters from equipment or bins
 - Lead or other heavy metals in soil

Soil testing can help determine the risk of lead and other heavy metals to food and workers.



KWL Process

Know, Want to Know, Learn



Suggested discussion questions for farmers to share from their experience:

- What concerns do you have about producing safe food?
- Where are some areas of your farm that may be more risky, and what steps can you take to decrease these risks?
- Do you have any food safety concerns related to the soil where you farm?
- How comfortable are you about the safety of the water you are using on your farm?



Suggested discussion questions to find out what participants want to learn:

- Which kinds of wildlife, such as squirrels, geese, deer, or groundhogs, have you observed on your farm?
- What about domestic animals like dogs and cats?
- Have you ever found animal poop in your field? What did you do about it?
- Have you done anything to keep them out? How has that worked?



Primary Activities

Overview of the main activities in this module

Activity 1

Animal Scouting

Participants will practice walking through a crop-growing area to look for signs of animals and discuss whether the produce is safe to harvest based on the evidence found.

Activity 2

Water Sampling

In this two-part activity, participants will learn how to take a water quality sample, practice taking samples of different water sources and review and interpret water quality test results.

Activity 3

Soil Sampling for Lead

In this two-part activity, participants will practice taking a soil sample for the purpose of lead testing, review the results and discuss implications for food safety.





1. Animal Scouting



OVERVIEW

Participants will practice scouting a crop production area as a group for signs of possible animal contamination.

MATERIALS NEEDED

Refer to participant handouts for printed or digital documents

- Printed or digital sample Animal Scouting Record
- Printed or digital Animal Scouting Risk Matrix
- Signs of animal activity*

BEST LOCATION

On a farm that grows produce

BEST TIME OF YEAR

During the growing season

FACILITATOR BACKGROUND INFORMATION

The feces (poop) of wildlife and domesticated animals is a major food safety risk when animals enter crop growing, packing, or holding areas. "Scouting" refers to the practice of walking one's farm for the purpose of observing something out of place (e.g., feces, pests, diseases, drying plants). From a food safety standpoint, growers scout for signs of animals entering crop production areas, such as feces, tracks or crop damage.

*If no animal signs are currently present in the growing area, the facilitator can simulate them using the following techniques:

- Placing Milk Duds candy for deer poop or Baby Ruth candy for stray dog poop
- Using a stick to draw animal tracks in the soil
- Placing printed pictures of animal tracks and feces in the field. Trim off white space and try to hide these as much as possible so they are not immediately visible
- Placing decoys of Canada geese, rabbits, deer, mice, etc.



1. Animal Scouting (continued)

FACILITATOR BACKGROUND INFORMATION (continued)

Unfortunately, there is no perfect science that dictates exactly how to decide if a crop is safe to harvest. There are some situations in which a crop must not be harvested and others in where it is more of a gray area. Often both situations can occur at once, as in the below example.

A grower finds a pile of rabbit poop in the middle of their lettuce row. The poop is directly touching some of the lettuce. Any lettuce touching the poop is not safe, but what about the lettuce next to it? Or one foot away? Or at the ends of the rows?

The answer can depend on a lot of different factors. Here are some to prompt your participants to consider as you go through this activity:

- Do you need to harvest it today? In a week? In a month? The longer you can wait before harvesting adjacent areas, the less risk there will be of produce contamination because the sunlight can reduce pathogens on the plant surface over time.
- Has it rained lately? Could the rainwater have splashed poop around?
- Is the poop uphill or downhill from other crops?
- Are there footprints in other parts of the area that indicate the animal moved through additional crop areas?

Think about the poop in the context of raw manure recommendations for application prior to harvest. The best practice for produce safety is to incorporate raw manure into the soil at least two weeks prior to planting and a minimum of 120 days prior to harvest.



1. Animal Scouting (continued)

PROCEDURE

- Each participant should have a printed or digital copy of the animal scouting record handout, found in the participant handouts for this activity.
- Guide the participants to a crop production area.
- Explain what is meant by animal scouting and how to do it.
 - Define scouting: "Scouting" refers to the practice of walking one's farm for the purpose of observing something. Sometimes growers will scout crops for pests or disease pressure. From a food safety standpoint, growers scout for signs of wildlife entering crop production areas, such as feces, tracks or crop damage.
 - Talk about common wildlife farm visitors.
 - What kind of wildlife have participants seen on their own farms or farms they have worked on?
 - How do they know those animals have been there? What kind of evidence are we looking for? (Prompts if needed: wildlife sightings, footprints, chomped vegetables, poop, fur, feathers, etc.)
 - Which living creatures (e.g., worms in soil, snakes, frogs, insects, etc.) are not considered a food safety issue?
 - Discuss different scouting techniques. Refer to list on page 11.
 - Talk about why it's important to record observations:
 - It can help you see patterns of animal activity on your farm. Is the activity seasonal? Occasional? Frequent?
 - It can help you manage risk.
 - Discuss the importance of adding observational records into the harvest or preharvest records you're already keeping.
- Practice scouting together. Walk the field to look for actual or staged evidence of animal activity. When a participant finds evidence of animals, talk about the circumstances as a group and decide whether it would be safe to harvest the affected crops.



1. Animal Scouting (continued)

SCOUTING TECHNIQUES



Scout the perimeter

- Walking the perimeter of the field can help focus your scouting and it allows you to see where critters have entered the field.

Scout a row

- Scouting a row provides a sample to judge how much contamination may be in an area and may help you determine whether adjacent rows have been affected. However, it's not representative of the whole growing area.

Zigzag the field

- This involves walking the entire crop production area. The benefit of scouting the whole thing is that you are less likely to miss any evidence of animals and it greatly reduces the risk of harvesting contaminated produce. Depending on the size of your farm, zigzagging through the field and checking each row can be time consuming.

Scouting common animal habitats

- Common animal habitats include the edge of the woods, water sources, brush piles, compost piles, tall grass or wildflower areas, equipment in grass, bunched-up plastic or plastic from tunnels, piles of Reemay, piled fence posts and more.



1. Animal Scouting (continued)

DIVE DEEPER

- Practice animal scouting on participants' own farms.
- Talk about what you would do if you found (use the Animal Scouting Risk Matrix handout as a guide):
 - Only footprints, NO crop damage or feces
 - A few piles of dog poop in your leafy greens
 - That deer have significantly munched on your swiss chard.
 - Widespread bird poop on raspberries
 - One pile of raccoon poop in your carrots

VARIATIONS

1. For a virtual activity, use this interactive video, [Wildlife Scouting for Beginning Farmers](#), which leads participants through a simulated preharvest wildlife assessment. The participant can choose which areas they think are important to scout within a carrot field. They can then decide on what to harvest based on their observations and receive feedback on their choices. This activity can be done by each participant. It could also be done in a group setting, where participants can discuss the choices together.
2. Review [Wildlife Damage Flashcards](#) individually or as a group.



2. Water Sampling



OVERVIEW

This is a two-part lesson that occurs on two different days. During the first lesson, participants practice taking water samples on the farm. The second lesson is designed to take place after water testing results come back and involves a discussion of the results and implications for food safety.

MATERIALS NEEDED

- Water sampling kits (at least one per participant and two for the instructor). These can be obtained from the county health department or a water testing lab.
- Handwashing station with soap, water, paper towels and waste basket
- Hand sanitizer or alcohol wipes
- Ice and a small cooler
- Sampling pole (if sampling a pond, river, stream). These are available for purchase online at retailers such as Amazon or scientific supply companies.

FACILITATOR BACKGROUND INFORMATION

Where to find water sample kits

County health departments have water sampling kits for the Drinking Water Laboratory at the Michigan Department of Environment, Great Lakes and Energy (EGLE). MSU Extension also maintains a list of [water testing laboratories](#) that meet FDA Food Safety Modernization Act requirements.

A water sample test kit will generally include a water collection bottle and shipping materials. It is critically important that when opening the sample bottle to not touch the inside of the bottle. People often carry E. coli bacteria on our skin, and touching the inside of the bottle can contaminate the sample. It is also very important not to open the bottle until ready to collect the water because airborne bacteria could also contaminate the sample.



2. Water Sampling (continued)

FACILITATOR BACKGROUND INFORMATION (continued)

Generally it is best to take a water sample at the point of usage, such as a faucet or end of a hose. Sometimes this is not practical and the grower may need to take the sample at the point of intake. For example, if they are irrigating with drip tape and the water is being pumped directly from a pond, they should take the water sample from the pond as close as possible to the pump. Similarly, if drip irrigation is gravity-fed from a rain barrel and the hose is not easily detached from the irrigation system, the sample should be taken from inside the barrel near the hose intake.

Testing water used on the farm is one way to determine if there is a concern for produce safety when irrigating, spraying, rinsing harvested produce, cleaning with water and handwashing. Water testing involves taking samples of the water at the farm and sending them to a lab for processing.

The Michigan Produce Safety Workgroup recommends testing water for generic *E. coli* bacteria. Depending on the tests available at an individual laboratory, you may be able to get a quantified result or you may simply get a result that indicates whether generic *E. coli* bacteria is present. Growers may choose to select a laboratory based on what type of tests are offered.



2. Water Testing (continued)

PROCEDURE - PART 1

- Facilitator identifies multiple water sampling locations on the farm. There should be at least one sampling location that is a hose or faucet and at least one that is a surface water source (pond, rain barrel, river, etc.). Depending on available facilities, these could include:
 - A faucet of a handwashing sink and/or spout of a portable handwashing station
 - The end of a hose used for irrigation and/or produce rinsing
 - A rain barrel
 - A pond, river, stream, etc.
 - A demonstration pond made out of a water-holding vessel, such as large plastic storage bin, a stock tank, a barrel or a kids swimming pool
 - A puddle
- Facilitator models the basic procedure for taking a water sample:
 - Guide participants to a sampling location that has a faucet or hose.
 - Wash hands (wet hands, apply soap, scrub for 20 seconds, rinse, dry with paper towel, turn off faucet with paper towel, dispose of paper towel in waste basket).
 - Have ice on hand so that the sample can be immediately placed on ice.
 - Open one test kit but do not take out the bottle.
 - Turn on the water source to let it run for several minutes. Explain that you are doing this to flush out any dirt or debris from the system that could affect the sample.
 - Apply hand sanitizer or wipe hands with an alcohol wipe.
 - Take out the sample collection bottle but do not open yet.
 - Explain that there is usually a preservative tablet or powder in the bottle. Do not remove this. If you think it's going to fall out when you are taking a sample that requires plunging the bottle into water, you can gently tip the bottle so that the tablet goes into the cap for safe storage while you sample. Remember not to touch the inside of the bottle, cap or the tablet.
 - Open the bottle and remind participants that you are being careful not to touch the inside of the bottle because people tend to have E.coli bacteria on their hands and you do not want to contaminate the sample.



2. Water Testing (continued)

PROCEDURE - PART 1 (continued)

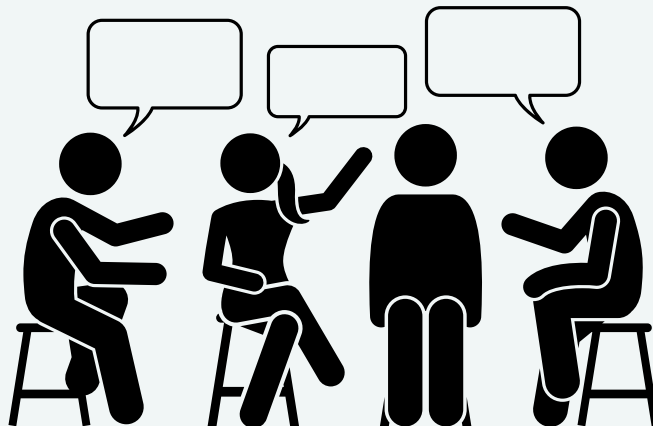
- Place the bottle under the hose or faucet stream to collect at least 100 mL.
- Replace the cap and immediately place the sample on ice. Explain to participants that E.coli bacteria can either grow or die off in the sample between the time it is collected and the time that it is delivered to the lab, so it is important to store it properly on ice and deliver it to the lab within six hours of taking the sample.
- Guide participants to a surface water sampling location.
- Open the second test kit but do not take out the bottle.
- Apply hand sanitizer or wipe hands with an alcohol wipe.
- Take out the sample collection bottle. Open the bottle and remind participants that you are being careful not to touch the inside of the bottle because people tend to have E.coli bacteria on their hands and you do not want to contaminate the sample.
- Demonstrate gently tilting the bottle so that the preservative rolls into the cap for safekeeping. Again remind participants not to touch the inside of the bottle, cap or preservative in the process.
- Secure the bottle to a sampling pole if needed. Quickly plunge the bottle into the water, avoiding any plants, algae or bottom sediments that may be present. Make sure to collect at least 100mL of water in the bottle.
- Replace the preservative and cap and immediately place the sample on ice.
- Have participants divide into small groups to practice taking samples at multiple water sampling locations on the farm. By working in small groups, peers can observe one another taking samples.
 - Each participant should be given the opportunity to take at least one sample.
 - Each group should take a sample at each of the identified sampling locations to practice how to take a sample at different water sources.
- The facilitator delivers samples to the lab for processing within six hours of the first sample being taken.



2. Water Testing (continued)

PROCEDURE - PART 2

- Once you have the results, compare the samples and discuss as a group why certain locations might be more likely to have generic E. coli bacteria present. Let participants think and respond first before prompting with:
 - A pond or uncovered rain barrel is open to the environment and is more likely to become contaminated by bacteria from the air, wildlife and domestic animals.
 - Rain water that lands on a roof and is collected in a rain barrel may pick up any contamination from the roof (e.g., bird poop) on its way down.
 - City water is maintained to drinking water quality standards by the municipality.
 - Well water from a capped well is less likely to become contaminated than water from an uncapped well.





2. Water Testing (continued)

DIVE DEEPER

Ask participants to assess water usage on their own farms and make a list of different water sampling sources where they can collect. Remind participants to use a separate kit for each sampling location.

For growers interested in using rainwater, Keep Growing Detroit has a number of resources:

- [Rainwater Catchment Safety & Use Tips](#)
- [Building a Rainbarrel](#)
- [8-by-12](#) and [12-by-14](#) Irrigation Station - DIY Manuals

VARIATIONS

If unable to provide enough test kits for all participants, this activity could be done as a demonstration with the instructor and a few participants demonstrating for the group.



3. Soil Sampling for Lead

OVERVIEW

This is a two-part lesson that occurs on two different days. During the first lesson, participants practice taking soil samples on the farm. The second lesson should be scheduled for a time after testing results come back. Part two involves a discussion of the results and implications for food safety.

MATERIALS NEEDED

- Soil auger (or corer) and shovel to demonstrate using each
- Clean plastic bucket
- Cup or jar
- Clean plastic quart-sized sealable bag
- Label for bag (if not preprinted)
- Water-proof marker for labeling the bag

BEST LOCATION

On a farm that grows produce

BEST TIME OF YEAR

During the growing season

FACILITATOR BACKGROUND INFORMATION

Lead is naturally found in soils in very small amounts. In urban areas, unsafe levels of lead may be found in soils, due to lead historically being used in house paint, gasoline and industry. Leaded paint was banned in 1978, and leaded gasoline was banned in 1986. However, it persists in soil and presents a chemical food safety risk, as well as a risk to individuals who come in contact with the soil through farming activities.

Lead can be hazardous to human health. It is especially hazardous for children under 6 years of age. Lead poisoning can cause learning and speech problems, hyperactivity and nerve damage that are difficult to reverse and likely lifelong.

To avoid the food safety and occupational hazards associated with lead, soil in urban areas or sites where prior land use included buildings or industry should be tested for lead. This involves taking a sample of the soil and sending it to a laboratory for testing.

If lead levels of concern are detected in the soil, it is advised that the grower install raised beds and bring new soil into the farm site to fill them.



3. Soil Sampling for Lead (continued)

PROCEDURE - PART 1

- Begin by asking what participants know about the dangers of lead and lead testing of soil.
 - If participants have not sufficiently covered the topic, review the information provided in the "Facilitator Background Information" section of this activity with the group to explain why they will be doing an activity around soil lead testing.
- The facilitator can explain to participants that the process for taking lead soil samples is very similar to the process of taking soil nutrient samples. Wearing PPE such as a dust mask and disposable gloves is advised to avoid potential lead exposure during sampling. Do not sample the soil on a very windy day.
- Explain that the sample should be taken at a depth of 6 inches, and demonstrate taking the sample using a soil auger, corer or shovel.
 - Take 10 to 20 samples and mix them in a bucket. Then, measure a cup of the mixture to send to the lab. Let this cup of soil air dry and then place it in a clear plastic bag. Label the bag.
- Invite participants to practice taking soil samples using the provided tools.
- Send the sample to a laboratory for testing.

PROCEDURE - PART 2

After receiving the test results, review and discuss them as a group. Talk about options for starting or continuing to farm on a site that tests positive for lead. Keep Growing Detroit has a recommended protocol of high lead levels, which can be found in their [Soil Testing Guide](#).



3. Soil Sampling for Lead (continued)

DIVE DEEPER

Share the video [D-Town Farm: How to Make a Raised Garden Bed](#) with participants. The video is a step-by-step guide to building a raised bed garden to mitigate flood areas, improve accessibility and avoid soils contaminated with lead or other heavy metals.

The group could also work together to construct raised beds as a hands-on learning activity.

CONNECTIONS TO OTHER MODULES

Soil nutrient testing is covered in the soil health curriculum. These activities could be done at the same time.





Additional Resources/Activities

Resource 1

Communicable Illness and Injury Symptoms Poster

This poster can provide instruction to highlight symptoms of human transmitted diseases and injuries that can contaminate fresh produce. It can be taken back to the farm and posted in a high-traffic area for continuous reinforcement.

Resource 2

Sources of Contamination Infographic

This infographic could be used in a slide or as a handout to introduce the various ways fresh produce can be contaminated in a farm environment.

Resource 3

Dealing with Rodents and Birds

This resource sheet outlines three steps for farmers to deal effectively with rodents, birds and other wildlife that could contaminate produce after it has been harvested, such as in packing and storage areas. It also details practical management tactics for repelling wildlife from these areas of the farm.

Resource 4

Keeping Produce Safe with Livestock

This resource outlines strategies for keeping produce safe when livestock are present on the farm.



Additional Resources/Activities

Resource 5

Irrigation Methods Infographic

This infographic shows how different irrigation methods can impact produce safety. It is included in the participant Handout for Primary Activity 2: Water Sampling and an image file is available to download from the website.

Resource 6

Probability of Water Contamination by Water Source

This slide from the Produce Safety Alliance Grower Training Curriculum shows the spectrum of risk to produce safety based on the source of the water. This image and an explanation of it are included in Primary Activity 2: Water Sampling and a PDF of the slide is available to download from the website.

Additional Activity

Look online for reports of foodborne illnesses traced back to farms. Share these examples and have the participants discuss steps that could have prevented the problem.

Connections

Connections to other modules

- Learn about other types of scouting in the Integrated Pest Management curriculum
- Learn about soil sampling to understand soil composition and crop needs in the Soil Health curriculum



Review and Encouraging Further Learning

Module review and evaluation questions:

- What are the common ways foodborne illness are transferred to plants in the field?
- What are signs of possible foodborne risks in a field?
- What do you do if you find out someone in the work team is sick?
- How do you know if there is a foodborne illness?

Taking your knowledge back to the farm:

- What do you look for when scouting the field?
- What is the best way to store manure or compost?
- If you have animals on your farm, what steps should you take to keep the produce as safe as possible?