



Good Agricultural Practices Guide For Plain Growers Version 1 (2019)

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INTRODUCTION

Why is fresh produce safety important?

As most Plain growers are aware, food safety of fresh produce is a major concern in the market. Buyers are requiring that growers make sure that their produce is safe and produce auctions require growers to have food safety training. It may also become more difficult to market produce if food safety plan is not in place.

The majority of the foodborne illnesses occur from eating fresh produce contaminated with microbes. Because most horticultural crops are eaten raw, it is important that they are free of microbes (also called germs) that may lead to illness under common and sensible handling and food preparation practices. However, once produce is contaminated with microbes, removing or killing the microbes is very difficult. Therefore, prevention of contamination on the farm is the best way to protect your customers. Prevention programs and worker food safety trainings are key elements in a credible produce safety program. They require a commitment to understanding food safety risks and implementing best practices in your operation to control those risks.

What are Good Agricultural Practices (GAPs)?

Good Agricultural Practices, better known as GAPs, are a set of best practices and standards developed to prevent the contamination of fruits and vegetables with microbes and other harmful materials that can cause illnesses. GAPs are about understanding the food safety hazards on your farm and actions that you take during production, both pre- and post-harvest, to prevent them.

Are GAPs and GAPs Certification Mandatory?

GAPs and GAP certification are NOT mandatory, but they will make your business more competitive. Adopting GAPs standards, whether you are certified or not, will help you produce a safer and better-quality product. Implementing GAPs mean that you are doing everything that you can to ensure that crops that you produce are safe to eat. To become GAP-certified a grower must go through a third-party auditing process. While becoming GAP-certified is not mandatory, most produce buyers are choosing to only do business with GAP-certified growers.

Are GAPs trainings the same as FSMA?

GAP trainings are NOT the same as Food Safety Modernization Act (FSMA) trainings. FSMA trainings are required under the law for covered farms. GAPs trainings are voluntary and will provide you with information needed to understand the food safety hazards on your farm and the ways you can implement best food safety practices. *This GAPs training is aligned with FSMA Produce Safety Rule and provides recommendations on how you can achieve FSMA standards.*



INTRODUCTION

Who is responsible for fresh produce safety?

Food safety must be maintained in every step from farm to fork. Because we cannot get rid of the microbes once they are on our crops, it is important that any contamination of crops is prevented. Prevention begins on the farm and ends in the home. Therefore, EVERYONE has a responsibility in keeping fruit and vegetables safe.



INTRODUCTION

Can traditional farming practices be used by Plain growers ensure food safety?

No matter what types of farming practices or traditions are used to grow produce, it is important that any contamination of crops is prevented. While agricultural practices used by the plain community may differ from those used by English growers, they can still be implemented in a way that will ensure safe crops while maintaining the religious and cultural traditions of the community. According to Raymond Yoder- **“if you do the best we can in trying to produce safe food, God will take care of the rest.”**

Why is fresh produce safety important?

Fresh produce causes more illnesses and outbreaks (not including multi-ingredient foods) than any other type of food. An outbreak constitutes two or more illnesses. While some outbreaks may be small, causing just a few illnesses, others can be large, causing thousands of illnesses.

What are foodborne illnesses?



Microbes, also called germs, are often present in the environment. Some microbes can make us sick through the foods we eat if it has been contaminated by these microbes.

Microbes like *Salmonella*, *E. coli*, *Listeria*, and Norovirus can be carried by the foods we eat and cause illnesses that affect the stomach. Microbes that cause illnesses in people are shed from an infected person through their feces, urine, and blood. Animals, domestic and wild, also carry some of the microbes that can make people sick.

53% of all outbreaks are caused by the consumption of green leafy vegetables, tomatoes, melons, cucumbers, and contaminated berries.



Figure 1. Examples of crops grown on plain farms

INTRODUCTION

0 minutes, One bacterium



How fast can microbes grow?

Microbes can grow fast in food and water if they have the right conditions for growth. Most bacteria, such as *Salmonella* and *E. coli*, will double in number every 20 minutes with the right growing conditions.

20 minutes, Two bacteria



40 minutes, Four bacteria



60 minutes, Eight bacteria



After 12 hours there will be ONE TRILLION bacteria!

Figure 2. Microbes divide fast. They can grow to millions from only one cell in several hours.



RISK ASSESSMENTS

What is risk assessment?

To implement GAPs you have to understand any food safety hazards that may be in your operation. A risk assessment will provide verification that you have made an effort to evaluate all potential food safety hazards.

Because microbial contaminants of fresh produce most often come from **water, people, waste such as those used for soil amendments, and wild and domestic animal poop**, it is important to evaluate all these sources of microbes. If there are any risk that the crops may be contaminated through these sources, you will know to take action to reduce the hazards.



Figure 3. Overview of the hazards on farm

RISK ASSESSMENTS

How do I conduct risk assessment?

The best way to start a risk assessment is to **draw a map of your farm**. Look over your whole farm, and its surroundings. Include all details of your farm such as:

- production areas
- areas that harbor wildlife
- livestock barns and grazing areas
- location of houses and packing sheds
- potential flooding zones
- septic fields
- well heads
- water sources and direction of water flow
- topography of the land
- roads
- potential flooding zones

Can you identify the potential food safety hazards on this farm?



Figure 4. Example of the farm map with its surroundings

Pre-harvest Risk Assessment

- Land use history and adjacent land use
- Water source and system assessment
- Animal control assessment
- Soil amendment assessment

Post-harvest Risk Assessment

- Produce washing assessment
- Packing assessment
- Allergen assessment

RISK ASSESSMENTS

Evaluate all practices used for the production of crops. Identify hazards on your farm and how likely it is that the contamination will happen. Assessments of both pre-harvest and post-harvest practices must be included. All potential hazards must be documented. The documentation does not have to be complex, a simple notebook page is sufficient if it contains all the required information.

What kind of risks should I look for?

You should identify all hazards on the farm that may pose a problem for human health. There are three groups of hazards and you should identify risks for all three groups that may end up on the crops.

- Microbes are considered **biological hazards**.
- Broken glass, pieces of equipment, hair and pieces of clothes are **physical hazards**.
- Pesticides, sanitizers, and other chemicals are **chemical hazards**.

How can I recognize food safety hazards?

Recognizing food safety hazards on the farm and land adjacent to the farm can be difficult. Hazards can be overlooked. For instance, contamination of a water source due to a domestic animal present in the water is often missed, especially if it is occurring on adjacent land. Once you draw a detailed map, these hazards can be more easily spotted.

What do I do when risks are identified?

For any hazard, you have to take action to prevent contamination of your produce. The measures we take to correct problems on the farm that may lead to contamination of produce are called **corrective actions**. Corrective actions minimize the risk of contamination.



Figure 5 Sanitizers are an example of a chemical hazard.



Figure 6. Livestock drinking from or cooling off in water used to irrigate is a hazard.

Example

Pre-harvest risk assessment

- Land use assessment
- Water systems assessment

Cattle are present in the creek upstream from the farm. Creek water is used as a water source. Water used for irrigation will likely contact crop.

Hazard: Biological, cattle carry microbes
Likelihood of contamination: High

Corrective actions

- Introduce barrier to prevent cattle from entering the creek.
- Source water from another location
- Document the changes made

FARM FOOD SAFETY PLANS & RECORD KEEPING

Why is a food safety plan important when considering produce safety?

A farm food safety plan is the documentation component of Good Agricultural Practices and a tool that is used to verify that your farm is using practices to prevent or reduce food safety hazards on the farm.

Am I required to have a farm food safety plan?

The short answer is NO. Food safety plans, like GAPs, are voluntary. However, many of your buyers may require you to have a food safety plan and a food safety plan is required for obtaining GAPs certification through the USDA or a third-party.

What should be in my farm food safety plan?

A farm food safety plan does not need to be complex, but it must be accurate. The plan should only include policies and practices that you are actually using or are doing on your farm, not those that you are planning on doing in the future.

Farm food safety plans should include the following:

- basic information about your farm
- a risk assessment
- farm policies and standard operating procedures (SOPS)
- records of practices and/or corrective actions.

Information About Your Farm

- Farm or owner's name and contact information
- Address of farm and packing shed
- Name and contact information of food safety officer

Risk Assessment

- Map of farm
- List of crops grown on the farm
- Description of land usage, soil amendments, water sources, packing shed, and other facilities
- Pre- and post-harvest water
- Storage and transportation

Written Policies and Procedures

- Types of soil amendments and when they are applied
- Irrigation practices
- Water sources and testing
- Sanitation practices
- Worker hygiene practices
- Cooling and packing produce
- Storage practices
- Traceability practices

Records

- Logs of who visited the farm
- Logs of when and who completed a specific procedure or corrective action.
- Sales receipts for produce
- Testing (i.e. water, compost) results
- Pesticide spray information (i.e. time, product name and rate)
- Sanitizer information (i.e. time, product name and rate, pH, temperature)
- Storage temperatures and humidity level
- Mock recall documentation

FARM FOOD SAFETY PLANS & RECORD KEEPING

When should a farm food safety plan be updated?

A farm food safety plan should be revised or updated **every year**. In addition to a yearly review, your plan should be revised when new on-farm food safety risks are identified, changes to production practices are made, changes to procedures, policies or corrective actions are made, and when a new food safety officer is named.

Tips for Writing a Food Safety Plan

1. Keep written procedures simple but accurate.
2. Create templates that fit with your farm practices.
3. Create check-lists to help you do the practices that you say you are doing.
4. Keep a copy of your food safety plan in your office and packing shed.

Why is it important to document and keep records of practices and/or corrective actions?

Documentation and record keeping of food safety practices provides proof to your workers, buyers, regulators and consumers that you are committed to selling a safe product.

Documentation will:

- prove that policies are effective and being completed as written
- show that care is being taken to prevent illnesses
- meet requirements for third party audits
- provide a paper trail to improve current practices

Documents	Records
<ul style="list-style-type: none">• Describe policies, activities and practices (how and when it is done)• Designates responsibility (who is responsible for the task?)• Permanent (but can be revised)	<ul style="list-style-type: none">• Filled in as the activity occurs• Provide proof that policies, activities and practices were followed

Remember- Do what you say and only say what you do!



AGRICULTURAL WATER AND FRESH PRODUCE SAFETY

What is agricultural water?

Agricultural water means any water that is intended to, or it is likely to touch the edible portion of produce that will be eaten raw.

Agricultural water includes water used for:

- overhead irrigation
- spraying pesticides or fertilizers
- frost prevention
- equipment cleaning

It is important to consider all water usage on farm. It often happens that growers forget to consider water used to apply fertilizers and pesticides.

How is water a food safety hazard?

Water is important for agriculture and you cannot grow crops without it. Water can become contaminated with harmful microbes and transfer the microbes to the produce you are growing. Water spreads fast and so it spreads the contamination.

Reducing direct contact between irrigation water and edible portions of the crop, whenever possible, is the best practice to reduce the risk of contamination.

What microbes can be carried by water onto produce?

All types of microbes can be carried in water and many of these microbes can make people very sick, such as:

- **Bacteria:** *E. coli*, *Salmonella*., *Vibrio cholerae*, *Shigella*, *Listeria monocytogenes*;
- **Viruses:** Norovirus and Hepatitis A
- **Protozoa:** *Cryptosporidium parvum*, *Giardia lamblia*, *Cyclospora cayetanensis*, *Toxoplasma gondii*
- **Helminths (worms or nematodes):** pin worms and tapeworms (this is more common in sub-tropical and tropical regions)

Can water carry plant pathogens?

Yes. Water can also be a carrier of important pathogens that reduce plant health and the quality of the produce. For example, water molds and bacteria that cause wilting and soft rot can be carried to crops through water.



Fig 7. Surface water source used to irrigate crops on plain farm

Many of the recommended GAPs used to ensure that agricultural water is safe will also minimize the risk of plant diseases.



Figure 8. Plant pathogen on cucumber and melon.

AGRICULTURAL WATER AND FRESH PRODUCE SAFETY

How does water get contaminated?

There are many ways that water can become contaminated with microbes. Usually contamination is from animal or human waste that gets into the water directly, through run-off, or damaged irrigation or well equipment. Understanding the ways this can happen is an important part of food safety.



Figure 9. Cows standing in the water used for crop irrigation on a plain farm.

Examples of risks from agricultural water

- Upstream livestock operations can result in run-off into source water or animals may use upstream water as a source of drinking water or to cool themselves.
- Manure piles located near water sources can result in run-off into water source.
- Cull piles are a source of microbes and can run-off into water source.
- Wildlife use surface water as water and food sources, breeding and to cool themselves.
- Ponds or other surface water sources that are prone to flooding can be a source of contamination.

What water sources are the safest to use on farms?

The quality and hence safety of water varies depending on the source.

- Surface water is considered to be of the poorest quality and highest food safety risk.
- Well water is lower quality than city water and a moderate to low food safety risk if the wells are maintained in good working condition.
- City water is treated with chlorine and is considered the cleanest with the lowest risk.
- If water is mixed (i.e. well with surface water) the water is considered the same quality of the source that is of the highest risk (i.e. surface water).

Examples of surface water:

- Ponds
- Rivers, streams and cricks
- Rain water (collected)
- Natural springs

AGRICULTURAL WATER AND FRESH PRODUCE SAFETY

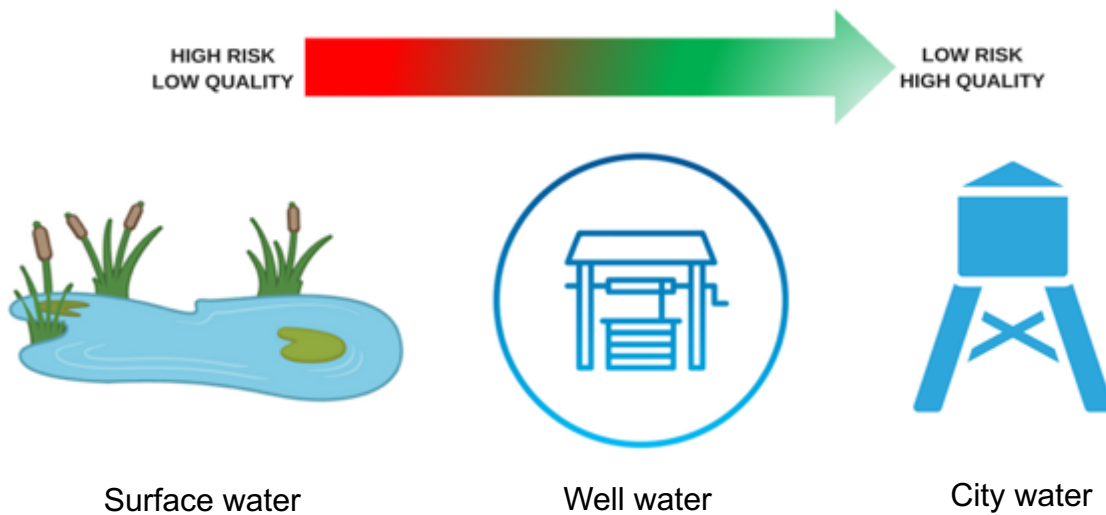
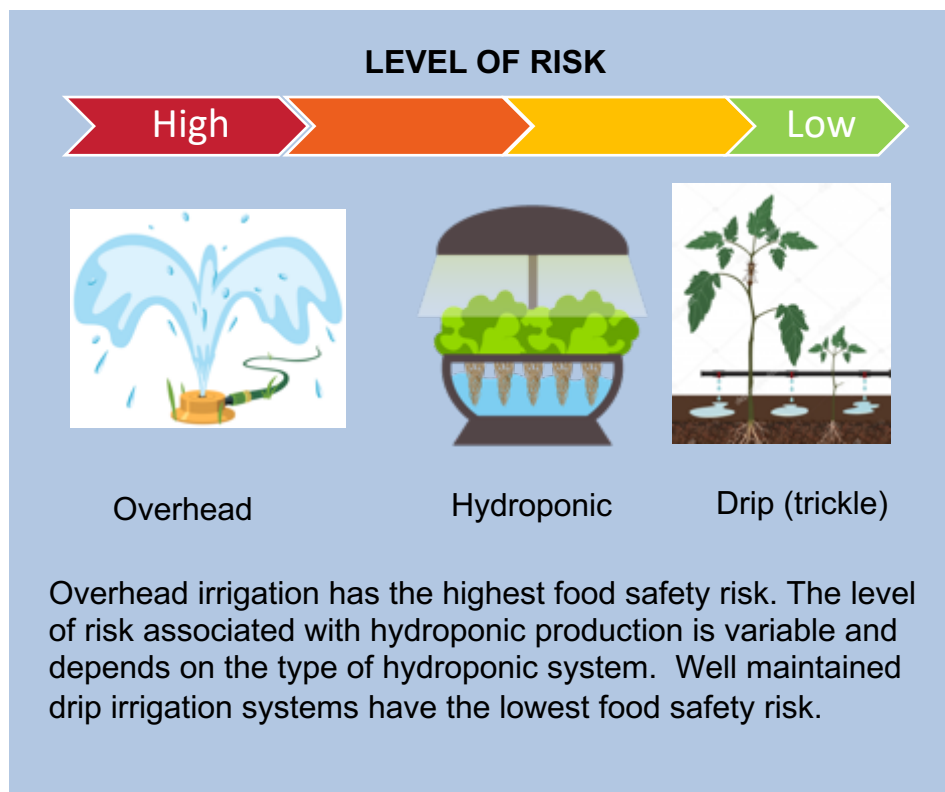


Figure 10. Levels of risks from different water sources use for crop irrigation

What else can influence the contamination of produce?

- Crops where the edible portions are closer to the ground are at higher risk of contamination due to splashing water.
- The risk of contamination with agricultural water varies depending on the irrigation method. Using water to move produce is riskier than not using water.



AGRICULTURAL WATER AND FRESH PRODUCE SAFETY

How can I know if my water is safe to use?

If you see dirt in water it is very likely that the water is also contaminated with microbes. However, we cannot see the microbes with our naked eyes. Even if the water looks clean it does not mean that it is clean, based on physical, chemical and biological parameters. So, the only way to know is to test the water in a lab. When water is tested they count the number of microbes in the water.

What microbes can tell us if there is contamination in the water?

You cannot see microbes with the naked eye. There are many microbes in water, but we do not care about all of them. We count the microbes that can tell us if there is contamination that came from human or animal poop. These are called fecal coliforms. Among them, **generic *E. coli*** is the best indicator of the presence of poop in agricultural water.

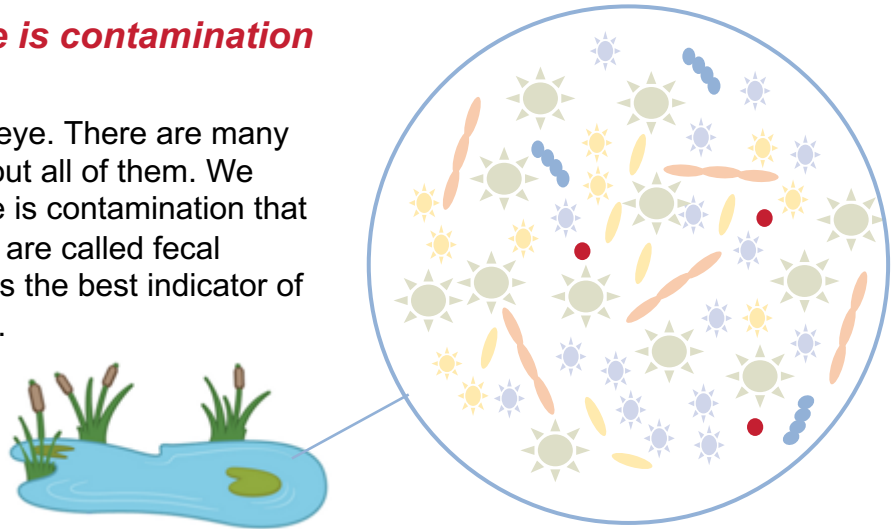


Figure 11. Microbes can be found in water ponds and other water sources

How much generic *E. coli* can be in my agricultural water for it to be considered safe?

The standard for agricultural water is based on **primary contact recreational** standards set by the Ohio Environmental Protection Agency (EPA). The number of generic *E. coli* cells in 100 milliliters of water must not be more than 126.

Indicator	OH Primary Contact	US EPA Primary Contact
Fecal coliforms	Not recommended	Not recommended
Generic <i>E. coli</i>	126 CFU*	126 CFU
Enterococci	-	35 CFU

Colony forming units (CFU) based on a geometric mean of at least 5 samples.

AGRICULTURAL WATER AND FRESH PRODUCE SAFETY

What if I can't understand the test results?

Many small growers do not understand the calculation behind the water results. Staff from the lab where you got your water tested, as well as your county Extension Educators, can help you understand the microbial counts. It is important that the results clearly state the number of microbes present in the water. This number is often listed as the colony forming units (CFU) per volume. Sometimes the lab report will include other parameters measured from the water such as pH and hardness.

HOLMES LABORATORY INC.
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IRRIGATION WATER
ANALYSIS REPORT
[A Vital Key to Todays Agriculture]
(330) 893-2933 * www.holmeslab.com
Test Performed: I

Customer :

OSU - OARDC
1680 Madison Ave.
Wooster, OH 44691

Date Reported: 05/24/2018
Lab Number: 18-634
SAMPLE I.D.:Water
Sample #3

Lab and client contact information, sample details, testing date

Other water parameters

Indicator microbe counts

Analysis of Chemical Properties	Unit of Measure	Your Results	Optimum Range
pH		8.6	5 - 7
Hardness (as CaCO ₃)	ppm	133	20 - 100
Hardness	grains per gal	8	0 - 6
Bicarbonate	ppm	74	30 - 50
Carbonate	ppm	0	0 - 15
Total Alkalinity (as CaCO ₃)	ppm	61	0 - 100
Electrical Conductivity (EC)	dS/m	.49	0 - 0.75
Total Dissolved Salts (TDS)	ppm	225	0 - 480
Sodium (Na)	ppm	50	0 - 30
Chloride (Cl)	ppm	108	0 - 50
IMPACT ON SOIL STRUCTURE			
Sodium Adsorption Ratio (SAR)	meg/l	1.90	0 - 4
Sodium Adsorption Ratio (Adj)	meg/l	2.73	0 - 10
Residual Sodium Carbonate (RSC)	---	-1.44	0 - 2.5
Total Coliform	CFU/100ml	765	
E-Coli	CFU/100ml	4	

*Ohio Department of Health Standards for Private Drinking Water Systems.

Always look for and use the results provided for generic *E. coli*.

Figure 12. Lab report example and what should be listed on it

Do I have to keep records of the test results?

Yes! Keep ALL test results and any other documents (i.e. receipts) related to water testing. For city water, contact your local water works to get a copy of the report.

AGRICULTURAL WATER AND FRESH PRODUCE SAFETY

What is the risk from different irrigation water systems?

Irrigation type	Level of Risk	Description
Drip Irrigation:	Low Risk	A type of micro-irrigation where the system emits water at a very slow rate directly to the soil where plant roots are growing. System may be on the soil surface or buried below the surface.
Flood/furrow/surface	Medium Risk	Water is pumped or brought to fields and allowed to flow along irrigation: the ground among the crops.
Micro-irrigation:	Low Risk	A system where water is distributed under low pressure through a piped network in a pre-determined pattern and applied as a small discharge next to or adjacent to each plant. Includes various systems (drip, micro-spray, micro-sprinklers, mini-bubbler) distinguished by the type of emitters used to deliver water to the plants.
Micro-sprinklers/sprays:	Low/Medium Risk	A type of micro-irrigation with fixed micro-sprays that deliver water at a higher rate and cover a larger area than drip emitters. Typically used in tree orchards, also in aeroponic operations.
Overhead/sprinkler irrigation:	High Risk	System where water is piped to one or more central locations and distributed by overhead high-pressure sprinklers or guns. Sprinklers can be fixed or mounted on moving platform
Sub-irrigation/seepage irrigation:	Low Risk	A method of artificially raising the water table to allow the soil to be moistened from below the plant root zone. A system of canals, weirs, gates, and pumps are used to increase and decrease water level in a network of ditches, controlling the water table. Hydroponic systems are based on the same principle.

Source: NCFS fundamentals of On-Farm Food Safety

What is the best way to manage water?

Start with checking your complete water system. This has to be done at least once every year, and the best time to do it is at the beginning of the season. Make sure all the water delivery equipment is in good repair and working properly.

How can I protect my water from getting contaminated?

- Use grass or sod around waterways to provide a natural barrier and filter run-offs.
- Use sand filters. Sand filters are the layers of sand that remove organic matter as the water is passing through them. Organic matter may harbor harmful microbes and also consumes all the sanitizer during the treatment. Slow sand filters can be built on large pieces of land and don't require much labor to maintain. rapid filters require more maintenance to prevent back flow, but don't take up much space.
- Use a water treatment. Chlorine based sanitizers and UV-light are most commonly uses for water treatment. Any water treatment that is used, has to be effective.

Best practices for water management

- Know your water source
- Know your local watershed
- Check your pipes and lines for cracks and leaks
- Maintain wells in good working condition
 - Well casing is secure and maintained
 - Pump is operating correctly

Best practices for water application

- Do not use surface water whenever possible.
- Avoid overhead irrigation with surface prior to harvest
- Water early in the morning or mid-afternoon to maximize drying time

AGRICULTURAL WATER AND FRESH PRODUCE SAFETY

How often should I test irrigation water?

If you wish to get GAP certified you have to test agricultural water and document the test results. How often you test your water will depend on your water source. If you use city water from a public water supply, you don't have to test your water as it tested by the city. Well water must be tested once each growing season, while surface water must be tested every three months (quarterly).



Fig 13. Surface water source used to irrigate crops on plain farm

What do I do when my water quality is lower than the standard?

If your water had more microbes than what is required by the standard it means it is low quality and use of that water may lead to crop contamination. **You have to correct the problem immediately.** First, you have to quit using the water for any activity that will result in the water contacting the edible portions of the fresh produce.

You can choose to apply a treatment that will remove the microbes such as filtration or sanitation with chemicals such as chlorine (bleach). When applying treatments, it is important to keep records of all the details of the sanitation process.

Water Source	Testing Frequency	Corrective Action
Municipal	Annually (by local authority)	<ul style="list-style-type: none">• None on the grower part
Well	Once per growing season	<ul style="list-style-type: none">• Chlorination followed by re-testing
Surface	Quarterly	<ul style="list-style-type: none">• Change source• Filtration and/or chemical treatment

FLOOD WATER AND FRESH PRODUCE SAFETY

Why is flood water a food safety hazard?

Fruit and vegetable crops exposed to flood water can pose a food safety risk because flood water can contain microbial and chemical contaminants.

Microbial contaminants include pathogens such as bacteria, viruses and parasites. Flood water can pick up these pathogens from farms, manure, animal droppings, and septic systems.

Chemical contaminants can include pesticides or other agricultural chemicals, oil and gas, and heavy metals. Sources of contamination will depend on the location of operations using these types of chemicals or run-off from road ways.

What do I do if my field floods during the growing season?

If your fields flood during the growing season the first thing you will want to do is determine whether or not your crop is safe to eat. Guidelines for determining if your crop is safe are based on the types of contact that the floodwater has with the edible portion of your crop. The U.S. Food, Drug, and Cosmetic Act established these guidelines.

If the edible portion of the crop has come into direct contact with the flood water it is considered to be unsafe with no adequate cleaning or sanitation method to make it safe to eat. Fruit and vegetable crops directly exposed to floodwater can't be used for human or animal food. Produce must be discarded.

If the edible portion of the crop has come into indirect contact (such as splashing or contact with non-edible portions) with the flood water the crop can be used for human food but must be treated to kill any pathogens that may have come in contact with the edible portion. Examples of effective treatments include cooking and canning.

If you don't know if the edible portion came into direct or indirect contact with the flood water the produce should be discarded.

When in doubt, throw it out!



Figure 14. Flood water that comes into direct contact with fruit or vegetables must be thrown out.

Remember- When in doubt, throw it out!



FLOOD WATER AND FRESH PRODUCE SAFETY



Image courtesy of UMass. Extension Vegetable Program
Fig 15. Flooded tomato field

SCENARIO

Following several days of heavy rain one portion of a grower's staked tomato field becomes flooded. The lower leaves and fruit on the tomato plants came into direct contact with the flood water but the upper portion of the plants and fruit did not. Can the grower harvest and sell the fruit?

Solution: In this scenario the fruit came into direct contact with the flood water and possibly indirect contact with the flood water. Mark the area of the field that was flooded and mark on the plants (with a flag or other type of tag) the high-water line so that you can identify where in the field and on the plants the crops were in contact with the flood water. Once the field has dried collect and destroy any fruit that was below the high-water line. In a separate container that has been cleaned and sanitized, collect fruit above the high-water line and treat the fruit, either by cooking or canning it before eating or selling it.



POST-HARVEST WATER AND FRESH PRODUCE SAFETY

What are post-harvest uses of water?

Post-harvest water is commonly used to rinse, wash, and cool produce. This means that post-harvest water directly touches the edible portions of fruit and vegetable crops. It is also used to wash surfaces that will directly touch the edible portions of crops. Water that is used to wash hands while handling fresh produce is also post-harvest water. This is why post-harvest water falls under more stringent standards than pre-harvest water.

Should I wash my crops?

No! Washing produce is not recommended. Each time we use water we add a food safety risk. Water can contaminate produce and spread contamination to other crops. Use the least possible amount of handling of produce after harvest.

Best practices for washing produce

- Always use drinking quality water
- Always use a sanitizer in your wash water
- Maintain water temperature **equal to or warmer** than the produce pulp temperature
- For produce with stem scars, hold the produce for at least 4 hours prior to dunking

How can I dry my crops?

Dry produce in a clean area on a clean and sanitized surface. Use only clean, single use towels to dry produce by hand.

What water should I use to make ice?

Only use drinking water quality water to produce ice that is intended to touch edible portions of crops.



Figure 18. Ice should be made only using clean drinking water

Post-harvest water must be of **drinking water quality (potable)** and must not have any generic *E. coli*.



Figure 16. Water can infiltrate into fruit or vegetables if they are dunked into water colder than the produce. Gas in the produce condenses and a gradient may be created.



Figure 17. All surfaces used to dry produce must be clean and sanitized.



POST-HARVEST WATER AND FRESH PRODUCE SAFETY

What sanitizers can I use for wash water?

If you wash your produce you should always use sanitizers. Sanitizers are put in water to prevent microbes from growing in the water and spreading to crops. Most commonly used sanitizers for wash water are chlorine (bleach), peroxyacetic acid, and sometimes UV light.

Sanitizers that you use must be labelled for food use. Clorox regular sanitizer is labelled for use on fruit and vegetables. Chlorine is very sensitive on conditions in water. It requires neutral environment to be effective



Fig 19. Sanitizers should be stored separately and used according to their label

If you wash produce, you have to use a sanitizer, and if you use a sanitizer you have to ensure that the sanitizer is working!

How can I tell if the sanitizer is working (effective)?

Much of what we do on farms is common sense, and it is not common sense to be wasteful. It is a waste to use sanitizer in water if it is not working. If you can answer these two questions you can tell if your sanitizer is working.

Is the water dirty? The sanitizer will not be effective if the water is dirty. Look at the wash water. Wash water that appears dirty, is dirty! Turbidity can be measured but our eye can easily discern dirty water. It's better to not wash the produce than to use dirty water.

What is the acidity of wash water? We cannot tell what the acidity, also known as pH, of water is by looking at it, we have to use a test strip or meter and measure the acidity. If the measurement is close to 7 (neutral) the chlorine sanitizer is working well. A measurement of 8 and above means that the chlorine sanitizer is not active. A measure of 5 or below can be toxic to people.

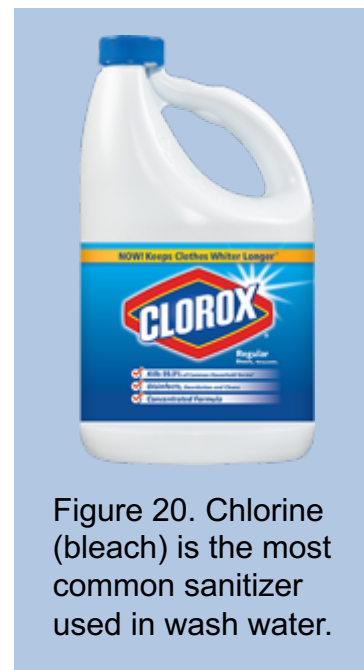


Figure 20. Chlorine (bleach) is the most common sanitizer used in wash water.

Do I have to keep records of water sanitation?

YES. If you use a sanitizer in your wash water you need to document the usage for certification purposes. The following items should be documented:

- Product name and application rate
- Water temperature and pH
- Date and time of application
- Date and time when solution was changed



CLEANING AND SANITIZING AND FRESH PRODUCE SAFETY

Why should I sanitize surfaces?

By handling your produce in clean environment you will reduce the risk of contamination and ensure safe produce. Microbes can establish on the dirty equipment and floors. Proper cleanliness and sanitation will also increase the quality of your crops and add value to your crop by extending shelf-life and preventing decay. Clean appearance is very important for marketing the product and buyer confidence.

What surfaces should I sanitize on the farm?

- Surfaces that directly touch the produce. Harvest bins, containers, packing belts, brushes, scales, sorting tables, and workers hands all directly touch produce and has to be cleaned and sanitized.
- Surfaces that do not directly touch produce but are close and can often contact surfaces that touch produce. These include workers hands, outer portions of conveyers, and containers.
- Floors and other environmental surfaces inside the packing shed. These surfaces can harbor microbes and animal pests and have to be cleaned and sanitize.
- Surfaces around the packing shed may attract and harbor animal pests and harbor microbes that can be tracked into the packing shed on peoples feet, especially if there are cull piles, weeds or manure piles near by.

You can not sanitize a dirty surface!

Clean the surface first. **Cleaning** is the process of physically removing dirt, hair, skin, plant debris or microorganism from a surface. Cleaning does not kill microbes.

Sanitize after cleaning. **Sanitation** is use of a chemical, called sanitizer or disinfectant, to kill the microbes remaining on the surface. Sanitizing chemicals are often called antimicrobial pesticides. Similar to water, you can not sanitize a dirty surface.

Do I have to document cleaning and sanitation practices?

Yes. Similar to records kept for sanitizing water, records should be kept of how and when surfaces are cleaned and sanitized.



Figure 21. Examples of surfaces that should be sanitized and sanitizer installation

Best practices for cleaning and sanitation

1. Pre-rinse
2. Wash/clean
3. Rinse
4. Sanitize (Rinse*)
5. Record practices

CLEANING AND SANITIZING AND FRESH PRODUCE SAFETY

What materials are the most difficult to clean?

Some types of materials are harder to clean and sanitize than others. For example, porous materials such as wood, plaster, and cardboard are more difficult to clean and sanitize than non-porous materials. Examples of non-porous materials include glass, stainless steel, metal, or smooth plastic.



Figure 22. Examples of surfaces that should be sanitized

SOIL AMENDMENTS AND FRESH PRODUCE SAFETY

Why are soil amendments important when considering produce safety?

A soil amendment is any organic (i.e. manure) or inorganic (i.e. chemical fertilizer) material that is added to the soil to increase soil fertility, improve soil structure and water retention capabilities, and increase the number of good microorganisms. Soil amendments can be a food safety concern because they can contain pathogens or chemical that can cause illness in humans and can contaminate produce when introduced into the production system. Organic soil amendments can also be attractants of rodents and wildlife, which can damage the crop or contaminate the crop with their poop.

Organic soil amendments include manure, sewage sludge (human waste), worm castings (vermiculture), plant material, and fish, bone, feather or bone meal. Organic amendments can be raw, aged, or composted. Organic amendments can also be brewed to make a tea.

Inorganic soil amendments, also called fertilizers, come in many forms. Examples of inorganic fertilizers include ammonium nitrate, potassium nitrate, calcium nitrate and urea.

What level of risk are soil amendments for contamination of my produce?

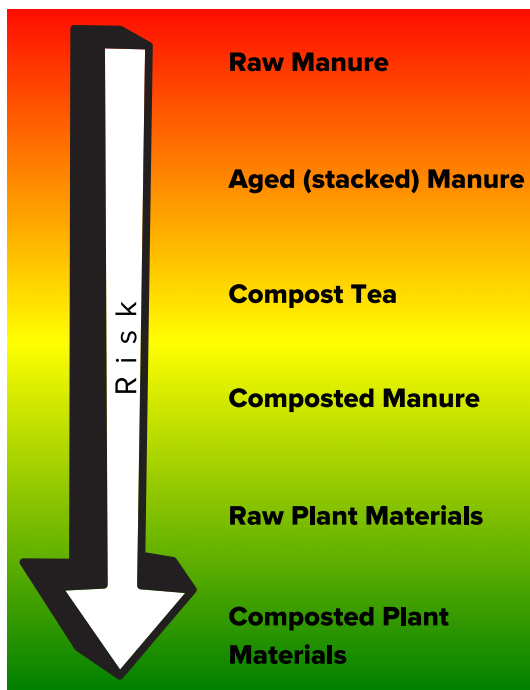


Figure 23. Levels of risk from soil amendments

The level of the food safety risk for a soil amendment depends on these factors:

- **Type of amendment** (organic or inorganic)
- **How it is treated** (not treated or raw, aged, composted, brewed)
- **How it is applied** (sprayed, spread, side dressed, incorporated)
- **When it is applied** (before planting, at-planting, during production, after harvest)

Non-manure based soil amendments such as meals (i.e. bone, blood, feather, fish) should be processed to kill pathogens. If the meal is not processed it must be considered an non-treated soil amendment.



SOIL AMENDMENTS AND FRESH PRODUCE SAFETY

What are the best practices for applying amendments to ensure my produce does not become contaminated?

Amendments with manure can contain pathogens and may contaminate produce if it is not properly treated or stored or if it is applied during the growing season. **If you don't know if the manure is raw, aged, or composted it should be considered raw manure.**

Best Practices for Raw or Aged Manure

Practices that prevent cross-contamination of raw or aged manure with the crop, fields, equipment, and water sources include:

- Manure covered with a tarp or physical structure.
- Manure stored in a closed structure with a non-permeable floor (i.e. cement).
- Manure stored away from water sources and farm equipment.
- Not using the same equipment to apply manure that is used during the growing season or to transport produce.
- Apply manure before the growing season starts.
- Incorporate manure into the soil within 72 hours of applying to the soil.



Figure 24. Raw dairy manure stored in a enclosed structure with a cement floor.

Application times for raw manure are based on recommendations from the National Organic Program (NOP), which considers the time frame between application and harvest.

Criteria	Example Crops	Days Before Harvest
Edible portion likely to contact manure	Root crops Leafy greens Strawberries	120
Edible portion NOT likely to contact manure	Pepper/tomato Tree fruit Cane berries	90



Figure 25. Raw manure stored too close to a water source.

SOIL AMENDMENTS AND FRESH PRODUCE SAFETY

Composting animal manure can reduce human pathogens in manure and greatly reduce the risk of cross-contamination of fruit and vegetables. Properly managed compost should reach an **internal temperature between 131 °F and 170 °F**. The composting process also kills some plant pathogens and weed seeds.

The composting process occurs in three phases:

Phase 1 (mesophilic phase). During this phase the organic material begins to breakdown and the temperature of the compost rises quickly.

Phase 2 (thermophilic phase). During this phase the organic material continues to break down and **pathogens and weed seeds are killed** by the high temperatures.

Phase 3 (curing phase). During this phase the remaining organic material is degraded and the temperature begins to go down.

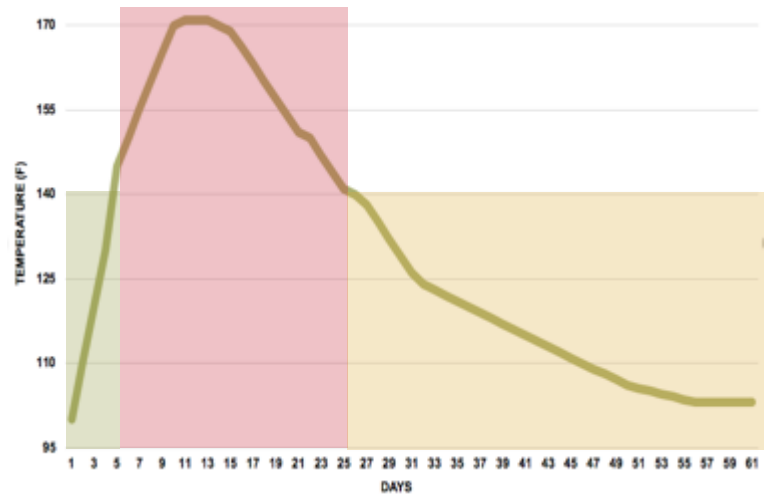


Fig 26. Phases of composting

- For static systems the temperature must be maintained for 3 days and turned 3 to 5 times.
- For windrow systems the temperature must be maintained for 15 days and the piles turned a minimum of 5 times.
- For both systems the compost must be cured (allowed to cool slowly) for a minimum of 45 days.



Fig 27. Static composting system. Temperatures must reach 131 °F for 3 days and the piles must be turned 3-5 times.



Fig 28. Windrow composting system at the OARDC. Temperatures must reach 131 °F for 15 days and the piles must be turned 5 times or more.

SOIL AMENDMENTS AND FRESH PRODUCE SAFETY

Best Practices for Composted Manure

It is very important that compost be stored and handled using practices that will prevent the compost from becoming contaminated with pathogens (and weed seeds). Safe storage and handling practices for compost include:

- Ideally, compost should be applied immediately following the curing process.
- If storing compost it should be put in a covered structure with a non-permeable floor (i.e. cement).
- Manure or plant material should not be added to the composted material.
- Equipment used to handle or apply raw manure should be cleaned and sanitized before it is used to handle or apply compost.



Should I test my compost for pathogens?

Unless you are preparing your own compost, testing for pathogens is not necessary since the company from which you purchased the compost will have tested it for fecal coliforms and *Salmonella*. Certified compost will come with a Seal of Testing Assurance logo on the certificate or product bag. If you make your own compost you should have it tested before applying it to your field. Labs that test soil will also test compost.

Best Practices for Compost Tea

Compost teas are used as soil amendments and foliar fertilizers. Teas are made by steeping (brewing) compost in water with or without the addition of oxygen. Oxygen can be added to the tea by injecting air into the mixture for 12 to 24 hours. Compost used to make tea should be properly prepared. Aged or raw manure should not be used to make teas.

- Only use potable water to make compost teas.
- The addition of additives such as molasses or yeast is not recommended as they can promote the growth of pathogens.
- Compost tea should be **used immediately after it is prepared** to prevent the growth of pathogens.

Should I keep records of how and when I apply soil amendments?

Yes. Recordkeeping is important for all soil amendment applications. Document what, where, when, how, and how much was applied. For compost, the composting process, including monitoring time, temperatures, and turnings should also be documented. If you purchase your compost this information is available from the company that you purchased the compost from.

Example of Compost Records

 OEFFA
41 Cleveland Rd Columbus, Ohio 43224
Phone: (614) 262-2022 • Fax: (614) 421-2017 • E-mail: organic@oeffa.org

COMPOST PRODUCTION RECORD
Use this form to record on-farm compost production practices.

Year: _____ Name/Farm Name: _____
Compost Pile, Windrow, or Cask ID: _____ Date Harvested: _____
Compost Production Method: Windrow Trench Aerated Pile In-Vessel
 Other (specify): _____
Feedstocks/Materials used (including inoculants): _____
Enhanced C:N Ratio: _____ Method of Temperature Reading: _____

DATE	TEMPERATURE	TURNED			INITIALS
		Yes	No	N/A	

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Fig 30. An example of compost records

WILDLIFE AND DOMESTIC ANIMALS AND FRESH PRODUCE SAFETY

Why is it important to consider wildlife and domestic animals when considering produce safety?

Domesticated animals and wildlife are a food safety concern because pathogens can be present in their poop and they can contaminate fields, crops and water sources as they move around the farm. Keeping animals and wildlife off the farm at all times is not possible but there are practices that can be put into place to limit animal and wildlife intrusions and reduce the risk of produce contamination.

What are the best practices for non-working domestic work animals on the farm?

Non-working domesticated animals such as cats and dogs, rabbits and livestock should not be allowed in fields during the growing season nor in any area on the farm where produce is handled. This includes wagons or other modes of transportation used to move or store produce. Livestock and chickens should be confined in pens, away from the production fields and irrigation water sources.



Fig 31. Examples of animal activities near water sources and packing sheds

How can I limit wildlife intrusions on the farm and in the packing shed?

While it is difficult to keep wild animals off the farm it is important to try to limit their access to fields during the growing season and to water sources, storage rooms, and packing sheds. There are several ways that animals can be deterred from entering the field, water sources or packing sheds including:

- Fencing around the field or water source.
- Noise makers such as cannons and bird sounds (i.e. predator sounds or distress calls).
- Decoys placed in packing sheds such as plastic owls and rubber snakes.
- Decoys in the fields (i.e. scarecrows) and water sources (i.e. plastic white swans to keep geese out).
- Netting on structures to prevent birds from nesting in the rafters.

WILDLIFE AND DOMESTIC ANIMALS AND FRESH PRODUCE SAFETY



- Fishing line strung across open water to deter birds from landing on or by the water.
- Removing culls and plant debris from the field to deter rodents and small animals from nesting in the field or packing shed.
- Maintenance of irrigation equipment to prevent leaks that can cause water to pool in the field and attract wild animals.
- Rodent traps around buildings and near entrances. Cats should not be used to control rodent populations in the packing shed.

What are the best practices for using domestic work animals on the farm?

Horses are an important part of fruit and vegetable production. Horses are used to assist with ploughing, planting, weeding, spraying, harvesting, and transport. Droppings (poop) from horses can contaminate produce, equipment or the handler. The following practices can reduce the potential for contamination of produce by horses.

- Plant harvest lanes with grass or a cover crop to provide a walk-way for the horses. Harvest lanes should be at least 5 ft from the crop.
- Do not cultivate or apply pesticides with horses within 14 days of harvest.
- Horse poop dropped during harvest should be scooped up immediately and disposed of by the driver. The poop can be buried away from the field or put into a bucket with a lid and removed from the field or drive lane.
- The person driving or handling the horses should have no contact with the produce being harvested.



Figure 32. Examples of areas that provide nesting and water sources for wildlife



Figure 33. Harvest lanes provide a walk-way for the horses and reduce the risk of crop contamination with droppings.

WILDLIFE AND DOMESTIC ANIMALS AND FRESH PRODUCE SAFETY

What do I do if my produce or water source comes into contact with animals or animal poop?

Produce that has come into contact with or close to animal poop should not be harvested. Workers should monitor the fields for animal droppings and place flags around the contaminated area so that workers know not to harvest any produce from that area. This area is referred to as a “no-pick buffer” zone.

The size of the buffer zone will depend on the amount and size of the droppings. Rain can contribute to the spread of animal droppings and should also be considered when determining the size of the buffer zone. For example, a larger buffer zone may be needed if it recently rained.

Surface water that is used for irrigation should be treated if animals are in or near the water. Water treatments are discussed in the *Agricultural Water and Fresh Produce* section of this guide.

Should I keep records of animal or wildlife intrusions?

It is a good idea to record what you see while you are monitoring your fields and water sources. Any practices that were done to prevent animals from entering the field in the future should also be recorded. In the case of no-pick buffer zones the size of the buffer zone and the date the buffer zone was started should be recorded.

Field Monitoring Date	What was observed?	What was done to correct the problem?
7/9/2019	Hole in deer fence around apple orchard.	Hole repaired on 7/11/2019
8/12/2019	Bird droppings on staked tomatoes.	Fruit with droppings removed and tomato plants beside plant with bird droppings flagged on 8/12/2019



Figure 33. Examples of animal activities in the field

PEOPLE AND FRESH PRODUCE SAFETY

Why are people important when considering produce safety?

People on the farm include workers, family, contractors and visitors. People can carry pathogens on their hands, in their mouth and nose and on clothes. These pathogens can then be spread directly to the produce when workers touch the produce during picking and packing or by sneezing or coughing on the produce. Workers can also spread pathogens to the tools and equipment they touch, which can then contaminate produce when they are used during production or for harvesting, processing or packing.

Everyone who comes onto the farm, including food safety inspectors, should be told what the food safety policy is for the farm.

Who should be trained on best worker health and hygiene practices?

ALL workers, including family members, should be trained on best worker health and hygiene practices prior to the start of the growing season. Workers should be trained on farm food safety policies including good agricultural practices and protocols (also called standard operating procedures or SOPs), best hygiene practices, and sick and injury policies.

Best Worker Hygiene Practices

Good personal hygiene practices are probably the most important thing that people can do to prevent produce from becoming contaminated with pathogens. Wearing clean clothing and shoes, handwashing and eating, drinking, and smoking in designated areas will decrease the risk of contamination.

Handwashing Guidelines

Handwashing is the most important thing that someone can do to stop the spread of pathogens. Hands should be washed frequently and before and after work, eating or drinking, smoking, using the toilet, touching your face or hair and whenever you handle produce. The use of hand sanitizers without first washing your hands is not effective at killing any pathogens that are on your hands. Hand sanitizers are NOT a substitute for soap and water. The following steps should be used to wash your hands:

1. Turn on water and wet hands and wrists.
2. Apply a generous amount of soap to hands.
3. Scrub palms, back of hands, cuticles, between all fingers, and wrists for a minimum of 20 seconds.
4. Rinse soap off of hands with running water.
5. Dry hands with a single use paper towel.
6. Turn off water with paper towel.
7. Place paper towel in trash bin.

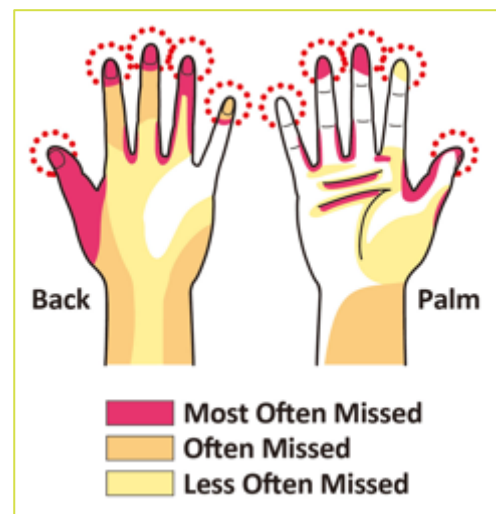


Figure 34. Areas on hands that are most often missed during hand washing

PEOPLE AND FRESH PRODUCE SAFETY

Handwashing stations should be available to all people on the farm and must be available in or beside a restroom facility. Instructions on how to properly wash hands should be posted by the handwashing station. Every handwashing station must have:

- potable running water
- soap
- single use paper towels
- catch basin for the dirty water
- trash bin.

Waste water (grey water) should be dumped in a grassy or graveled area AWAY from the handwashing area or field. It can also be hauled away and dumped down a drain.



Handwashing station with all the required supplies.

Toilet Facility Guidelines

Permanent (house, office etc.) or portable toilets are acceptable. Portable toilets should be placed away from the field in case of tipping or spilling. Toilets must be available to all people on the farm and must be within a 10 minute walk of any area where people are working, including fields. One toilet must be available for 1 to 20 workers. Each toilet facility must have a handwashing station. Toilet and handwashing supplies must be filled regularly and maintained in a clean and sanitary way.

ALL workers must be trained on best toilet usage practices. Posting signs in or near the toilet on best toilet usage practices is recommended. The following practices are NOT permitted:

- Peeing and pooping in or near a production field.
- Standing or squatting on the toilet seat.
- Placing soiled tissue in the trash bin. All used tissue must be put in the toilet.



Figure 35. Poster communicating appropriate use of toilet

SCENARIO

Workers are getting ready to harvest spinach so the owner provided a portable toilet for the workers. The portable toilet includes a handwashing station so that workers can wash their hands after they use the toilet or after they harvest the crop. Based on the image to the left what could be changed to reduce potential food safety risks?

Solution: In this scenario the portable toilet was placed too close to the field. The portable toilet should be moved so that any accidental spillage will not contaminate the field. Posting a sign on proper handwashing technique and directions on where to dispose of used paper towels is also recommended.



Figure 36. Portable toilet located near the field

PEOPLE AND FRESH PRODUCE SAFETY

Worker Clothing Guidelines

When working in the field or packing shed the following practices should be used:

- Do not have bare feet.
- Wear clean clothes and boots/shoes.
- Clothing and boots/shoes worn in the barn where livestock or work animals are held or that come into contact with animal manure should be cleaned with soap and water before going into the produce field or packing shed.
- Clean aprons and gloves should be worn in the packing shed.

What records should be kept to document worker health and hygiene practices?

Protocols for toilet and handwashing stations should be written down. Keep protocols simple and only include practices that you are doing (see examples).

Example 1: Toilet facilities are cleaned twice a day.

Example 2: Toilet paper, soap, and paper towels are restocked as needed.

Example 3: Water in the catch basin at all handwashing stations is disposed of when the basins are approximately half full. Dirty water is poured over the gravel in the drive way next to the house.



Figure 37. Do not have bare feet in the field. Clean boots or shoes should always be worn in the field and packing shed.

Records of when (day and time) the facilities were cleaned or when the supplies were restocked, who did the work, and what was done should be kept and filed in a location that can be easily accessed at any time. If a company is hired to do the work, a copy of an itemized invoice can serve as the record.

Date	Time	Facility is clean	Supplies replenished	Notes	Signature
3/10/19	7:30 am	✓	✓	No problems	John Miller
3/10/19	4:25 pm	✓	✓	Added soap to dispenser	John Miller
3/11/19	7:45 am	✓	✓	Emptied trash bin, replaced bag	Amy Miller

PEOPLE AND FRESH PRODUCE SAFETY

Why is it important to have a policy in place if people on the farm are sick or injured?

Having a sick policy is important for food safety but also for worker wellness. Most illnesses can be passed from person to person (referred to as a contagious disease) just by being near someone who is sick or touching something that a sick person previously touched. The common cold virus, flu virus, and Norovirus virus are good examples of contagious pathogens. Foodborne illnesses are also contagious. Having a policy in place for anyone who is sick will protect others on the farm from getting sick and will also prevent contamination of the produce.

Symptoms of illnesses:

- Coughing or sneezing
- Runny nose
- Red eyes or nose
- Sweating
- Pale face
- Rashes
- Diarrhea
- Vomiting

If you know that a worker or family member (including children) is sick or they are doing things that suggest they may be sick, such as going to the toilet frequently or taking more breaks than usual, action should be taken to prevent the spread of illness or contamination of produce. Workers or family members should be:

- given time off to rest and get better OR
- assigned to a job that doesn't involve handling produce or equipment that will come into contact with produce or packing materials, or requires direct contact with other people on the farm

The illness and what was done to prevent the spread of the illness to other people and/or contamination of the produce should be documented.



Figure 38. Always check that the supplies in the first aid kit have not expired.

Injuries often occur on the farm and should be handled quickly and depending on the seriousness of the injury, by a doctor.

First aid kits should be kept in any areas where people will be working or taking a break, including the packing shed, break room or house. First aid kits should also be kept in the buggy or on the wagon. Supplies in the first aid kit should be replaced **BEFORE** the expiration date listed on the kit.

If a worker has a minor injury such as an open cut or wound it should be cleaned and covered **before** starting to work with produce (in the field or packing shed or at a farm stand).



PEOPLE AND FRESH PRODUCE SAFETY



Figure 39. Minor injuries should be cleaned and covered. Boots should always be worn in the field.

If a worker is injured while working in a field with growing fruit or vegetables they should **stop** what they are doing immediately, let someone know they are injured, and first aid should be started or emergency care should be sought. The following steps should then be taken to prevent contamination of the produce:

1. Mark the area where the injury occurred with flags.
2. Check the plants and area around the plants to make sure these areas did not come into contact with blood or other body fluids.
3. Remove all contaminated produce from the field and destroy.
4. Tell other workers not to go into the flagged area or harvest from within the flagged area.
5. Document the accident and what was done to fix the problem.

Date	Worker name	Injury or illness	Action taken	Date returned to work	Signature
5/10/19	Jane Smith	Upset stomach	Given the day off	5/12/19	<i>John Miller</i>
6/5/19	Joseph Miller	Cut hand on wheel of harvest wagon	<ul style="list-style-type: none"> • Harvest stopped • Got help from J. Miller • Cut cleaned and wrapped • Wagon wheel inspected-no blood 	Same day	<i>John Miller</i>

Best Practices for Children on the Farm

Including children in activities on the family farm is a vital part of the tradition of farming. Children may be working, watching other family members work to learn a farming practice, or just having fun and playing. Finding children safe jobs to do on the farm is very important. It is also important to keep children wearing diapers or sick children out of the field or packing sheds to prevent contamination of the produce with baby poop, pee or germs.

- Designate an area beside the field, on a wagon, or in a buggy to change diapers or for a sick child to rest or play.
- Dirty diapers, tissues or soiled clothing should be placed in a covered container.
- Wash your hands after changing the diaper or after holding or comforting a sick child.



Figure 40. Children should wear shoes in the field.

STORAGE AND TRANSPORTATION AND FRESH PRODUCE SAFETY

Why is it important to consider storage practices and transportation when considering fresh produce safety?

Produce storage and transportation are the final stages of production before the produce reaches the buyer so it is very important to protect the produce from becoming contaminated at these stages. Best practices for storing and transporting should be followed to ensure that the final product is safe to eat.

Best Practices for Storing Produce

- Produce should not be stored in re-usable containers unless they are properly cleaned and sanitized.
- Produce should be stored in a cool (40 °F or below) and dry location within two hours of harvesting. The temperature of the storage rooms should be checked regularly using a thermometer. Produce in storage should be off of the ground and away from walls.
- If ice blocks are used to cool a room, the room should have cement floors with drainage. Storage containers made out of plastic or containers with a waxy coating are recommended for rooms using ice blocks.



Best Practices for Transporting Produce

- Before produce is loaded onto any vehicle it should be inspected. All vehicles used to transport fresh produce should be clean with no signs of animal manure including horse manure, and bird or rodent droppings.
- Wagons or trailers used to transport produce should not be used to move compost or raw animal manure, livestock, or pesticides or other chemicals.
- If motorized vehicles are used they should also be inspected for broken plastic or glass and oil or gas leaks.
- If refrigerated vehicles are used the temperature should be monitored and maintained at 40 °F or below. These vehicles should also be inspected for dripping water.
- Produce transported on wagons or trailers by horses should be covered.



Figure 42. Produce transported on wagons or trailers by horses should be covered.

TRACEABILITY AND RECALLS AND FRESH PRODUCE SAFETY

Why is it important to be able to trace your crop?

Traceability means that if ever there was a problem with the crop and you had to recall it, you would be able to trace it one step forward and one step back. You should know who is the buyer of your product, unless you sold it directly to the consumer. You also should know who you got your inputs from, in case you have to recall a crop and trace back the problem to your supplier.

If you have traceability program in place it can help protect you in a case of an outbreak that did not originate at your farm. Also, if you have traceability program in place, and your product is properly labelled, your product may remain in the market even if similar products have been recalled due to a food safety issue that is in your general area but not specified.

Traceability requirements can be met simply with labelling your crop with information that include farm name and harvest date and numbers such as lot number and any references that will allow you to trace your product back

Best practices for traceability

To be able conduct **one step backward** traceback you should keep records on following:

1. What was harvested
2. Who harvested the product
3. Field where the product was grown
4. Harvest date
5. Packing date
6. Sale date
7. Buyer name

Best practices for traceability

To be able conduct **one step forward** traceback you should keep records on following:

1. What was sold
2. How much was sold
3. Sale date
4. Buyer's name and location

TRACEABILITY AND RECALLS AND FRESH PRODUCE SAFETY

Do I have to conduct a mock recall?

If you are or wish to be GAP certified, you have to conduct and document a mock recall. The mock recall will demonstrate how well you have set up your traceability.

Conducting a mock recall involves calling your buyers and asking them for certain lot numbers. You will have to contact the buyers ahead of time to let them know that you are planning the mock recall, so that they are not surprised by it.

During the recall you will have to do following:

1. Provide buyers with all information that you have about the product involved in recall
2. Ask them how much they have remaining and how much they have sold or destroyed.
3. Record all the information



Figure 43. Examples of traceability tags in produce auctions.



FARM STANDS AND U-PICKS AND FRESH PRODUCE SAFETY

Why is it important to consider produce safety at farm stands and U-pick operations?

Customers picking their own fruit or vegetables on your farm, or selecting produce from a farm stand can carry and spread pathogens. In addition, customers may bring their pets with them resulting in additional food safety risks.

How can I reduce the potential for contamination of produce at my farm stand or U-pick operation?

It is very difficult to control customers activities while they are on your farm, especially at farm stands, which are often unattended. Several things can be done to promote food safety at farm stands and U-pick operations.

Best Practices for U-pick Operations

- Provide handwashing stations and encourage handwashing before and after picking.
- Provide clean restrooms with handwashing stations.
- Provide trash bins.
- Do not allow domestic animals in the fields or other recreational areas. Special accommodations should be made for service animals.
- Customers should be provided clean and sanitized picking containers.
- Post signs indicating your visitor and food safety policies.

Best Practices for Farm Stands

- Provide a handwashing station and encourage handwashing before and after selecting product.
- Farm stand attendants should wash their hands after exchanging money and before handling produce.
- Provide a trash bin.
- Customers should be provided clean and sanitized containers or single use containers.
- Do not allow domestic animals at the farm stand. Special accommodations should be made for service animals.
- Post signs indicating your visitor and food safety policies, including a policy for produce that is dropped on the ground.



Figure 44. Farm stand examples. Produce should not be stored on the ground

Additional information of best food safety practices for farm stands and U-pick operations is provided in the GAPs materials.

PRODUCE AUCTIONS AND FRESH PRODUCE SAFETY

Produce auctions in Ohio take fresh produce safety very seriously. Most auctions require sellers to attend a Good Agricultural Practices Training every year. Many auctions also have a food safety plan for the handling of produce once it arrives at the auction. Growers should ask the auction manager what the food safety guidelines are for the auction. Some auctions will post their guidelines in the office or on community boards in the produce display or selling area. Auction will also have a written recall plan on hand.

Produce auctions in Ohio do not own, wash, pack, store, cool or transport produce that arrives at the auction. Growers should consider the auction as an extension of their farm and use best handling practices while at the auction.

Best practices for Handling Produce at the Auction

- Wear cleaning clothing and boots to the auction.
- Wash your hands before unloading produce.
- Throw out any produce that falls out of a box or any boxes that fall onto the ground.
- Display produce on a clean cart or table.
- Do not touch the produce or allow buyers or other people at the auction to touch the produce.
- Sick workers and family members should not transport produce to the auction or display produce at the auction.

Produce auctions have records of what each grower sells and who buys it. Growers should keep a record of their sales and any other documentation they receive from the auction. These records should be kept in the growers food safety plan.

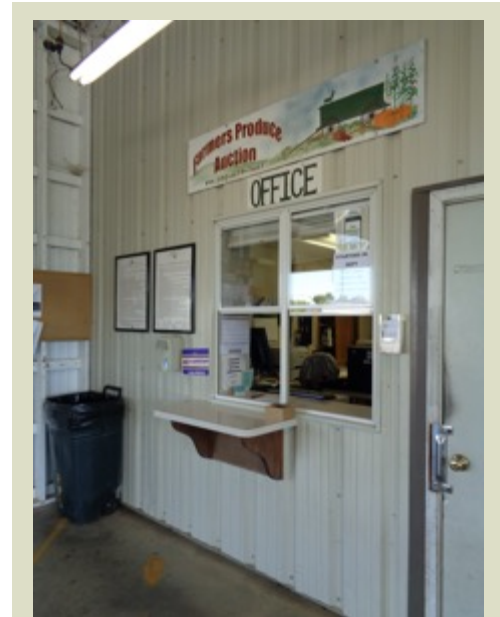


Figure 45. Auction food safety and recall plans are often posted in or by the office



Figure 46. Produce should be displayed on carts, skids or tables, never on the floor.

FRESH PRODUCE SAFETY RESOURCES

Who can I contact to get more information on GAPs and fresh produce safety?

The Ohio State University Fruit and Vegetable Safety Team Extension Specialists and Extension Educators can be contacted to get more information on GAPs and fresh produce safety. Contact information for team members are in the GAPs training materials provided during the GAPs training and are also available at your nearest county Extension office.

Where can I find more resources on fresh produce safety?

Factsheets on various fresh produce safety topics (such as the Fresh Produce Safety Rule, Flooding) are included in the GAPs training materials provided during the GAPs training. Additional materials are available at county Extension offices.

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DEFINITIONS

Aged manure. Manure that has been sitting in a pile for 6 months to a year without any type of treatment.

Audit. An official inspection of a farm's produce safety policies and procedures.

Biological contaminant. A living thing in food or water that can make a person sick if they eat the food or drink the water. Examples included viruses, bacteria, and fungi.

Contagious. Spread of disease from one person to another.

Chemical contaminant. A chemical in food or water that can make a person sick if they eat the food or drink the water. Examples of chemical contaminants include fungicides, insecticides, herbicides, oil, gas, grease, and cleaning products.

Cleaning. The action of removing dirt or debris using soap and clean water. Also called washing.

Cull. Fruit or vegetable that is not marketable.

Curing. The process of reducing the temperature of compost to allow for the completion of the decomposing process. Usually requires 45 days.

Debris. Plant waste such as overgrown branches, stems or leaves, dead plant tissue, and dried or rotten fruit.

Decoy. Something that is used to deter animals.

Edible. Something that can be eaten.

Farm food safety plan. A written document of on farm food safety policies, procedures, and risk management practices. It also includes records of completion of practices.

Flood water. Water or run-off from surface waters such as rivers, lakes, or streams that overflow and run into fields.

Food Safety Officer. Person who is responsible for writing and revising the farm food safety plan and for ensuring that people on the farm are trained in doing the recommended practices.

Microbe. A very small living thing that can not be seen with the naked eye. Also called a microorganism or germ.

Microbial contaminant. A pathogen that can be in food or water and can make a person sick if they eat the food or drink the water. Examples of microbial contaminants are bacteria, viruses, and parasites.

Microorganism. A very small living thing that can not be seen with the naked eye such as a bacterium and virus. Also called a microbe or germ.

Mesophilic. Growth and survival of microorganisms such as bacteria at moderate temperatures (not too high and not too low). Growth at approximately 57 to 70 F.

No-pick buffer zone. Area surrounding animal droppings that is not harvested.

Pathogen. A microorganism that causes disease in humans, animals or plants. Examples included viruses, bacteria, and fungi. Also called a germ.

pH. A number indicating the amount of acid or base in a solution.

Physical contaminant. A foreign object in food or water. Examples include metal, plastic, and hair.

Potable. Safe to drink.



DEFINITIONS

Recall. To bring back to the place of origin.

Sanitation. The action of killing or inactivating germs using a chemical or other substance (sanitizer).

Sanitizer. A chemical or substance that kills or inactivates germs on surfaces or in water.

Soil amendment. A soil amendment is any organic (i.e. manure) or inorganic (i.e. chemical fertilizer) material that is added to the soil to improve the soils physical characteristics such as water and nutrient holding capacity.

Standard. An acceptable level of quality.

Static composting. The process of making compost without turning the compost pile. Air circulation is required.

Thermophilic. Growth and survival of microorganisms such as bacteria at high temperatures. Growth at approximately 100 to 250 F.

Third party. A person or group indirectly associated with another group or organization.

Traceback. The process of tracking something back to its source.

Traceability. The ability to track or trace something.

USDA. United States Department of Agriculture.

Windrow composting. The process of making compost by forming rows and turning the piles to provide aeration.



ACKNOWLEDGMENTS

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IMAGES & FUNDING

Images

Unless otherwise noted the images in this guide were taken by members of The Ohio State University Fruit and Vegetable Safety Team and Extension Specialists or from the public domain.

Funding

Funding to support the research and development of this guide was from the USDA-National Institute of Food & Agriculture Food Safety Outreach Program Award No. GRT00048506.

