

Food Safety on the Farm

Introduction	321
Lecture 1: Introduction to Food Safety, Risks of Microbial Contamination, and Food Safety Plans	323
Lecture 2: Assessing Risks and Developing a Food Safety Plan	329
Resources and References	336
Appendices	
1. Example of Farm Risk Assessment Checklist	338
2. Example of Employee Training Policy and Instructions	343
3. Example of Injury/Illness Log	344
4. Example of Visitors' Policy and Log	345
5. Example of Pre-Harvest (GAPs) Checklist	346
6. Example of Standard Operating Procedure (SOP) Form	347

Introduction: Food Safety on the Farm

UNIT OVERVIEW

For a variety of reasons, including the demands of buyers and insurance companies, food safety has become a major concern in farming operations. Federal regulations governing food safety on the farm are still developing, but even in their absence, all growers should be aware of and employ practices that minimize the risk of food-borne contamination. This unit introduces the concept of food safety, and the steps involved in the development of a food safety plan based on “good agricultural practices” (GAPS).

The first lecture discusses some of the reasons behind recent food safety concerns, reviews the categories of microbes and the pathogens most involved in food contamination, and discusses the need for a food safety plan and the current status of the federal Food Safety Modernization Act (FSMA).

Lecture 2 discusses potential sources of pathogens, practices that minimize risks of microbial contamination, and the use of logs, checklists, and standard operating procedures in implementing and tracking good agricultural practices. The concepts of conservation and biodiversity on the farm as they relate to food safety are also introduced, along with third party audits and sources for help in developing a food safety plan.

MODES OF INSTRUCTION

- > LECTURES (2 LECTURES, 1 HOUR EACH)

LEARNING OBJECTIVES

CONCEPTS

- Food safety as it applies to farming operations
- Sources and types of microbial contamination
- Goals of a food safety plan and the use of good agricultural practices (GAPs)
- Food Safety Modernization Act (FSMA) and its potential impact
- Assessing and minimizing risks of microbial contamination on the farm
- Importance of biodiversity considerations
- Sources of help in developing a food safety plan

Lecture 1: Introduction to Food Safety, Risks of Microbial Contamination, & Food Safety Plans

A. What Is Food Safety and What Are the Risks?

1. According to the USDA Food Safety and Inspection Service, food safety is defined as "A suitable product which when consumed orally either by a human or an animal does not cause health risk to consumer." There are three potential sources of health risks caused by food:
 - a) Chemicals – Improperly stored, handled, or used chemicals can be a source of contamination. Examples of chemicals used in food production include: fertilizers, sanitizers, synthetic and non-synthetic pesticides/herbicides/fungicides, equipment lubricants, cleaning agents, etc.
 - b) Physical – Examples include screws, glass, hair, staples, wood, jewelry, insects, etc.
 - c) Microbial (biological) – Examples include viruses, bacteria, parasites, and fungi
 - i. Microbes that are disease causing are also referred to as pathogens. Illnesses caused by eating foods that are contaminated with microbes are referred to as foodborne illnesses (or food poisoning).
 - ii. When it comes to food safety, all three sources are important to understand from a risk perspective, but microbial contamination is the biggest concern. This is in part because human sensory system cannot see, taste, smell, or feel pathogens, whereas we can often detect chemical/physical contamination. The Centers for Disease Control estimates that 1 in 6 people are sickened nationally each year from food borne pathogens (source: <http://www.cdc.gov/foodborneburden/>).

B. Why is Food Safety Becoming Such a Big Issue?

Fresh produce is often eaten raw—there is no “kill-step” or action taken to kill bacteria/pathogens (in contrast to milk, for example, where pasteurization is used as a “kill step” to eliminate pathogens). Produce that is not cooked is therefore considered higher risk for pathogens than those fruits and vegetables that are cooked. Since produce has been eaten raw in the past, why has food safety become a more pressing concern? There is no single answer; instead, a number of factors have contributed to heightened awareness of risks related to fresh produce.

1. Recent outbreaks of foodborne illnesses related to on-farm practices (e.g., spinach-based E. coli O157:H7 outbreak in 2006 and cantaloupe-based Listeria outbreak in 2010) have led to more focus and due diligence from producers to ensure they are doing what they are saying to ensure food safety
2. Changing environmental factors
 - a) Putting more constraints on agricultural production
 - i. More urban pressures are creating more stress on the environment: e.g., development infringes on both wildlife habitat and on farmland, pushing farming onto former wild lands, and leading to a potential increase of wildlife activity on farms.
 - ii. Increased competition for the same diminishing resources: e.g., water is becoming more and more valuable as sources are limited and droughts affect supplies; therefore, the quality of water available for agricultural/food production use may at times be questionable.
 - b) Microbial pathogens have adapted to changing environmental conditions; many have become resistant to antibiotics.

3. Changing science leads to more knowledge, understanding, and awareness
 - a) Advances in science and technology have led to more finite detection of both chemical and microbial presence in the environment. Contaminants were once measured at ppm (parts per million), but now tests can be done to find evidence of contaminants at ppb (parts per billion) or ppt (parts per trillion).
 - i. Most contaminants are expressed as ppm—which if expressed as a percent would be 0.0001%; another way of looking at it is that you have 1 milligram added to 1 liter of liquid. This is the unit of measurement the government uses to express exposure standards and create guidelines to protect the public from harmful substances that can cause serious health effects.
4. Human immune systems have become more sensitive
 - a) Years of conditioning to a “clean” environment and exceptional water quality have led to greater sensitivities with respect to our bodies’ ability to deal with foreign agents such as bacteria. This is why national standards for contaminants may at time differ from international standards. For example, most North Americans would fall sick if they were to drink tap water in developing countries; however, for the most part those living in such countries are able to drink the water without getting ill.
 - b) Antibiotic resistance has developed due to misuse and abuse of antibiotics (e.g., the use of antibiotics to treat viral infections that don’t respond to antibiotics)
 - c) More virulent strains of pathogens have adapted to the changing environment/stresses
 - d) Those with weak or compromised immune systems are more susceptible / vulnerable to food borne pathogens. Those with underdeveloped immune systems (such as babies), those with “tired” immune systems (those over 60 years of age), and those with compromised immune systems (e.g., HIV positive and diabetics) are more vulnerable to pathogens than middle-aged adults. Middle-aged adults can unknowingly carry pathogens and transfer (cross-contaminate) anything they come in contact with. Symptoms of food borne pathogens resemble those of a cold or flu; upset stomach, nausea, vomiting and diarrhea.

C. Microbes: An Overview

1. Thousands of microbes (organisms too small to see with the naked eye, e.g., bacteria, viruses, parasite) are naturally present in our everyday environment. They can be found all around us in the soil, the air, on our skin, in our water, etc. Microbes include those bacteria that cause disease.
2. Microbes simplified:
 - a) Microbes are either anaerobic (not requiring oxygen to live or grow) or aerobic (requiring oxygen to live and grow)
 - b) Microbes can be divided into 3 general categories:
 - i. The Good – Added to food to add flavor, create texture, and preserve
 - Naturally found in our intestines to aid in food digestion.
 - Used in food processes (commonly used in making cheese, wine, beer, etc.)
 - Introduced in foods to help with human functions (e.g., bacterial cultures in yogurts)
 - ii. The Bad – Spoil or make the food go “off/bad”
 - Mold on bread
 - Souring of milk
 - iii. The Ugly – Microbes that cause illnesses (also known as pathogens). Illnesses can range from mild cases of diarrhea/vomiting to life-threatening cases involving hospitalization and in some cases death.

- People who are more susceptible to falling sick or have a higher chance of serious reactions include: pregnant women, older adults, person with chronic illness and/or who are immuno-compromised, and children under 5 years of age
- c) Some viruses (e.g., Hepatitis A and Norovirus) can also be spread via food if the handler is carrying the virus. People who are infected may not show any symptoms until they have had the virus for a few weeks.
3. To multiply, microbes need the following:
- a) Water/humidity/moisture
 - b) Food/nutrients – Often readily available in the environment in which bacteria thrive
 - c) Temperature – Warm is better than cold in most cases
 - d) Source/host – Anywhere that pathogen/bacteria can survive (i.e., humans, food contact surfaces, harvesting tools, soil, etc.)
 - e) Time – Under ideal conditions, bacteria double every half hour
 - i. How they spread: Some microbes are naturally occurring in the environment (e.g., in soils) while others occur under certain environmental conditions (e.g., damp, dark locations that are hard to clean can easily harbor microbial pathogens). Microbes can spread from a host or source via direct contact (e.g., when an infected person handles food, or contaminated water comes in contact with food), via airborne transmission, or through contact with an inanimate object (e.g., from contaminated water to tools, which can then spread the microbes to food).

D. Pathogens of Particular Concern

Several pathogens are of particular concern due to their role in food-borne illness (for more information, see Forsythe 2010 in Resources)

1. *E. coli*: Bacteria that lives in both human and animal intestines. Although most strains of *E. coli* are harmless, some can make you sick.
 - a) *E. coli* O157:H7 is of particular concern, as only a few cells are needed to cause illness. This bacteria can tolerate a wide range of conditions and therefore can easily thrive in many agricultural environments. It can quickly cause illnesses among young children, the elderly, and those with a compromised immune system. It may cause bloody diarrhea, abdominal pain, vomiting, and sometimes kidney failure and even death. *E. coli* O157:H7 makes a toxin called Shiga toxin and is known as a Shiga toxin-producing *E. coli* (STEC). There are many other types of STEC, and some can make you just as sick as *E. coli* O157:H7 (source: Foodsafety.gov). Both large- and small-scale operations have been the source of produce-related outbreaks.
2. *Salmonella*: Bacteria prevalent in the GI tract of many animals, including birds, mammals, reptiles, and insects. Route of transference for *Salmonella* is usually fecal oral contamination (usually food or water contaminated by feces).
3. *Listeria monocytogenes*: Bacteria found in soil and water and some animals, including poultry and cattle. *Listeria* can also live in food processing and packing areas / facilities. It has a tendency to collect and thrive in cracks in the floor and drains.
 - a) Unlike many other bacteria, *Listeria* can grow even in the cold temperature of a refrigerator. *Listeria monocytogenes* can grow without oxygen (anaerobic) in temperatures that range of 1-45°C (34-113°F) and survive in high-salt foods (25.5%). It is killed by cooking at temperatures above 260°C (140° F) and pasteurization.
4. *Shigella*: a family of bacteria that can cause diarrhea in humans. People with shigellosis shed the bacteria in their feces. The bacteria can spread from an infected person to contaminate water or food, or directly to another person. Getting just a little bit of the *Shigella* bacteria into your mouth is enough to cause symptoms.

- a) Shigellosis is an infectious disease caused by *Shigella* and is most commonly seen in child-care settings and schools. Shigellosis is also a cause of traveler's diarrhea, from contaminated food and water in developing countries (source: Foodsafety.gov). Examples of crops that infected consumers with *Shigella* include: cilantro, green onions, parsley and lettuce, to name a few. *Shigella* was introduced into these crops either as a result of water contamination or human (fecal-oral route).
- 5. Note that although the above-mentioned pathogens are most often cited as playing a role in food-related illnesses, there are a number of other pathogens associated with produce-related outbreaks of illness, including *Campylobacter*, *Cyclospora*, and *Giardia*.

E. How Do We Address Food Safety?

1. As good stewards of the land, we are also good stewards of the produce we grow. Good food-handling practices throughout the supply chain (from the field to the plate) protect against foodborne illnesses. Improper handling, preparation, and storage can all result in foodborne illnesses. Although there is no such thing as zero risk, risk can be minimized.
 - a) At the farm level, adopting good agricultural practices, or GAPs (see sidebar below and more about GAPs in Lecture 2, Assessing and Minimizing Food Safety Risks) and conducting proper risk assessments can help with minimizing the risk of contamination. Both of these components are key elements of a food safety plan.
 - b) Food safety does not begin and end at the farm level. Anyone involved in food production, e.g., in a home/community garden, must understand the various levels of risks associated with their practices and how they impact food safety. Similarly, anyone involved with food preparation, whether it is in a restaurant or home environment, must be familiar with good practices associated with preparing, handling, and storing food.

F. What Is a Food Safety Plan and Why Do I Need One?

1. A food safety plan is an evolving, written plan that considers each operation's uniqueness, and highlights the operation's key risk areas and what is being done to minimize the potential risk. This document provides evidence that you are "Saying what you are doing, and doing what you are saying."
2. Whether or not you currently need a food safety plan may depend on the commodity or product you produce (see below), your buyer(s), the end user, the insurance company providing your farm insurance, and/or current regulations and policy. Be aware that although your operation may not currently be required to have a food safety plan in place, this situation is fluid and may change (see below on the Food Safety Management Act, or FSMA).
 - a) Most buyers, particularly at the retail level, have broken produce into high, medium, and low risk categories:
 - High Risk = E.g., leafy greens, herbs, green onions, sprouts, cantaloupes (melons), tomatoes, nuts and berries (specifically strawberries, raspberries, and blackberries)
 - Medium Risk = E.g., peppers, cucumbers
 - Low Risk = Items that are typically cooked before eaten. E.g., potatoes, asparagus, artichokes, etc.

GAPS (good agricultural practices): Practical and reasonable practices that can be adapted or adopted on the farm/garden to reduce/minimize the risk of physical, chemical, and microbial contamination. GAPs should be documented; without documented it is difficult to prove what you did and when (see Appendices for examples of forms used for documentation). Just as each farm and/or operation is unique, each GAPs plan is also unique, as it is tailored to be operation specific.

3. A number of growers already have a food safety plan for their operation, often in response to requirements of distributors, wholesalers, and other buyers (e.g., restaurants, local stores). At an international level it is seen as a non-tariff barrier to entry; nationally, many major retailers, food service providers, and manufacturers are demanding not just a plan, but also 3rd party verification of the plan (some operations may have multiple 3rd party audits, as there is currently no one standard audit protocol that meets every buyer's requirements). At the local level there is a growing demand to recognize the importance of understanding food safety and implementing good agricultural practices (GAPs).
4. There is no one set plan, policy, or regulation that identifies what needs to happen regarding a food safety plan; rather it is a moving target that most likely will continue to evolve as more research on how food is contaminated becomes available.

The Food Safety Modernization Act

The current policy/regulation driving change in the industry is the U.S. Food and Drug Administration (FDA) Food Safety Modernization Act (FSMA). Although it was signed into law in 2011 it is still being developed and as of this writing, is not yet finalized.

What is FSMA and what does it mean for food producers?

The Food Safety Modernization Act (FSMA) is the first major overhaul of our nation's food safety practices since 1938, and it includes new regulations for produce farms and for facilities that process food for people to eat. FSMA authorizes new regulations that will affect certain growers and certain facilities. Specifically, FSMA mandates the establishment of:

- Standards for produce production (Produce Rule), and
- Food safety measures for facilities that process food for people to eat (Preventive Controls Rule).

The rules outlined in FSMA are not yet law—FDA is in the process of developing them. In 2013, they released what was effectively a "first draft." In response, thousands of organizations, experts, growers, and eaters weighed in with comments on the draft rules aimed at fixing FSMA so that our nation can have a safe and sustainable food supply.

The National Sustainable Agriculture Coalition, sustainableagriculture.net, is a good resource for up to date information on the progress of the FSMA's development and its potential impact on small- and medium-scale operations.

What does the Produce Rule Establish?

(Source: <http://www.fda.gov/downloads/Food/GuidanceRegulation/UCM345226.pdf>)

- Science-based minimum standards for the safe growing, harvesting, packing and holding of produce on farms, particularly in the following major areas:
- Worker training and health and hygiene

- Agricultural water
- Soil amendments of animal origin
- Domestic and wild animals
- Equipment, tools and buildings
- Sprouts
- It covers fruits and vegetables in the raw or unprocessed (natural) state.

It does not apply to produce that is:

- Rarely consumed raw (e.g., potatoes, turnips);
- Grown for personal consumption; or,
- Destined for commercial processing, such as canning that will adequately reduce microorganisms of public health concern.

Preventive Controls Rule

(Source: <http://www.fda.gov/downloads/Food/GuidanceRegulation/UCM345224.pdf>)

Would revise the definitions for the following:

- Critical control point
- Food contact surfaces
- Microorganisms
- Plant
- Safe moisture level
- Sanitize

FSMA is currently going through a review and comment period, the first revisions were made and it is now its second iteration.

The regulation is targeted to be finalized by October of 2015. For more up to date information see the Food and Drug Administration (FDA) website:

www.fda.gov/Food/GuidanceRegulation/FSMA/ucm247559.htm

5. Although it may not be required and some grower/producers may be exempt from the policy/regulations, food safety is everyone's responsibility and good practices should be understood and adopted by everyone throughout the supply chain, including the end consumer. The key to all food safety plans is to understand the risks and put strategies/protocols/policies and monitoring in place to minimize the risk of contamination. The point of the plan is to ensure that only those production methods that minimize the risk of contamination are followed.
6. Food safety practices and GAPs are not limited to the farm, but should be practiced by anyone who is producing/growing food for consumption
7. Anyone along the supply chain may be asking for a food safety plan (buyers, including wholesaler distributors, food service, farmers markets, retail stores, processors/packers); however, the consumers (you and me as the final customer) expect our purchase to be safe.

Lecture 2: Assessing & Minimizing Food Safety Risks

A. Where Do Pathogens Come From? Assessing and Minimizing the Risks and Developing Good Agricultural Practices (GAPs)

Pathogens that cause food-borne illnesses can come from a number of sources, including the intestinal tracts and feces of wild and livestock animals (mammals), cross contamination between humans and animals transferred to produce, time and temperature mismanagement, and poor personal hygiene. Pathogens can enter the food supply in the field, or during harvest, packing, storage, or transport.

In assessing an operation's food safety-related risks, there is no "one size fits all": each operation must be carefully evaluated based on its own unique setting and situation, and the appropriate steps to ensure food safety applied. The following may not apply to every operation and therefore should only be considered as examples of risk-based questions and Good Agricultural Practices (GAPs). See Appendix 1, Farm Risk Assessment Checklist, for additional details.

1. Water

- a) Depending on the source and how water is used or stored, water can be a carrier and vehicle for transferring pathogens. *E.coli*, *Salmonella* and *Cyclospora* are examples of pathogens that may be found in water; each has been identified as the cause of foodborne-illness outbreaks associated with produce.
- b) Water is used in various ways both on the farm and in the garden, including but not limited to: irrigating, chemical application (via fertigation, pesticides/herbicide/fungicide applications, and sanitation), washing tools/equipment, washing and cooling produce, ice making. Note that water quality, including chemical composition, can impact the effectiveness of chemicals.
 - i. Know and document the source(s) of water and its intended use.
 - ii. Test the water source(s) for fecal coliform and generic *E.coli*. Note that generic *E. coli* is used as an indicator organism and only indicates the presence of fecal contamination. Frequency of testing should be based on the level of risk associated, as dictated by the water source and how it will be used. Water that will be in direct contact with produce, e.g., post harvest spray, sanitation, or wash water should be potable from a microbial standpoint. City water does not need to be tested by the farmer; the water service can provide the needed test results—usually online or at their main office. If you're going through a food safety audit you will need to have the test results (generic *E. coli* at this time) on file.
 - Generally speaking, risk levels decrease moving from:
Surface water ↘ uncovered well ↘ covered well ↘ city water
 - iii. Surface water sources should be thoroughly examined (via risk assessment) to understand all potential sources of contamination including upstream and adjacent land use.

2. Soil and soil amendments

- a) Healthy, fertile soils are naturally home to many organisms, including microbes. Growers often amend the soils with manure (raw or composted*), compost, and other amendments such as lime (calcium carbonate) or gypsum (calcium sulphate). *Note that according to the EPA, composted manure must attain temperatures of 131°F-149°F for at least three days and must be turned at least 5 times in a 15-day period.

- b) Manure/compost is often readily available to use as a source to help increase soil organic matter and add nutrients. However, improperly handled, stored and/or treated manure or manure-based compost can be of major concern with respect to food safety, as animal feces are a source of microbes and pathogens. Proper management can reduce contamination risks (see also Managing Manure Applications, ucfoodsafety.ucdavis.edu/files/26444.pdf). Be aware of the following:
- i. Source of manure? (Chicken, horse, steer, mushroom, etc.)
 - ii. Where is it stored? And, how?
 - iii. How, when, and where is it used?
 - Are there requirements for specific days to harvest after manure has been applied? (see below)
 - Where and who is recording this?
 - Who is verifying that crop is not harvested prior to the intended day?
 - Are there specific instructions for employees who may come in contact or track this with their shoes/clothing? What are the instructions?
 - How and where is equipment/tools treated/washed upon application? Who is responsible for this?
- c) If using raw manure, it should be applied at least 90 days prior to harvest for those crops not touching the ground or 120 days prior to harvest for crops in contact with the ground. The longer the interval between application and harvest the better. Note that these number of days to harvest are based on California Certified Organic Farmers' requirements; other certifying organizations may have different requirements.

3. Wildlife and rodents

- a) Wildlife and rodents can shed pathogens in their feces
- i. Wildlife is a natural part of the environment in which we farm. Risks have to be evaluated based on findings in the operation and nearby activity that could be a source of cross contamination. Some of the most common type of wildlife found or seen in fields include flocks of birds, deer*, rodents, and wild pigs. As part of risk assessment, the following should be included:
 - How and when is wildlife/rodent presence monitored? What are they looking for: tracks, droppings, trampling etc.?
 - Is there any significant risk of cross contamination from nearby activity (e.g., flocks of birds moving between your operation and an adjacent cattle feedlot)?
 - (*Deer in California have not been found to be a source of *E. coli* 0157:H7)
 - ii. Rodent activity may be more difficult to monitor. It is important, however, that growers evaluate whether rodent activity is occurring, and if so, where, and why.
 - Ensure that containers, tools, and equipment used to harvest are located in an area where they will not be contaminated and are not stored on the ground in the fields.
 - Ensure your property is well maintained, e.g., grass is kept short to limit/ prevent rodent habitation (but see below re: conservation and biodiversity considerations); avoid clutter; keep materials off the ground—store drip tape, irrigation pipes, etc., on pallets; maintain adequate spacing between storage pallets/materials in order to complete visual monitoring of any potential activity

4. Domestic animals and livestock

- a) Just like wildlife, domestic animals and livestock can host pathogens in their gut. It is important to keep them out of production, packing, and storage areas. Particular care and consideration should be given when domestic animals are unwell and have diarrhea.

- b) Other considerations include the location of livestock activities relative to production fields and access to water sources. Livestock operations upstream or upwind from crop fields may pose a risk.
5. Human activities (hygiene and illnesses)
- a) People are not always aware of the potential for transferring pathogens as a result of their behavior and practices. Developing this awareness and good food safety/hygiene habits is critical, and is especially important when people are directly handling produce (e.g., harvesting or packing). People must consider their activities and potential impact on food safety: training and education are key to reducing the risk of contamination.
- b) What aspects will the employees be trained in? Who is conducting the training? When does the training take place? How often will the training occur? Here are some examples of training considerations and practices (see also Appendix 2, Employee Training Policy and Instructions):
- Hand Washing –
 - Who is required to use the hand washing units?
 - How are they meant to be used? Wet hands? Apply soap? Lather and scrub front and backs of hands (minimum 20 seconds)? Rinse? Dry with paper towel (taps shall be turned off with paper towel). Point out that gloves and/or hand sanitizer are not a substitution for hand washing. Reusable gloves must be washed and follow the same policy as hand washing.
 - When is it necessary to wash hands? (Before entering the field, after a break, after using the toilets, after smoking, after coughing/sneezing directly into hands)
 - Illnesses/cuts, wounds and blood (see Appendix 3, Injury/Illness Log)
 - What is someone supposed to do in the case of illness/cuts:
 - Who do they go to for help?
 - Where is the first aid box?
 - Where and who is recording what happened and how it was dealt with?
 - What happens if equipment/tools/containers become contaminated?
- c) Visitors – All visitors should understand and comply with the farm policies with respect to hygiene, illness and limitations of access. Visitors should understand that in order to access certain areas they will need to be accompanied by someone involved in the operation.
- GAPs would require visitors to sign-in, acknowledging that they are made aware of the visitor policy (see Appendix 4, Visitors Policy and Log Sheet, for an example). Although a sign-in system may be difficult to institute depending on the type of operation (e.g., U-pick, agri-tourism), it is good to have posters/signage that states what is required of visitors as it applies to food safety.
 - Cross-contamination: How is daily activity a potential for cross contamination? E.g., consider movement between production and non-production fields. Is there any activity in either location that could be a source of contamination?
 - Break/eating areas: Are there separate and designated areas (with a posted sign), including designated smoking areas? Are people using these locations? Gum/candy should also be limited to break areas.
 - General hygiene: Regular cleanliness, including trimmed and clean nails, long hair is tied back, where necessary hair/beard nets are worn, clean clothes, coughing/sneezing into shoulder vs hand.

6. Harvest and Post-Harvest (packing, storing, transporting; see also Appendix 5, Pre-Harvest [GAPs] Checklist)

a) Harvest and Post Harvest: As discussed above, take into consideration human hygiene/illness, wildlife, and rodents, as well as the following:

i. Harvest:

- Where is harvested product kept in the field, prior to reaching its intended destination? Should it be covered?
- Are harvested product containers stacked? If so, do they ever have direct contact with the ground, or are they stored on something to prevent ground contamination (i.e., pallets)?
- Tools, Equipment/Containers
 - Who is cleaning the tools/equipment?
 - How often?
 - Where are they cleaned and stored?
 - What water source is used to clean?
 - Before using are they being inspected (for cracks, breaks or other damage), if so by whom?
 - Where do employees leave used, dirty, or blood- contaminated tools? Who do they report blood-contaminated tools/equipment to?

ii. Post-Harvest:

- Storing
 - Once the product comes in from the field, where and how is it being stored? Cooler? Refrigerator? Reefer? Barn/shed? Covered area?
 - How clean is this area? How is pest activity being monitored in the area?
- Packing
 - What are they packed into? Where is packing taking place? How is the equipment being cleaned and sanitized? How often? What is the water source?
 - Is product washed? What water source is used? Is it flumed? Is a chlorination/sanitation step added, if so, how often and at what rate?

iii. Transporting – Both from the field to packinghouse, and to final destination

- When are vehicles and other transport means inspected?
- Who is to inspect them, e.g., for cleanliness, pest activity, functionality, cross contamination?
- Where is this inspection information recorded and by whom?
- What happens if they are not clean?

7. Land use (previous and adjacent)

a) What is happening around us can also be a potential source of contamination

i. Always evaluate the location itself and its activities such as:

- Are there any livestock? Where is their location relative to crop-producing regions?
- Is there any surface water? Where is it located and is it potentially being contaminated by either something specific to your operation or from anything happening upstream?
 - Manure leachate?
 - Chemical contamination from improper use/storage of chemicals?
 - Livestock access or extreme wildlife activity in and around water or water source?
 - Location of portable toilets and hand washing units?
 - Storage of trash, old batteries, etc.?

- ii. Understand what is happening on nearby or adjacent properties and the risk of potential contamination from adjacent land use
 - Surface water contamination from upstream?
 - Feedlots nearby?
 - Manure storage near property line
 - Are they covered?
 - Leaching? Blowing manure dust?
 - Animal barns
 - Vents blowing towards crop?
 - Riparian and greenbelt areas
 - Are there animal feces coming onto your property?
- iii. Setbacks/Buffers
 - What requires setbacks or buffer zones?
 - Between fields, yours and your neighbors
 - Between crops
 - Is there a hedgerow or windbreak that can prevent or minimize dust from blowing into your growing area?
- iv. Barns
 - Do barns hosting livestock have vents with downspouts on them?
 - What happens if dust is blowing across the field into crop area?
- v. Flooding
 - Has flooding occurred? When was the last flood? What is happening in and around the flood area that could lead to contamination of the growing area?
 - Risks increase with feedlots, garbage dumps, animal husbandry operations, factories, etc.

8. Chemicals

- a) Who is to apply/handle chemicals?
- b) How and where are they stored? Who has access to the storage?
- c) Chemical/Spray Application
 - i. How is the application equipment calibrated?
 - How often?
 - By whom?
 - Where is this documented?
 - ii. What water source is used?
 - Where are the filling stations?
 - iii. Where and how is the chemical mixed?
 - iv. How are records kept and who verifies appropriate days to harvest intervals were satisfied?
 - v. How and where is the equipment cleaned?

B. Developing a Food Safety Plan

1. As discussed above, in order to develop a food safety plan or implement GAPs, growers must first understand what their risks are throughout the complete growing cycle, from soil preparation prior to planting to transporting final product(s). A number of tools are used to help growers understand/evaluate the risks and develop a plan based on minimizing risks specifically for each farm. These tools may include:

- a) Process Flow Diagram – Used to understand what is happening throughout the operation (step by step)
 - b) Risk Assessment / Hazard Analysis – Defines what potential biological (microbiological), chemical and/or physical risks may exist at different steps from production to shipping. See Appendix 1 for examples.
 - i. After identifying the potential risks that may exist, it is important to understand and document what if any action could be taken to prevent or minimize the potential of any contamination occurring.
 - c) Standard Operating Procedures (SOPs) – Designed to ensure that everyone (staff, visitors, and owners) follows the same set of rules/procedures. SOPs provide details about a certain activity and who, what, when, where and how it should be carried out to reduce the risk of that specific activity contaminating product. Examples of SOPs may include:
 - i. Employee training
 - ii. Equipment cleaning
 - iii. Blood contamination of product
 - iv. Cleaning blood-contaminated tools
 - v. Cleaning food contact surfaces
 - vi. Storing product
 - vii. Storing packaging material
 - viii. Water sampling for irrigation/wash water
- (Note: Some plans may include SSOPs; these refer to sanitation standard operating procedures, which are SOPs that are specific to cleaning)
- d) Policies
 - i. Hygiene and produce handling
 - ii. Disposing of blood-contaminated product
 - iii. Reporting Illness / Injury
 - iv. Visitors
 - e) Record keeping – Helps to prove (verify) that the appropriate steps were taken to minimize risk; records are verified/monitored to ensure ongoing prevention or risk reduction
 - i. Checklists and Logs – E.g., training, visitors, pesticide application log, pH and chlorination monitoring of wash water, soil amendment application, harvest, cooler storage temperature, shipping, cleaning (tables, surfaces, transport vehicles, etc.), cleaning and servicing of sanitation units (hand wash stations and toilets), pest monitoring, during harvest, pre-harvest, etc. For examples see Appendices.
 - ii. Letter of Guarantee – E.g., compost, packaging material, new equipment, 3rd party pest management program, contract chemical application companies, etc.

Collectively these tools provide evidence that risks have been evaluated and steps are in place to help monitor, prevent, or minimize risks; your food safety plan is a “Say what you do, and do what you say” written description of your farm operations..
2. Your food safety plan/GAPs plan will change over time, either as your practices evolve change or as tools, technology, or science evolve. It is essential to evaluate the plan and policy at least once a year to ensure information and material is current. Logs and policy forms should be dated to demonstrate ongoing changes and updates.
 3. Other production methods and food safety
 - a) Food safety and GAPs apply to all forms of agricultural or food-producing methods including:
 - i. Organic production

- ii. Greenhouse production
 - iii. Agritourism
 - iv. Agroforestry – Including alley cropping, silvopasture, forest farming
 - v. Wild harvest/collecting
4. Conservation considerations
 - a) Some requirements imposed by produce buyers have led to impacts on efforts to improve biodiversity and minimize farming's effects on wildlife. These impacts have included removing on-farm conservation plantings, such as hedgerows and grassed waterways, and destroying wetlands and other vegetation surrounding fields.
 - b) Work by the Wild Farm Alliance (wildfarmalliance.org) and other organizations concerned with farming and wildlife has shown that a healthy, diverse ecosystem combined with careful management can minimize the presence and spread of pathogens that cause foodborne illness. E.g., see Resources for a link to the Wild Farm Alliance's *A Farmer's Guide to Food Safety and Conservation: Facts, Tips and Frequently Asked Questions*.

C. Third Party Audits: Who Can Help with Developing a Food Safety Plan

Preparation for food safety audits—resources online and various agencies

- Onfarmfoodsafety.org
- Primus Lab website – Has templates
- ABC Farm Food Safety – Template

Mock Audit – Some agencies willing to perform a food safety mock audit at no cost

- Community Alliance with Family Farmers (CAFF) food safety program provides this to its members

Audit certification – Annually

- CDFA \$92/hr. plus travel (2013)
- NSF \$600 plus travel (2013)
- Primus Lab \$400 plus travel (2013)

Special price given when three or more farms in a 75-mile radius sign up for an audit appointment at the same time

Resources & References

PRINT RESOURCES

McSwane, David, Richard Linton, Anna Graf Williams, Nancy Rue. 2008. *Essentials of Food Safety and Sanitation, Fifth Edition*. Prentice Hall.

Forsythe, Stephen J. *The Microbiology of Safe Food, Second Edition*. 2010. Wiley-Blackwell.

This detailed (496-page) volume reviews the production of food and the level of microorganisms that humans ingest, covering both food pathogens and food spoilage organisms.

Anu Rangarajan et al. 2003. *Food Safety Begins on the Farm: A Grower Self Assessment of Food Safety Risks*.

The assessment is designed to guide growers through the process of identifying risks particular to their operation, developing appropriate solutions, implementing good agricultural practices and developing a farm food safety plan. Available for purchase at: www.gaps.cornell.edu/educationalmaterials.html

Wolfe, Pamela, and Rex DuFour. 2010. *An Illustrated Guide to Growing Safe Produce on Your Farm*. National Center for Appropriate Technology (NCAT).

This 20-page publication discusses ways farmers can reduce produce contamination risk, which creates a safer food system and increases consumer confidence in their own products and farm at the same time.

Available for purchase at: attra.ncat.org/attra-pub/summaries/summary.php?pub=350

Wild Farm Alliance. 2013. *A Farmer's Guide to Food Safety and Conservation*. wildfarmalliance.org/resources/FS_Facts_Tip_FAQ.htm

This free publication describes basic factors that affect the survival and movement of food borne pathogens on the farm, and how healthy diverse ecosystems can help to keep pathogens in check. A set of frequently asked questions addresses everything from wildlife and compost issues, to CSA visitors on the farm. Another section gives tips on how to have a successful food safety inspection, and the resources list includes links

to web pages where your auditor can learn about the co-management of food safety and conservation.

WEB-BASED RESOURCES

California Leafy Greens Marketing Agreement (LGMA) Food Safety Practices

www.caleafygreens.ca.gov/food-safety-practices

Describes food safety practices developed by California's leafy greens marketing board.

California Certified Organic Farmers (CCOF)

www.ccof.org/certification/food-safety-services

CCOF offers its members a variety of food safety services; the website includes a section on frequently asked questions about food safety issues.

Center for Produce Safety (CPS)

www.centerforproducesafety.org/

Based in Davis, California, the CPS provides science-based research on food safety topics.

Centers for Disease Control and Prevention – Food Safety

www.cdc.gov/foodsafety/

Information on a variety of food safety topics, including foodborne illness and outbreaks, antibiotic resistance, and microbial risk assessment.

Commodity Specific Food Safety Guidelines for Cantaloupes and Netted Melons

www.fda.gov/downloads/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ProducePlantProducts/UCM365219.pdf

Commodity Specific Food Safety Guidelines for the Fresh Tomato Supply Chain – 2nd Edition July 2008

www.fda.gov/downloads/Food/GuidanceRegulation/UCM171708.pdf

Commodity Specific Food Safety Guidelines for the Production, Harvest, Post-Harvest, and Processing Unit Operations of Fresh Culinary Herbs

[www.fda.gov/downloads/
Food/GuidanceRegulation/
GuidanceDocumentsRegulatoryInformation/
ProducePlantProducts/UCM365142.pdf](http://www.fda.gov/downloads/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ProducePlantProducts/UCM365142.pdf)

The above web-based publications provide food safety practices and guidelines for various commodities. They are most appropriate for large-scale operations but include useful information on topics such as harvest practices, field packing, and greenhouse practices of interest to all growers. All are available free online.

Community Alliance with Family Farmers (CAFF)

www.caff.org

CAFF advocates for California's family farmers and sustainable agriculture, and provides resources on food safety.

Cornell University – Good Agricultural Practices and Produce Safety Alliance

www.gaps.cornell.edu/

producesafetyalliance.cornell.edu/

Cornell University's Department of Food Science hosts the National Good Agricultural Practices (GAPs) Program website, with the goal of reducing microbial risks in fruits and vegetables by developing a comprehensive extension and education program for growers and packers. Includes links to educational materials, courses, collaborators, a database of research material, and much more. The Produce Safety Alliance (PSA) website provides science-based information on food safety, and offers fact sheets, newsletters, and a listserv to stay up to date on Food Safety Modernization Act (FSMA) information, research, and educational opportunities.

Farm Commons

farmcommons.org

This website offers tools and resources about legal matters to farmers. The site includes resources and documents pertaining to food safety.

Food Safety Modernization Act (FSMA) Proposed Rule for Produce Safety

[www.fda.gov/Food/GuidanceRegulation/FSMA/
ucm334114.htm](http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm334114.htm)

Information on the status of the proposed Food Safety Modernization Act (FSMA), including fact sheets and presentations, actions to date, and the Federal Register Notice.

Guidance for Industry: Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables Contains Nonbinding Recommendations 1998

[www.fda.gov/food/guidanceregulation/
guidancedocumentsregulatoryinformation/
ucm064574.htm](http://www.fda.gov/food/guidanceregulation/guidancedocumentsregulatoryinformation/ucm064574.htm)

Although somewhat dated, includes detailed information on minimizing microbial risks from water, manure and municipal solids, and farming activities such as harvesting, packing, storing, and transporting fresh produce.

Postharvest Technology Research and Information Center, University of California, Davis

postharvest.ucdavis.edu/
postharvest.ucdavis.edu/producefacts/

This center aims to reduce postharvest losses and improve the quality, safety and marketability of fresh horticultural products. Offers postharvest produce fact sheets in several different languages.

US Food and Drug Administration Guidance and Regulation

[www.fda.gov/Food/GuidanceRegulation/default.
htm](http://www.fda.gov/Food/GuidanceRegulation/default.htm)

Contains FDA guidance and regulatory information with links to Federal Register documents. You can also access information about food safety programs, manufacturing processes, industry systems, and import/export activities.

Wild Farm Alliance

wildfarmalliance.org/resources/food_safety.htm

The Wild Farm Alliance website offers a variety of resources that address farming with food safety and habitat conservation in mind. Includes a webinar on food safety and conservation, and the latest research findings.

Farm Name: _____

Date: _____

Farm Location: _____

Completed by: _____

If the answer to the question falls in the shaded box, a **Corrective Action** is needed to demonstrate what is done to prevent or minimize contamination. (Corrective Actions examples: monitoring, policies, training, covering items, cleaning etc....)

	YES	NO	N/A	Corrective Action
LAND USE (History and Adjacent)				
Has the land previously been used for mining, animal husbandry, industrial or waste storage purposes?				
Are septic tanks/fields, waste disposal and drainage systems well-constructed and maintained?				
Are there any water bodies (creek, irrigation/drainage ditches, river, slough) running through your property?				
Do animals/livestock have direct access to water bodies on your farm?				
Are there any water bodies (creek, irrigation/drainage ditches, river, slough, lakes) adjacent to your property (including in neighbor properties)?				
Do animals/livestock have direct access to water bodies your property and/or adjacent properties?				
Has this property flooded in the last year?				
Does activity on adjacent land to growing area pose a risk to crop(s) or water source(s)?				
Are there measures in place (barriers, drainage, setbacks, buffers, hedgerow, windbreaks etc...) in place to minimize drift or leaching of manure, poultry dust, or pesticides from adjacent farms?				

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	YES	NO	N/A	Corrective Action
WATER				
Is each water source that comes in direct contact with crop or with crop contact surfaces tested for fecal coliforms / generic E.coli? (Including water used for chemical application.)				
Are agricultural water storage containers used for hand washing, spray water or equipment cleaning, etc... cleaned prior to first use and have lids that close?				
Is well(s) maintained, covered and in good condition?				
Is the water used to clean harvest tools and harvest equipment from a tested water source?				
MANURE / COMPOST				
Is manure/compost stored on property in a way that minimizes crop, water and equipment, fuel and chemical contamination?				
Are process records (or a letter of guarantee or certificate of analysis if purchasing) available demonstrating that proper composting measures were followed?				
Is field stored manure/compost located to prevent leaching and drifting?				
Is the source of the manure known and is the application made at least 120 days before harvest for crops grown on the ground and 90 days for crops not immediately touching the ground?				
Is manure applied using a method that minimizes manure contact with crop and crop parts?				
Are records of application date, rate and method available?				

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	YES	NO	N/A	Corrective Action
CHEMICAL APPLICATION (PESTICIDE, FERTILIZERS, SANITIZERS, CLEANING AGENTS, ETC....)				
Is chemical application equipment well maintained at all times and calibrated at least once a year?				
Are chemicals stored in a leak-proof locked cabinet, in a well-ventilated area (barn/shed) away from food and food contact surfaces; with warning signs on doors?				
Are chemicals stored and used according to label specifications?				
Are there legible labels on all chemicals?				
Are chemical application records available?				
Are there records available that demonstrate pre-harvest intervals are observed prior to harvesting crops?				
Are empty chemical containers disposed as per label and regulations?				
Do chemical applicators have the appropriate licenses and training?				
DOMESTIC / WILD ANIMALS AND LIVESTOCK				
Do domestic animals or livestock have access to fields that are producing or will be producing this season?				
Is wildlife activity monitored and is there a pre-harvest policy in place that specifically considers intrusion in fields ready for harvest?				

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	YES	NO	N/A	Corrective Action
EMPLOYEE TRAINING (HEALTH, HYGIENE AND HARVEST)				
Is a training program and policy that covers good hygiene, harvest and handling practices in place?				
Are there adequate number of clean and replenished toilets and hand washing units available for employees to use?				
Are there records of cleaning and replenishing supplies for toilets and hand washing units?				
Have employees been instructed as to what happens in case of illness, cuts, open wounds/sores and blood on equipment/produce?				
Do employees know what to do with product if it may have been contaminated by wildlife/domestic animals?				
Are readily understandable signs posted (and in good conditions) to instruct employees and visitors of good hygiene practices?				
Is the field free of debris and garbage with trash cans (with lids) located to prevent contamination?				
Do employees know where the designated eating areas are?				
HARVEST TOOLS, EQUIPMENT, CONTAINERS AND BUILDINGS				
Are harvest tools, equipment and containers stored to prevent contamination?				
Are these tools, equipment and containers are used for the sole purpose of harvest?				
Is the produce delivery vehicle visibly inspected to ensure it is clean prior to loading produce?				
Is the produce delivery vehicle only used to deliver produce?				
Are the buildings which are used to store produce or produce contact surfaces (equipment, containers, packaging etc...) being cleaned and monitored for pests?				

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TRACEABILITY	YES	NO	N/A	Corrective Action
Are chemical application and manure application pre-harvest intervals observed prior to harvesting?				
Is there a system in place to enable tracking of specific product from the field to where it was shipped?				
Can inputs used on the crop or in the field be traced back to the supplier?				

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Appendix 2: Example of Employee Training Policy & Instructions

<p>Employee Illness, Disease and Injury</p> <ul style="list-style-type: none"> ○ Persons able to transmit, or suffering from, a contagious disease and/or illness transferable to food (e.g., Hepatitis A, Salmonella, <i>E. coli</i> O157:H7) and those with a temporary illness (e.g. diarrhea, nausea or vomiting) are advised to see a doctor and stay at home ○ Employees are trained on the role and responsibility they play in preventing the contamination of crops ○ Open wounds are immediately treated and covered with a waterproof dressing (e.g. rubber gloves) ○ Report illnesses and injuries as soon as they occur 	<p>Employee Hand Washing</p> <ul style="list-style-type: none"> ○ Hands are washed: <ul style="list-style-type: none"> - Before beginning work each day - Before entering the harvesting area - Before putting on gloves (if used) - After every visit to the restroom - After breaks, meals, smoking - After hand-to-face contact (e.g., coughing, sneezing, blowing nose) - After applying sunscreen and insect repellent - After using the phone - After handling garbage ○ Hands and reusable gloves are washed using proper hand washing techniques: <ul style="list-style-type: none"> - Wet hands - Lather with soap - Scrub well (20 secs) - Rinse - Dry hands with paper towel ○ Gloves are not worn as a substitute for hand washing
<p>Employee Glove Use</p> <p><input type="checkbox"/> <i>Check if gloves are <u>not</u> used and proceed to the next sub-section</i></p> <ul style="list-style-type: none"> ○ Gloves are made of rubber, nitrile, polyethylene, polyvinyl chloride, polyurethane or cloth ○ Hands are washed, before gloves are put on and after they are removed ○ Gloves are replaced when ripped or worn out ○ Gloves are removed when leaving the work area and replaced upon return or, if reusable, washed (using proper hand washing technique) after being put back on 	<p>Other</p> <ul style="list-style-type: none"> ○ Employees adhere to the following: <ul style="list-style-type: none"> - Always use toilet facilities - Never spit in the crop growing area - Only eat, smoke, drink, chew gum, spit or use tobacco products in areas designated to these activities - Put personal effects in designated areas (i.e., weatherproof clothing, boots, lunches etc...) - Use garbage cans - Leave tools in designated areas (including at breaks and before entering toilet facilities - Never take tools / gloves into toilet facilities
<p>During Harvest</p> <ul style="list-style-type: none"> ○ Only harvest using clean tools, equipment and into clean containers ○ Always inspect to ensure there is no wildlife or animal contamination (ie. droppings / trampling) ○ Product contaminated with blood is discarded ○ Harvest containers are used solely for harvesting ○ Other: 	<p>Security</p> <ul style="list-style-type: none"> ○ Employees will report any strange or suspicious activity in or around the facility ○ Employee will report any suspicious materials and/or chemicals
<p>Additional</p> <ul style="list-style-type: none"> ○ _____ ○ _____ ○ _____ ○ _____ 	

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Appendix 3: Example of Injury / Illness Log

Example of Injury/Illness Log

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Appendix 4: Example of Visitors' Policy & Log

Welcome to:

Our Food Safety Policy at _____ ensures that all the crops we grow are produced for our customers under strict food safety guidelines. All visitors must comply with the following Visitor Rules.

All visitors must:

- ✓ Remain in the area they are given permission to be in
- ✓ Wash hands before entering crop growing area / packing area
- ✓ Not chew gum / eat / smoke / drink other than in designated areas
- ✓ Follow the instructions given to them
- ✓ Remove jewelry
- ✓ Wear clean shoes (should not be visibly dirty or soiled) or cover shoes prior to entering
- ✓ Not touch or handle anything that they do not have permission for
- ✓ Sign in below to indicate they are informed of and understand the visitor policy:

✓ _____

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Appendix 5: Example of Pre-Harvest (GAPs) Checklist

"No" answers require a corrective action.

Crop(s) Inspected: _____ Date: _____

Farm Location and Blocks: _____ Checked by: _____

INSPECTION	YES	NO	N/A	Corrective Action
ADJACENT LAND USE				
Activity on adjacent land does not pose a risk of contamination to the growing area.				
SITE				
Flooding has not occurred so far this season either natural or irrigation related.				
No strange or suspicious activity is observed (broken gates/locks, unusual tire tracks etc...).				
Growing area is free of animal (wild and domestic) intrusion including droppings, carcasses, tracks, trampling etc...				
The site is free of excessive garbage.				
WATER				
A tested safe water source is used for chemical applications made close to or during harvest.				
CHEMICALS / MANURE / COMPOST				
Appropriate days to harvest are observed between application and harvesting of crop.				
Are stored to prevent or minimize contamination of crop, water source, harvesting equipment, tools & containers				
HARVEST TOOLS, EQUIPMENT & CONTAINERS				
Are clean prior to use.				
Are washed and cleaned using a tested and safe water source.				
HYGIENE AND HEALTH				
Toilet and hand washing facilities are in good working order.				
Employees are following good hygiene and harvesting practices.				

In the event that feces or carcass from fauna are found in the produce growing area, the area around the feces or carcass will be marked or flagged and:

- a) During a period of 3–7 days prior to harvest, the feces or carcass will be marked and a three-foot buffer determined. The produce in the marked area along with the feces/carcass will be collected in trash bags with disposable gloves and tools and deposited in the county land fill dumpster.
- b) During the period of 8 or more days prior to harvest, the feces or carcass will be collected with appropriate gloves, tools and trash bags and deposited in the county land fill dumpster.

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Appendix 6: Example of Standard Operating Procedure (SOP) Form

Standard Operation Procedures (SOPs) are step-by-step descriptions of specific tasks. Individual tasks should each have their own SOP. The document is meant to be concise and easy to read, and it is best to start each step in an SOP with an action verb.

SOPs can be used to train employees as well as provide them with a reference document. Before writing an SOP, understand who the audience is (those who will perform the task), and task's intent.

A standardized form ensures that all the necessary material is included in each SOP. There is no set template—you can design the form in a way that works for your operation.

Below is a sample SOP form:

NAME: Proper Hand Washing SOP	CREATED ON: Nov. 13, 2013	LAST MODIFIED: Aug. 14, 2015
PURPOSE: To minimize the risk of microbial contamination		
WHO PERFORMED THE TASK? All Employees and Visitors	WHERE IS THE TASK PERFORMED? Washrooms and Hand Wash Stations	WHEN IS THE TASK CARRIED OUT? <ul style="list-style-type: none">• After any potential contamination• Upon returning to work
EQUIPMENT / TOOLS / SUPPLIES: <ul style="list-style-type: none">• Soap• Water• Single-use Paper Towels	RECORD / FORM USED: Pre-Harvest Checklist Facilities Cleaning Log	CREATED BY: Name MODIFIED BY: Name
PROCEDURE: <ol style="list-style-type: none">1. Wet hands2. Apply soap3. Lather and scrub (for at least 20 seconds)4. Rinse (with water running down the hands)5. Dry with a single-use paper towel6. Throw paper towel in garbage		

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