



Food Safety for Fruit and Vegetable Farms

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Food safety is important on every farm, and growers have a responsibility to minimize risks to produce food that is not only wholesome and nutritious, but also safe.

Why should fruit and vegetable growers be particularly concerned about food safety?

Most farmers take great pride in growing high-quality, nutritious fruits and vegetables and would never knowingly produce food that could harm their customers. And yet, foodborne illnesses that can be traced back to farms happen, and incidents increase each year.

According to the Centers for Disease Control and Prevention, one-third of all significant multistate outbreaks of foodborne illness in 2011 involved fresh produce. The human costs can be heartbreaking when people die or become

chronically ill. The cost to public health is great and deserves attention. The economic cost is enormous, with an estimated \$1.4 billion lost nationally per year from produce-related illnesses, not including the cost to industry or government. Everyone benefits when produce is grown that is nutritious *and* safe.

A Costly Reminder

One of the deadliest foodborne illness outbreaks in decades occurred in 2011 when 147 people were sickened and 33 died after an outbreak of listeriosis caused by *Listeria monocytogenes* in cantaloupe.

Investigations revealed that the pathogen was present in the packing facility and on washing and packing equipment. Experts believe poor sanitation in the packing facility and lack of precooling were key factors contributing to the outbreak. Armed with some knowledge and a commitment to food safety, growers can do a lot to prevent outbreaks like this in the future.

Human pathogens, harmful chemicals, or foreign objects can contaminate produce anywhere along the supply chain — from farm, to market, to the consumer's table. Thoroughly cooking produce kills pathogens, but consumers eat many fruits and vegetables without thorough cooking. That's why it is critical to prevent contamination.

Preventing contamination on the farm depends largely on farming and post-harvest practices, not farm size, distribution area, or revenue. Whether a farm is big or small; growing melons, tomatoes, or greens; in a greenhouse or in a field; poor farming and food handling practices can contaminate produce. Implementing good agricultural practices (GAPs) is the best way to protect your customers, your business, and the produce industry as a whole.

GAPs are farming practices that focus on preventing contamination of fruits and vegetables on the farm. Taking reasonable steps to prevent a problem in the first place often costs far less money and time and is more effective than trying to fix a problem after it arises. Just as farmers tailor crop production and pest management practices for their particular operations, farmers should tailor GAPs to the specifics of their farms.

The following pages highlight some GAPs growers can follow to reduce the risk of contaminating produce on the farm. Growers can prevent contamination at all stages of crop development: before planting, while the crop is growing, during harvest, and after harvest.

Are GAPs the Law?

Good agricultural practices (GAPs) are farming practices that aim to prevent fruit and vegetable contamination. Laws and regulations govern some GAPs. Others have not been codified and are meant to provide guidance, recommendations, or industry best practices.

The bottom line is that it is against the law to sell "adulterated" food. For fresh fruits and vegetables, adulterated basically means produce that is unhealthy due to contamination. Farms that adopt GAPs reduce their risk of producing adulterated food.

Before Planting

Follow these GAPs before planting produce to avoid contaminating the crop:

- Assess the likelihood that the produce will be thoroughly cooked before being eaten. If it will not be cooked, then preventing on-farm contamination from pathogens is especially important.
- Locate production sites uphill, upstream, and upwind from areas where manure is stored or animals are grazed or housed.
- Assess the potential of nearby feedlots, animal pastures, or livestock farms to contaminate your produce fields.
- Avoid fields that regularly flood or are exposed to excessive runoff.
- Store manure away from growing and handling areas, and store it in a manner that prevents runoff and wind drift.
- If you use manure or other animal products (such as blood meal, bone meal, feather meal) as soil amendments, reduce the contamination risk by following one or more of these practices:
 - Apply the soil amendment long before harvest, preferably when soils are warm (>50°F) and nonsaturated. We recommend applying untreated manure at least nine months before harvesting produce, ideally to a cover or agronomic crop. Specific audit or certification programs may require longer or shorter periods between application and harvest (for example, the USDA National Organic Program requires only 120 days for many crops).
 - Incorporate the amendment if possible.
 - Apply soil amendments so they don't contact the produce.
 - Compost the amendment before applying

it. Use a compost process that meets the USDA National Organic Program (NOP) compost standard or purchase compost from a supplier who provides documentation that their process meets the standard —more information about the NOP standard is available from the U.S. Government Printing Office website, see www.ecfr.gov/cgi-bin/text-idx?SID=a6d95fb8c0e78bef7e73bb10d83aca4&node=7:3.1.1.9.32.3.354.4&rng=div8.

- Treat amendments with heat, chemicals, or other means that reduce pathogens. Always retain documentation of such treatment.
- Record all soil amendment sources, application dates, and methods of composting or treatment.
- Ensure that animal holding areas and manure staging areas are far enough from wells to prevent contamination.
- Avoid locating wells in flood zones or downhill from other sources of contamination.
- Protect wells with grouting, sanitary caps, and intact casings.
- Inspect wells and water sources before each growing season to identify potential sources of contamination.
- Test water used for drinking and hand washing to make sure it meets drinking water standards — is potable. Keep records of tests and results.

During Production

Follow these GAPs while produce crops are growing to avoid contamination:

- Do not allow domestic, nonworking animals (pets, chickens, grazing livestock, etc.), to enter produce fields during growing or harvesting.

- Limit wild animal access to growing areas using reasonable, appropriate, and legal measures. Comanage to conserve natural resources *and* promote food safety.
- Do not apply manure or animal products during crop production unless properly composted or treated (see above).
- If you use well water for irrigation or sprays, test it for generic *E. coli* before the growing season, and continue to test it quarterly. Keep records of tests and results.
- If you use surface water for irrigation or sprays, use drip or furrow irrigation to minimize contact with produce. Avoid using surface water for overhead irrigation or sprays unless it is documented to have a low risk of contamination. Test water sources for generic *E. coli* before using each season and regularly during the season. Keep records of tests and results.
- Provide and maintain an adequate number of toilet and hand-washing facilities for workers. Facilities should have toilet paper, running water, soap, single-use towels, and waste bins.
- Train workers in proper hand-washing methods, when to wash, and other farm food safety policies. Post signs as reminders and keep records of training efforts.
- Ensure that workers wash hands before starting work, after breaks, and after engaging in nonfood handling activities such as using the restroom, handling animals, cleaning equipment, etc.
- Do not allow anyone who has been diagnosed with a foodborne illness, or who is ill with vomiting, diarrhea, jaundice, or infected wounds to handle produce or food contact surfaces.
- Use only EPA-approved pesticides and follow all label instructions.

During Harvest

Follow these GAPs while harvesting produce to avoid contaminating the crop:

- Clean and sanitize harvest bins, tools, and wagon beds before using them during harvest.
- Use nonabsorbent, durable, and washable materials for equipment and tools that directly contact produce during or after harvest (Figure 1).



Figure 1. Porous wood, corroded metal, flaking paint, and carpet are materials that should not contact fresh produce. These materials are rough or absorbent, so they can't be easily cleaned or sanitized. Use smooth plastic, metal, or painted materials instead.

- Keep equipment and farm implements clean and in good repair. Fix fuel, oil, or hydraulic leaks promptly.
- Remove as much dirt and debris from produce as possible while in the field.

- Do not harvest damaged, diseased, or visibly contaminated produce.
- Keep records of cleaning, sanitizing and maintenance.

Post-harvest

Follow these GAPs after harvesting produce to avoid contaminating the crop:

- Cool produce quickly to remove field heat and minimize potential pathogen growth.
- Prevent bruising and damaging produce. Discard any bruised or damaged produce.
- Keep packed fruits and vegetables off the floor. Place containers on clean pallets.
- Keep floors and equipment clean and dry. Avoid pooling water in packing sheds and coolers.
- Use only potable water sources for washing or cooling harvested produce and for cleaning surfaces that will contact produce.
- Regularly change produce wash or dump tank water to prevent organic debris from building up in the water.
- Treat dump tank or recirculated water to kill microorganisms and prevent cross-contamination.
- Regularly measure the sanitizer and pH levels of postharvest water. Always maintain adequate sanitizer concentration and desired pH. Record measurements.
- Avoid immersing tomatoes, apples, and other fruits in water that is more than 10°F cooler than the produce. When the water is too cool, the produce can absorb water along with any pathogens that may be present.
- Ensure produce is dry before packing to limit the potential for bacterial growth on the surface of the produce.
- Install appropriate backflow prevention on hoses and water supply lines.

- Regularly remove trash and culls to avoid attracting animals to packing areas.
- Prevent birds from perching or roosting in rafters.
- Before loading with produce, make sure transport vehicles are adequately clean and, if previously used to transport goods or animals that could contaminate produce, have been thoroughly cleaned and sanitized.
- Keep wagons and vehicles used to dispose of culls and trimmings out of animal lots or other places of possible contamination.
- If a transport vehicle has a cooling system, cool it before loading and ensure cooling equipment is functioning properly.
- Keep records of where each product was grown, dates of harvest and packing, dates of sale/shipping, and where it was sold/shipped.
- Be prepared to show records to authorities if requested.

As we learn more about microbes, produce, and human health, recommended practices may change. Stay informed to keep up-to-date with current GAPs.

To learn more about GAPs, visit the Food Safety for Fresh Fruit and Vegetable Farms website at ag.purdue.edu/hla/foodsafety, or contact your local extension office.

Attend educational programs about GAPs and other food safety topics offered by your state's extension service and other organizations.

For Indiana growers, the Indiana State Department of Health has made food safety farm consultants available for outreach, education, and assistance to Indiana produce growers. Visit www.in.gov/isdh/25773.htm for information.

Illinois growers who need help about food safety should call the Illinois Department of Public Health, Division of Food, Drugs and Dairies at (217) 785-2439, visit the Illinois Local Food Systems & Small Farms Food Safety website (web.extension.illinois.edu/smallfarm/foodsafety.html), or call the nearest University of Illinois Extension office.

Farmers can help improve the quality of the fruits and vegetables we eat, assure consumer safety and confidence, and maintain the viability of their farms and the fruit and vegetable industry. But they need to learn about the issues, use their experience and knowledge to contribute solutions, and commit to food safety in their operations.

Find Out More

Find more publications in the *Food Safety for Fruit and Vegetable Farms* series by visiting the Purdue Extension Education Store: www.the-education-store.com.

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