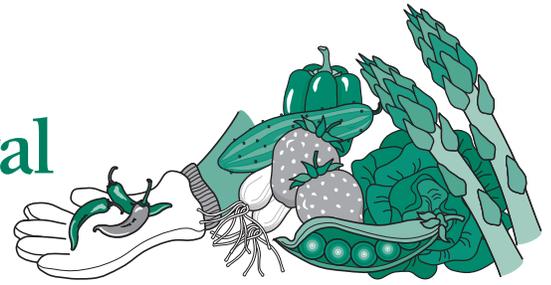
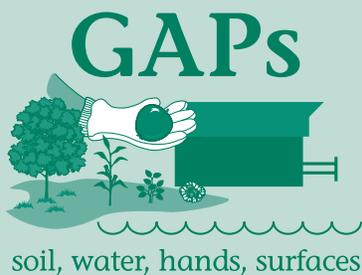


# On-farm Food Safety: Guide to Good Agricultural Practices (GAPs)



**Safe produce begins with the production and handling practices on the farm. Produce that is grown and sold with little biological contamination is less likely to result in health hazards caused by poor handling during later preparation stages. Producers and their employees have the critical job of minimizing product contamination by learning about potential sources of contamination and by using Good Agricultural Practices (GAPs).**



Food safety concerns are increasing as once unheard of illness-causing microorganisms become more prevalent and as products previously considered safe cause an increasing number of illnesses each year. Produce, recently thought of as a safe product, has been identified as a cause of major foodborne illness outbreaks in recent years.

Illnesses are primarily caused by bacteria, viruses, parasites, and fungi. These microorganisms, often referred to as pathogens or biological hazards, also are associated with ground beef, poultry, eggs, and seafood. Cooking is a common method of easily killing most pathogens in those foods. However, fresh produce is often consumed raw.

In addition, produce is exposed to naturally occurring, biological hazards in the soil, water, and air. The potential risk for contamination is increased by production practices using manure for fertilizer and human handling of products.

Developing a safety plan helps food producers manage the safety component of their operation by organizing the action steps identified as key to reducing those risks. Documenting of current practices and any changes over time allows for monitoring the safety of the food product.

This publication provides some background about GAPs and how they relate to the development of a food safety plan. Resources for other produce production GAPs and food safety information also are provided.

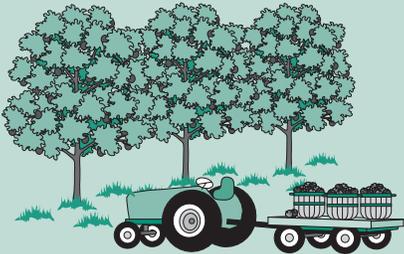
## **Good Agricultural Practices (GAPs)**

Good Agricultural Practices, more commonly referred to as GAPs, are a set of recommendations that can help improve the quality and safety of the produce grown. These general guidelines can be adapted and/or incorporated into any production system. GAPs focus on four primary components of production and processing: soil, water, hands, and surfaces.

**Soil**—Maintaining “clean soil” reduces the risk of contaminating produce with illness-causing microorganisms found in soil during stages of growth and harvesting. Illness-causing microbes always are present in the soil, but their populations and resulting risk of product contamination can be increased tremendously by improper manure management and application.

Although manure is a good form of fertilizer, all manure contains pathogens. Some pathogen levels in the soil will decrease over time due to competition from other bacteria in the soil or because of less-than-desirable conditions.

# GAPs improve the quality and safety of your produce



The following steps are recommended to minimize risks from manure.

- Incorporate manure or use cover mulch after application to reduce the risk of physical contamination of product from rain or irrigation splash.
- Reduce microbes through high temperature, aerobic composting.
- Apply manure to cover crops in the fall.
- Apply manure in the spring two weeks before planting and preferably on grain crops or perennials.
- Allow a minimum of 120 days between manure application and fruit or vegetable harvest.

**Water**—Water used for irrigation, cooling, processing, or for cleaning equipment and facilities should be free of microbial contaminants. Water quality and safety can be dependent on the water source. Municipal water usually has the best quality because of previous testing and safety requirements. Ground or well water will have fewer pathogens than surface water (such as ponds, streams, or rivers) because there is less chance of contamination.

Regularly testing water sources provides documentation that the water is not a source of contamination. The frequency of water testing is dependent on the type of water source and the time of year. Water quality becomes more important as harvest approaches and water contact with the product occurs or increases.

The method and timing of water use also has an effect on its contribution to product contamination. Using drip irrigation instead of sprinklers helps prevent contamination from soil splash and from product contact.

**Hands**—Having “clean hands” refers to the human element involved in food safety during production and processing. The food producer and handler each have an important role in ensuring the safety and quality of foods grown and processed. Poor hygiene and health, unclean clothing or shoes, or unsafe practices on the part of workers can threaten food safety. Providing clean and appropriately stocked restroom and handwashing facilities to field and processing employees helps prevent product contamination. A lack of restrooms results in unnecessary product contaminants in the field. The publication “On-farm Food Safety: Guide to Food Handling” (PM 1974b) provides more details about managing the human impact on product quality and safety.

**Surfaces**—Produce items will have physical contact with many surfaces during harvest and processing. These may include harvest equipment and containers, transport bins, knives and other utensils, sorting and packaging tables, product packaging, and storage areas. Basic GAPs to help ensure clean surfaces include the following:

- Keep potential contaminants, such as soil and manure, out of the processing area or facility.
- Cull soiled produce in the field and damaged produce prior to processing.
- Use plastic containers and totes that are suitable for routine and efficient cleaning and sanitizing.
- Clean and sanitize equipment and facilities daily.
- Consider including a sanitizer in produce rinse water to reduce bacterial contamination.
- Control animal contamination sources, including pets, wildlife, birds, insects, and rodents.
- Develop guidelines for product storage and transportation.

Management steps that are taken to improve product quality can also improve product safety. Product spoilage also is caused by bacteria and molds, so whatever practices are implemented to control product loss from spoilage also will control pathogens. Refer to the publication “On-farm Food Safety: Guide to Cleaning and Sanitizing” (PM 1974c) for additional information about appropriate cleaning and sanitizing procedures.

### Food Safety Plan

The food safety plan developed for your operation is a roadmap for actively reducing risks that may jeopardize product safety. The plan also includes checkpoints and monitoring mechanisms to verify that the steps taken or changes made actually help maintain or improve product quality and safety. A comprehensive food safety plan describes procedures for all aspects of production and processing, including manure management; water management; product handling; cleaning and sanitation; employee training; and crisis management.

**Developing a plan**—The best way to start developing a food safety plan is to review your current production practices.

1. Start by listing the steps from preparation for planting to post-packaging product handling.
2. During this assessment, **identify** areas where product quality and safety may be affected.
3. Identify how you can **measure** or **monitor** this risk. Various audit forms have been developed. Refer to the reference list at the end of this material for specific Internet addresses of these resources.

4. Once areas of potential product safety problems have been identified, the next step is to **modify** your practices to reduce or eliminate these risks. Consider modifications that will reduce risks and are economically feasible. Keep in mind the cost may be more than the initial monetary investment to make the change; it also can include time to implement, time to perform once implemented, recurring costs of new practices, and can affect efficiency.
5. While making modifications to reduce contamination risks, **document** all steps of the changes, including how practices were previously carried out, what the changes included, and how you will measure or monitor the potential risk. See the following scenario for an example.

#### Sample Food Safety Plan

**Steps 1-2.** While assessing your storage facility, you identify the cold storage temperature as a potential risk of promoting bacterial growth.

**Step 3.** Measuring and recording the temperature routinely is a way of monitoring this risk.

**Steps 4-5.** Start monitoring and recording temperatures. This is a modification that easily can be implemented with minimal expense and time commitment.

**Updating the food safety plan**—Having a food safety plan in place is a good first step, but just like a business or marketing plan, the food safety plan requires revisions and updates to stay current with your operation.

## A food safety plan documents your risk reduction efforts



The best time to give your food safety plan a thorough review is during the off season when you are preparing for your next growing season. Part of this review is looking at the monitoring or tracking records kept from the previous year. These documents can help identify areas needing improvement going into the next growing season.

As you make changes to your operation based on the previous year's experience, be sure to update your food safety plan. The plan then serves as a written guide or reference.

Changes to the plan, however, can and should be made anytime throughout the year. If something occurs during the season that causes changes in your operating practices, then change your food safety plan too.

#### Benefits of a Food Safety Plan

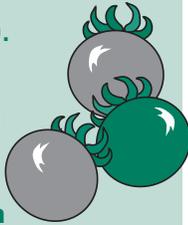
- Provides operational roadmap for food safety risk reduction
- Offers mechanism for monitoring effectiveness of changes to improve product safety and quality
- Provides structure through which assessment of an operation can occur
- Creates a documentation process to verify production and processing changes
- Serves as a reference for all employees during training and throughout the season

## Summary

**Producers and their employees have the critical job of minimizing product contamination by learning about potential sources of contamination and by using Good Agricultural Practices (GAPs).**

**After identifying the risks that may exist within a producer's specific operation, a series of action steps can be developed to measure, monitor, and, if necessary, modify procedures designed to reduce these risks.**

**By using a food safety plan that tracks and documents procedures, a producer has a series of records that demonstrates progress toward the reduction of risks for the operation.**



## References and Resources

More information about general produce food safety, GAPs, and food safety plans is available at the following Web sites.

**Local Foods: From Farm to Foodservice, Hotel, Restaurant, and Institution Management, Extension, Iowa State University**  
<http://www.extension.iastate.edu/hrim/localfoods>

**Foodborne Illness Education Information Center, USDA/FDA**  
<http://peaches.nal.usda.gov/foodborne/fbindex/Produce.asp>

**FoodSafe Program, University of California, Davis**  
<http://foodsafety.ucdavis.edu>

**Good Agricultural Practices, New England Extension Food Safety Consortium**  
<http://www.hort.uconn.edu/IPM/foodsafety/index.htm>

**Good Agricultural Practices, University of California**  
[http://groups.ucanr.org/UC\\_GAPs/](http://groups.ucanr.org/UC_GAPs/)

**Good Agricultural Practices Project, Cornell University**  
<http://www.gaps.cornell.edu>

**Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables, Center for Food Safety and Applied Nutrition (CFSAN), U.S. Food and Drug Administration**  
<http://vm.cfsan.fda.gov/~dms/prodguid.html>

**HACCP: Hazard Analysis Critical Control Point Information Center, Iowa State University Extension**  
<http://www.iowahaccp.iastate.edu/sections/farmfoodsafety.cfm?action=resources>

**ISU Extension publications-**  
<http://www.extension.iastate.edu/pubs>

**On-Farm Food Safety for Fruit and Vegetable Growers, Ministry of Agriculture and Food, Ontario, Canada**  
<http://www.gov.on.ca/OMAFRA/english/offsgrowers.htm>

**Postharvest Technology Research and Information Center, University of California, Davis**  
<http://postharvest.ucdavis.edu>

**Vegetable Research and Information Center, University of California Cooperative Extension**  
<http://vric.ucdavis.edu>

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