

# Growing Vegetables, Fruits and Produce

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Food safety is a concern to all involved in the production, marketing and consumption of food-stuff. Produce, fruits and vegetables, present unique problems in that they are often consumed raw without processing. In many cases, small produce growers market their crops directly to consumers or outlets where they are sold fresh. Raw foods can carry disease-causing microorganism like *Salmonella* and *E.coli*. Unless these pathogens are killed or washed off, people may become sick. This chapter discusses the risks of microorganism contamination from the time of planting to harvest to preparing for sale.

Risks are related to our actions or lack thereof. When we decide to do something, we should consciously strive for practices that minimize the risks. The microbial food safety risks of growing only one crop that is shipped and marketed directly from field to the processor, is markedly less than that of growing a variety of crops with a variety of exposures to potential contamination. A person growing potatoes for a chipper has less food safety risk than someone growing and direct marketing fresh lettuce, carrots, radishes and strawberries at the same time. Growers are willing to accept this higher level of risk because diversification for a small farm is more profitable. These growers need to evaluate their operations to minimize risk and to promote consumer education in food safety. For example, growers can provide information to their customers about the need to wash all produce before eating.

This self-assessment tool will help diversified growers identify potential risk areas and provide them with information and resources to minimize the risk. The purpose of this section of *Food\*A\*Syst* is to provide fruit and vegetable growers with a self-assessment tool to determine their level of risk for food contamination.

The following topics are covered:

1. *Site Conditions as Related to Field Selection.* What do my neighbors do, especially those upstream? Are livestock in the area? How has the field been used in the past?
2. *Wildlife, Vermin, and other Pests.* How will the presence of wildlife and vermin affect various areas of my production?
3. *Water Source.* What risks are associated with the water used in various areas of my production?
4. *Crop Selection.* Does the type of crop I grow affect food safety risks? What about risks during cleaning of the crop?
5. *Crop Production.* How do compost and chemical use affect food safety? What about record-keeping? How can harvesting be accomplished safely?
6. *Post-harvest Operations.* Does the packing shed and equipment create food safety problems? How about employees' activities? Is cross-contamination a problem? What should be sanitized and how often?
7. *Employee Personal Hygiene.* Are adequate facilities provided? Are employees trained to wash hands?
8. *Design and Processing.* How can you minimize the potential for cross contamination? At what temperatures should food be stored?
9. *Cleaning and Sanitizing Frequency.* Check your risk.

## Part 1—Site Conditions

Each site or field will have a unique history and location in the watershed. Recognizing that these factors indicate a potential for contamination in a field is the first step in reducing risk levels. Where

ever possible, fruit and vegetable crops should be upstream from animal-oriented activities so that they are not in the direct path of runoff carrying bacteria. While wildlife cannot be completely excluded from crops, domestic animals can and should be contained.

### Assessment 1—Site Conditions

Use the table below to rate your risks. For each question, indicate your risk level in the right-hand column. Although some choices may not correspond exactly to your situation, choose the response that best fits. Refer to Part 1 if you need more information to complete the table. Transfer medium-high and high risks to the Action Check list at the end of the chapter on Page 3-10.

	LOW	LOW-MEDIUM	MED-HIGH	HIGH	MY RISK
<b>Neighbors' Land</b>	My neighbors are environmentally responsible growers like myself.	Their land is farmed with few chemicals - or - is grazed only a few months/year.	Their land is farmed with chemicals - or - is grazed more than 6 months/year.	Their land is upstream with feed lot(s), and I only use surface water for crop production.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>History of Land Use</b>	My land is fenced virgin prairie that has not been grazed.	My land is a former farm with no history of animal production.	My land was used for animal production more than 5 years ago.	My land has been used for animal production in the last 5 years.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Watershed</b>	My farm is upstream from any sources of contamination.	My farm is downstream from crop land with no animal production.	My farm is downstream from a well-managed feed lot and only receives runoff during flooding.	My farm is downstream from at least one feed lot and runoff is commonly received.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Livestock</b>	Neither my neighbors nor I have livestock.		All livestock in the area is fenced and contained.	Animals commonly roam freely in fields and processing areas.	<input type="radio"/> Low <input type="radio"/> Med-High <input type="radio"/> High

## Part 2—Wildlife, Vermin and Other Pests

Wildlife are a source of microbial contamination and pose a hazard in all aspects of growing and marketing produce. Deer can contaminate fields and water sources; rodents can contaminate pack-

ing facilities and equipment, as well as storage areas for produce, equipment, and supplies.

## Assessment 2—Wildlife, Vermin, and other Pests

This table describes risk levels for several areas. Assess each area and determine where the greatest risks exist, and record your risk level in the right-hand column. It makes sense to address the highest risks first.

	LOW	LOW-MEDIUM	MED-HIGH	HIGH	MY RISK
	Ongoing preventive actions using enclosed buildings, fences, monitoring and appropriate controls.	Intermittent vermin monitoring, buildings enclosed, fences and controls initiated when low population levels observed.	No monitoring, controls initiated for infestations; some fencing, buildings partially enclosed.	No monitoring or controls; infestation ongoing; no fences or enclosed buildings.	
Fields					
Packing Facilities					
Container Storage					
Product Storage					
Vehicles					

## Part 3—Water Source

Water has been strongly implicated in the contamination of produce. The water may be used for irrigation, packing and cleaning of equipment and facilities. Potable/drinkable water is best for all uses. In rating water sources, rural, public, and municipal water sources are best as they are routinely disinfected and tested for microbial contamination. Private farm wells that are tested and treated are the next best choice. Water tests should be taken routinely but often are not. Although ground water sources from wells are generally better than surface water, only testing can determine water safety. Recent surveys indicate that only 40 percent of Kansas wells meet safe drinking water standards.

Without testing, water quality cannot be determined. While infants should not drink water with elevated nitrate levels, nitrate contamination by itself, is not a risk for crop production. See Chapter 4, *Water Well Management*, for further information. Kansas versions of *Farm\*A\*Syst* and *Home\*A\*Syst* are available from your county extension office and provide assistance in evaluating water wells.

Surface water, ponds, irrigation ditches, lakes, streams, and rivers, can be contaminated with runoff from neighboring feedlots, grazing animals and sewage, making these water sources unsuitable for packing/processing produce and for cleaning facilities.

## Assessment 3—Water Source

This chart describes risk levels for areas of water use in growing produce. Check the box under the source of each water use to determine where the greatest risks exist, and record your risk level in the right-hand column. It makes sense to address the highest risks first.

	LOW	LOW-MEDIUM	MED-HIGH	HIGH	MY RISK
<b>Water use</b>	Public water	Tested & disinfected water from well or cistern	Untested well or cistern water	Surface water or open cistern	
Irrigation*					
Cleaning					
Packing					

\*Irrigation is a good use of low quality water on crops that are not eaten raw (such as cereal grains), or applied so that the food has no direct contact with the irrigation water, such as with deep sub-surface irrigation.

## Part 4—Crop Selection

Crop selection is an important consideration when assessing risk for microbial food borne illness. Some risk is inherent (such as the nature of the crop chosen), and steps must be taken to minimize these risks. A crop can be contaminated at various places in the production and processing chain. Some products (like sprouts) can be contaminated as seed, with pathogens being carried into the finished product. Processing water can be a source of microbial contamination. Producing a crop that needs extensive water contact to prepare it for marketing increases the risk of contamination. Knowledge and

use of **Good Manufacturing Practices (GMPs)** and **Good Agricultural Practices (GAPs)** can do much to lower the risks. Soil contact can increase the risk for microbial contamination. If crops chosen are either grown on or in the soil, they have a higher risk of contamination, and steps need to be taken to minimize the risk.

See the end of this chapter for more information and resources.

### Assessment 4—Crop Selection

Use the table below to rate your risks. For each question, indicate your risk level in the right-hand column. Although some choices may not correspond exactly to your situation, choose the response that best fits. Refer to Part 4 above if you need more information to complete the table. Transfer medium-high and high risks to the Action Checklist at the end of the chapter on Page 3-10.

	LOW RISK	LOW-MED	MED-HIGH	HIGH	MY RISK
<b>Is crop consumed raw or cooked</b>	Always eaten cooked or fully processed.		Sometimes eaten fresh or raw.	Always eaten fresh.	<input type="radio"/> Low <input type="radio"/> Med-High <input type="radio"/> High
<b>Seed source for sprouts</b>	Only purchase seeds certified to be pathogen free.			Seed source is unknown; or not certified pathogen free.	<input type="radio"/> Low <input type="radio"/> High
<b>Processing needed</b>	Crop can be, and is, field packed without washing into clean containers: GMPs and GAPs are used.	Crop needs and receives lots of washing before marketing; GMPs and GAPs are used.		Crop needs lots of washing; don't use GMPs and GAPs.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> High
<b>Soil contact of plant part harvested</b>	Grown in sterilized media.	Grown on plant, no soil contact.	Grown on plant and in contact with soil.	Grown in the soil.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Crop's cleaning</b>	Always remove all soil and use sanitizing rinse; use GMPs in packing; instruct customers to wash thoroughly before eating.	Remove all soil, instruct customers to wash thoroughly before eating.	Remove heavy soil, leaving some soil.	No removal of soil so produce is often dirty.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High

Foods commonly eaten raw	Foods commonly cooked before eating
Leafy vegetables—lettuce, parsley, spinach Strawberries, raspberries, blackberries Tomatoes, peppers, peapods Melons, radishes, onions, carrots	Field crops—wheat, corn, barley Sweet corn Peas, beans, okra, Squash, potatoes, carrots, asparagus

## Part 5—Crop Production

### Definition of terms:

- **Biosolids:** Solids originating from a biological source like animals and humans; used interchangeably with “sludge” when referring to solids retained from human wastewater treatment; EPA regulations govern the use of sludge as a soil conditioner because it contains possible pathogens and heavy metals.
- **Compost:** End result of natural bacterial and chemical decomposition of organic materials of animal, human, and plant origin; valuable as a soil conditioner and nutrient source. Properly managed, composting greatly reduces pathogen numbers (see bulletins listed at the end of this chapter).
- **Manure:** Animal feces not composted or incompletely composted; contains pathogens like Salmonella and E. coli.
- **LD<sub>50</sub>:** (stands for Lethal Dose to 50% of the organisms exposed.) A rating that tells how toxic a pesticide is to mammals; lower numbers are assigned to more toxic chemicals, meaning a small amount will kill. Signal words are included on the label to help you understand how poisonous a product is:
  - “*Danger-Poison*” indicates the most toxic chemicals and has a rating of 1-50; an example is parathion
  - “*Warning*” indicates moderate toxicity and has a rating of 50 - 500; an example is diazinon
  - “*Caution*” indicates lowest toxicity and has a rating of 500 or more; examples are Sevin® and malathion and permethrin (Ambush® and Pounce®)



Crop production planning in order to reduce the risk of food-borne diseases, begins with soil preparation before planting. This includes when and what animals have had access to the field. Also, the timing and application of composted biosolids to the soil in relation to planting and harvesting has a direct relationship to food safety risk.

The use of manures and biosolids as fertilizers presents a risk for microbial food borne illness unless properly applied. Biosolids may also contain toxic organic compounds and heavy metals, which present chemical hazards. Organic growers have acceptable alternative non-manure fertilizers to choose from such as alfalfa pellets and cover crops. Municipal waste biosolids are appropriate only for fertilizing field crops such as cereal grains that will be cooked or commercially processed. EPA regulations (40 CFR 503) require extended periods of at least 14 months and up to 38 months between application of biosolids (from wastewater treatment) and harvesting of foods other than field crops.

Although most of this section deals with microbial hazards, chemical hazards are also sources of foodborne illness. Using chemicals according to the label and respecting re-entry times usually minimize risks. For lowest risk choose a product with a high LD<sub>50</sub> number, such as Sevin® (LD<sub>50</sub>=625) or malathion (LD<sub>50</sub>=1187). Pesticide use is generally governed by label instructions. The label should be legible and will specify the crop and pest, application rates, and time limitations for application before harvest of the food. Records of pesticide use should be kept to verify dates, sites, chemical used, effectiveness, and rate of application. Extension bulletins offer information about chemical application and appropriate choices. Do not hesitate to contact your county extension agent for advice.

Use the following table to rate your risks. For each question, indicate your risk level in the right-hand column. Although some choices may not correspond exactly to your situation, choose the response that best fits. Refer to Part 5 if you need more information to complete the table. Transfer medium-high and high risks to the Action Checklist at the end of the chapter on Page 3-10.

## Assessment 5—Crop Production

	LOW	LOW-MED	MED-HIGH	HIGH	MY RISK
<b>Animal access</b>	No livestock in area; crops fenced and netted to reduce access by stray animals and wildlife.	I have no livestock; neighbors livestock confined away from my crops.	My livestock are confined away from my crops which are fenced.	My livestock, ruminants, and poultry have free access to crops all the time.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Type of fertilizer</b>	Use only non-manure organic fertilizers or synthetic fertilizers.	Use composted plant waste on growing crops.	Use composted manure on growing crops—or—raw manure applied >12 mo. before harvest; no municipal waste used.	Use raw manure and biosolids on growing crops.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Cleaning and use of fertilizer application equipment</b>	I thoroughly wash all equipment used in manure application after each use and it is used for nothing else.		I occasionally use my manure application equipment for other purposes.	I don't clean my application equipment and also use it for harvesting and transporting produce.	<input type="radio"/> Low <input type="radio"/> Med-High <input type="radio"/> High
<b>Type of pesticide</b>	Use biological pesticides, bait stations, or pesticides non-toxic to mammals.	Use pesticides targeted to specific pest only after seeing considerable economic damage.	Use broad spectrum pesticides with high LD <sub>50</sub> ratings.	Use broad spectrum pesticides with low LD <sub>50</sub> and/or long duration re-entry times.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Pesticide application</b>	No pesticides used—rely on cultivation for weed control and biological agents for insect control.	Weekly monitoring for weeds and pests; apply minimum rates and highest LD <sub>50</sub> rated chemicals when damage is noted.	Monthly monitoring for weeds and pests; apply maximum rates if any pest organisms found.	Apply maximum rates on a calendar basis, regardless of presence or pest.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Label instructions</b>	I always read and follow the label each time I use a pesticide—label is legible.	I usually read and follow the label—label is legible.	I read the label the first time the pesticide is used—label partially illegible.	Label missing or illegible; I've mixed the pesticide the same way for years.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Re-entry after pesticide application</b>	Fields kept posted to reflect label's crop and re-entry times.	I respect the label's crop and re-entry times.	I wait a day to re-enter and try not to spray close to harvest.	I pay no attention to label's crop and reentry times.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Record-keeping</b>	All chemical applications are logged with date, mix, field notes, weather, location; I monitor inventory and note expiration dates.	All chemical applications are logged with date, mix, field notes, weather, location.	I record that I applied a certain chemical on a date to a crop.	I use pesticides without recording any information.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Harvesting</b>	Pickers wash hands before harvesting and after toilet use; clean gloves donned for harvesting.	Pickers wash hands before harvesting and after toilet use.	Pickers don gloves for harvesting.	No hand washing or gloves used.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High

## Part 6—Postharvest Operations

### Past and Current Building Use

The building used for post-harvest handling should be of easily cleanable construction that provides protection against insects, rodents and weather. It should be equipped with suitable plumbing for handling the crop, cleaning equipment, and for personal hygiene. Use of the structure for other purposes such as housing animals or for storing equipment or chemicals, increases the likelihood of contamination. Plumbing fixtures should be fully operational and undamaged so that they can be cleaned as part of the weekly routine. Hot water must be available for proper utensil washing and for hand washing. Sinks should be equipped with mixing faucets to allow tempering the water. Soap and paper towels should be available at all hand sinks.

The food contact surfaces such as utensils, table tops, racks, bins, etc. should be smooth and impervious. After cleaning to remove visible soil and debris, sanitizing these surfaces is important to control bacterial growth. A simple, effective sanitizing solution is one tablespoon of household bleach to a gallon of clean, tepid water. (See “Sanitizing Solutions,” Page 3-10) Because the solution loses strength, it should be made up fresh every hour during use. This solution can be used as the final rinse in utensil washing, and final wipe-down of large surfaces. Allow sanitized surfaces to air dry.

Be aware that post-harvest processing may be subject to regulation, and require a license from the **Kansas Department of Health and Environment (KDHE)**. If the processing involves anything more than removal of soil and excess plant debris, KDHE should be contacted at (785) 296-5600 to discuss possible needs for inspection and licensing.

### Assessment 6—Postharvest Operations

Use the tables below to rate your risks. For each question, indicate your risk level in the right-hand column. Although some choices may not correspond exactly to your situation, choose the response that best fits. Refer to the section above if you need more information to complete the table. Transfer medium-high and high risks to the Action Checklist at the end of the chapter on Page 3-10.

	LOW RISK	LOW-MED	MED-HIGH	HIGH	MY RISK
<b>History of use</b>	New or not ever used for livestock.	Housed livestock more than a year ago and extensively cleaned, sanitized, and remodeled.	Housed livestock more than a year ago, no cleaning or remodeling.	Housed livestock within last year-or-livestock have access.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Vermin</b>	Well screened and sealed to exclude vermin.		Vermin have access but not seen.	Rodent droppings and/or insects visible.	<input type="radio"/> Low <input type="radio"/> Med-High <input type="radio"/> High
<b>Licenses</b>	License checked with KDHE, no license needed.	License needed and obtained from KDHE.		Although needed, no license obtained.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> High
<b>Sources of contamination</b>	No livestock or chemicals in or within 500 ft. of building.	Chemicals stored in secured cabinet; any livestock are > 500 ft. away.	Livestock nearby so that dust can enter facility.	Used to store fertilizer, pesticide, livestock.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Plumbing</b>	No hoses in use, plumbing only used for production.	Any hoses used are dedicated for production.		Hoses used for multiple purposes.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> High
<b>Water source</b>	Public water supply.	Tested, treated well meeting construction standards.	Untested, untreated well water.	Untested, untreated surface water.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High

## Assessment 7—Employee Personal Hygiene

Personal hygiene is closely related to the level of food safety. The simplest and most effective way to prevent spreading germs is to wash hands with soap and water before handling food. Hands can be dried with disposable towels or mechanical blowers. People who handle food should be trained in good practices. As more employees are involved, the risk of potential contamination increases. Clothing should be clean and hair restrained. Footwear can carry in contaminants, and should be changed, covered, or sanitized before entering the food processing areas.

The Kansas 1999 Food Code prohibits individual cloth towels in food preparation areas. The Food Code is available online at: [http://www.kdhe.state.ks.us/fpch/1999\\_Ks\\_Food\\_Code.pdf](http://www.kdhe.state.ks.us/fpch/1999_Ks_Food_Code.pdf)



## Assessment 7—Employee Personal Hygiene

	LOW RISK	LOW-MEDIUM RISK	MEDIUM-HIGH RISK	HIGH RISK	MY RISK
<b>Handwashing facilities</b>	Toilet room and sink with mixing faucet, hot and cold running water, soap, and paper towels provided in work area.		Toilet room and sink with separate hot and cold water faucets, soap, and paper towels provided in work area - or - proper facilities not near work area.	No facilities provided - or - anything less than previously described.	<input type="radio"/> Low <input type="radio"/> Med-High <input type="radio"/> High
<b>Fixture cleanliness</b>	Fixtures of current design and cleaned weekly.	Fixtures old but undamaged and cleaned weekly.	Chipped fixtures in poor repair, no cleaning schedule.	No flush toilet provided or toilet is outhouse.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Handwashing practices</b>	Employees trained in handwashing and usually monitored.	Employees trained in handwashing with occasional monitoring.	Employees trained in handwashing but not monitored.	No employee training.	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High
<b>Cross contamination</b>	Employees trained in potential trouble spots and monitored (no field clothing worn in packing area).	Employees trained in potential trouble spots, but not monitored.	Employee education limited to washing hands after using toilet.	No employee training (field shoes worn in packing area).	<input type="radio"/> Low <input type="radio"/> Low-Med <input type="radio"/> Med-High <input type="radio"/> High

## Assessment 8—Design in Processing

Failure to observe some simple rules can result in contaminated food. Chemicals may be necessary in the facility, but they must be stored separately from food. Anything that may leak down should be stored at the lowest level with nothing under it. Packaging materials should be in protected storage to stay clean.

Harvested foods entering the packing line can be considered a source of contamination and must be kept separate from the final product. Handling itself may generate dust or splash that should be contained. Different cutting boards should be dedi-

cated to raw and processed foods—label one “Raw” and one “Cooked” (or use words appropriate to your operation). Using different colors or shapes also helps. Sanitizing is the critical final cleaning step for all food contact surfaces.

For information about the next step in marketing your product, transportation, see Chapter 7, Packaging and Transportation for Food Safety. For more information about reduction and management of production waste, see Chapter 6, Managing Production Waste.

## Assessment 8—Design in Processing

	LOW RISK	LOW-MEDIUM RISK	MEDIUM-HIGH RISK	HIGH RISK	MY RISK
<b>Working surfaces</b>	Stainless steel tables and counters adequate in area.	Smooth, rust-free metal tables and counters adequate in area.	Sealed wooden surfaces adequate in size.	Rough wooden surfaces, work area too small (product placed on ground).	O Low O Low-Med O Med-High O High
<b>Cross-contamination</b>	Containers labeled and dedicated to use and work area.		Containers labeled but may be found in other work areas.	Containers used for multiple purposes.	O Low O Med-High O High
<b>Product container</b>	New* (or sanitized before reuse) and/or hard food-grade plastic; separate storage.	New* containers or hard plastic containers; separate storage.	Recycled containers cleaned only; separate storage.	Recycled containers not cleaned; storage with ag chemicals.	O Low O Low-Med O Med-High O High
<b>Wastewater (includes gray water) goes to:</b>	Public sewage collection system.	Private sewage system designed for production and not seeping or muddy.	Private sewage system of unknown design but not seeping or muddy.	System discharging to ground surface.	O Low O Low-Med O Med-High O High
<b>Cold storage of produce</b>	Provided in work area, temperature 40° F or less.	Provided in work area, temperature 41° to 45°F.	Located away from work area— or-temperature more than 45°F.	No mechanical cooling facilities.	O Low O Low-Med O Med-High O High
<b>Transport vehicles</b>	Dedicated to hauling produce; cleaned before each use; (refrigeration unit if needed).	Dedicated to hauling produce; not always cleaned before each use.	Also used for hauling manure/ag chemicals; usually cleaned before hauling produce.	Also used for hauling manure/ag chemicals; not cleaned or sanitized.	O Low O Low-Med O Med-High O High

\*Note: Organic certification requires new containers or recycled containers that have only been used for organic produce to prevent cross-contamination of chemicals.

## Sanitizing Solutions

First, wash surface with hot soapy water and rinse.  
For hard, nonporous surfaces:

1. Mix 1 tablespoon liquid bleach with 1 gallon water.
2. Immerse clean utensil for 60 seconds, or apply solution to hard surface.
3. **Allow to air dry, no rinsing.** Do not rinse.

For porous surfaces, like wooden cutting boards:

1. Mix 3 tablespoons liquid bleach with 1 gallon water.
2. Immerse or apply to surface.

3. Keep surface wet for 2 minutes.
4. Rinse with water and let dry. Do not dry off.

*Disinfecting Solution (use when contamination has occurred)*

1. First, remove loose dirt.
2. Mix 3/4 cup bleach with 1 gallon water.
3. Immerse or apply to surface, and keep surface wet for 2 minutes.
4. Rinse with water and let dry.

## Assessment 9—Cleaning and Sanitization Frequency

This chart describes risk levels for cleaning practices. Check the box to show the cleaning frequency for each area to determine where the greatest risks exist, and record your risk level in the right-hand column. It makes sense to address the highest risks first.

	<b>LOW RISK</b> Clean and sanitize daily and as needed.	<b>LOW-MEDIUM RISK</b> Clean periodically or as needed.	<b>MEDIUM-HIGH RISK</b> Clean at beginning of season.	<b>HIGH RISK</b> Do not clean.	<b>MY RISK</b>
Field/harvest containers					
Equipment					
Tools					
Transport vehicles					
Packing line equipment					
Packing facilities					
Storage areas					
Pre-cooling facilities					
Handling containers					
Packing containers					
Delivery vehicles					



## For More Information

K-State Research and Extension Bulletins:  
MF-2260 *Food Safety for Farmers Markets*  
MF-2344 *Organic Certification*

Minimizing Microbial Food Safety Hazards for Fresh Fruits and Vegetables Series:

MF-2484 *Introduction*

MF-2479 *Production Water*

MF-2480 *Processing Water*

MF-2481 *Worker Health and Hygiene and Sanitary Facilities*

MF-2482 *Field Sanitation Packing Facilities, Sanitation, Transportation, and Tracking*

MF-2483 *Manures and Municipal Biosolids*

AF-42 *Revised Controlling House Mice*

AF-43 *Revised Controlling Rats*

Solid Waste Management Series. May 1995:

EP-2 *Compost Activators*

EP-3 *The Composting Process*

EP-4 *Using Compost*

EP-5 *Composting Troubleshooting Guide*

EP-6 *Quick Composting*

EP-7 *Direct Application of Organic Materials*

EP-22 *Sewage Sludge Use on Agricultural Land*

## Other Resources:

*Safer Processing of Sprouts* by the California Dept. of Health Available from: Circle Solutions, 2070 Chain Bridge Rd., Suite 450, Vienna, VA. Telephone: 703-902-1300.

Description: This curriculum covers agricultural and postharvest water uses, manure and biosolids, worker health and hygiene, field and facility sanitation, transportation, and trace back. Information is also applicable to all domestic and foreign growers, packers, and shippers of unprocessed or minimally processed fresh fruit and vegetables, not just for sprout growers.

## Websites:

<http://www.cfsan.fda.gov/~dms/prodguid.html>  
Description: (full text online) *Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables*, is maintained by the FDA, USDA, and CDC. This guidance document addresses microbial food safety hazards and good agricultural and management practices common to the growing, harvesting, washing, sorting, packing, and

transporting of most fruits and vegetables sold to consumers in an unprocessed or minimally processed (raw) form.

<http://www.pma.com> Description: *Food Safety for Produce Distribution*.

Available from: Produce Marketing Association, the guide covers such key topics as management knowledge and responsibility; supplier relationships; transportation; employee health, hygiene and food safety awareness; equipment and facility sanitation; and safety program evaluation.

## Food\*A\*Syst Helps Ensure Your Safety

This *Food\*A\*Syst* handbook covers a variety of topics to help you examine and address your most important food safety and environmental concerns. For more information about topics covered in *Food\*A\*Syst*, or for information about laws and regulations specific to your area, contact your local environmental health department or county K-State Research and Extension office.

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